SOUTH CAROLINA ELECTRIC & GAS COMPANY
POST OFFICE BOX 764
COLUMBIA, SOUTH CAROLINA 29218

November 4, 1981

T. C. NICHOLS, JR.
VICE PRESIDENT AND GROUP EXECUTIVE
NUCLEAR OPERATIONS

Mr. Harold R. D...ton
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Virgil C. Summer Nuclear Station
Docket No. 50/395
Solid Radwaste Handling and
Disposal - Open SER Item 1.7.17

Dear Mr. Denton:

As a result of recent industry difficulties involving the use of urea formaldehyde as a radwaste solidification agent, South Carolina Electric & Gas Company (SCE&G) has contracted with Chem Nuclear Systems, Inc. (CNSI) for portable solidification services using the cement process. This portable (skid mounted) system will be located inside the Auxiliary Building in the existing radwaste handling area.

Per conversations between Mrs. Nancy Clark and Mr. Gary Moffatt of SCE&G and members of your staff, the following is being submitted:

a. FSAR Chapter 11.5, "Solid Waste System," marked to reflect these changes (Attachment I).

b. "Operating Procedure for CNSI Portable Cement Solidification Unit No. 21," document number SD-OP-020, Rev. 0 (Attachment II).

c. "Dewatering Procedure for CNSI Conical-Bottom High Integrity Containers 1% Free-Standing Water," document number FO-OP-003, Rev. C (Attachment III).

d. "Process Control Program for CNSI Cement Solidification Units," document number SD-OP-003, Rev. D (Attachment IV).

e. "P&ID PSU C-21," document number 313-2101-E01, Rev. 0 (Attachment V).

Please note that attachments C through F are Chem Nuclear proprietary information. The attached affidavit is in support that these documents are to be withheld from public disclosure (Attachment VI).

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Based on the above, we feel that sufficient information has been provided to complete your review. However, if you require further information, please advise.

Very truly yours,

for T. C. Nichols, Jr.

GDM:TCN:glb

Attachments

cc: V. C. Summer
G. H. Fischer
T. C. Nichols, Jr.
H. N. Cyrus
J. C. Ruoff
D. A. Nauman
W. A. Williams, Jr.
R. B. Clary
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ATTACHMENT I

11.5 SOLID WASTE SYSTEM

11.5.1 DESIGN OBJECTIVES

The solid waste system is designed to package and/or ~~and~~ solidify radioactive wastes for shipment to an approved offsite burial facility in accordance with applicable Department of Transportation (DOT), NRC and State regulations. The system conforms to 10 CFR 20 and 10 CFR 50 requirements by providing shielding so that radiation exposure of operating personnel and the public is within acceptable limits. Solid waste packaging is accomplished in an ~~a limited access~~ area located on the ground floor (elevation 436') of the auxiliary building, a Seismic Category I structure. ~~This area is isolated from the bulk of the auxiliary building by concrete shield walls, except for an opening into the truck access corridor. Passage through this opening is controlled. There is also an intermediate concrete shield between this opening and the fill area.~~ 29

Design, fabrication and test of solid waste system components and piping is in accordance with ANSI B31.1 and other accepted standards referenced by ANSI B31.1. Additional onsite system tests will be performed using nonradioactive materials prior to commercial operation. The shipping containers are DOT Type A. Overpacks for highly radioactive materials satisfy DOT regulations. Packaging and shipping conform to 49 CFR 171 through 49 CFR 178. 15

Individual container shields and casks ~~having nominal 1-1/2 and 4 inch thicknesses of lead~~ are used, when required, to maintain radiation levels within 200 mR/hr at surface contact and 10 mR/hr at 3 feet. 29

11.5.2 SYSTEM INPUTS

Radioactive waste packaged includes:

1. Evaporator bottoms.
2. Chemical laboratory samples.
3. Spent resins.
4. Used filter cartridges.
5. Radioactive hardware.
6. Compacted waste such as rags, paper, clothing, etc.

14 Containers holding high level solidified radioactive materials are stored with their individual shields, within a concrete cubicle at grade. Containers holding low level wastes are stored with their individual shields, if required, on a mezzanine floor 11 feet above this area. They are lifted by a 10 ton, motor driven trolley and crane which locates containers in this area. 29

14 The filling, flushing and solidification process is performed automatically or remote manually from a control panel in a shielded room. Figure 11.5-1 is a flow diagram of the system. A layout of this area is given by Figure 1.2-25.

Design quantities and activity levels of the various wastes are listed in Tables 11.5-1 through 11.5-4.

29 11.5.3 EQUIPMENT DESCRIPTION

11.5.3.1 Processing

14 The input to the solid waste system consists of the contents of four radioactive waste storage tanks containing waste evaporator concentrates, chemical laboratory samples, primary spent resins and nuclear blowdown spent resins and the associated valves, piping and pumps. These components are located at elevation 412' in the auxiliary building

14 except for the chemical drain tank which contains spent chemical laboratory samples and is located at elevation 374' of the auxiliary building.

INSERT A

A chemical processing area is located on the auxiliary building mezzanine floor at elevation 447' to locate as much equipment as possible in a nonradioactive area for service and maintenance purposes. The following equipment is located in this area:

1. The urea formaldehyde concentrates (UFC) storage tank which contains urea formaldehyde, water and a small amount of a proprietary additive. This mixture comprises the solidification agent (SA).

2. The urea catalyst storage tank which contains ammonium sulfate, prilled urea, water and a small amount of a proprietary additive. This mixture comprises the catalyst.

3. The sulfuric acid storage tank contains the sulfuric acid which can be used to lower the pH of liquid waste below 6.9, if required, prior to packaging.

4. The chemical process module which contains the catalyst pump, UFC pump, valves and piping to direct the SA and catalyst to the waste container.

5. The sodium hydroxide storage tank contains sodium hydroxide which is used to raise the pH of the liquid waste above 6.0, if required, prior to packaging.

Liquid waste is routed to a waste blending tank (WBT) prior to packaging, where the liquid is recirculated through a pH meter by a recirculating/radwaste pump. Sulfuric acid and/or sodium hydroxide is added to the WBT as necessary to adjust the pH of the tank liquid to within 6.0 to 7.0. By appropriate valving, a sample of the WBT constituents can be obtained to demonstrate solidification capability as required by NRC regulations. The WBT is equipped with a mechanical mixer to ensure a homogenious mixture for sampling and for greater assurance of solidification. The WBT is also heated to permit close temperature control. The recirculating pump is located in a shielded cubicle below the WBT and adjacent to the fill area at elevation 436'. The WBT is located on the floor above the pump within the same cubicle at elevation 445'. 29 ~~19~~

INSERT A

Radwaste solidification is accomplished using a portable cement solidification process supplied by Chem Nuclear Systems Inc. Liquid waste contained in the Chemical Drain Tank and Waste Evaporator Concentrates Tank is recirculated using their respective pumps and a sample is taken. This sample is used in the Process Control Program to determine pH adjustment, waste/binder ratio, and for the purpose of test solidification. Liquid waste is transfered to the fill head and into the liner located in the solidification area. Correct pH range based on the test solidification is accomplished by adding calcium hydroxide through the fill head to the liner. Bulk cement and calcium hydroxide are stored in a bulk trailer outside the Auxiliary Building truck access. Other conditioning chemicals may be added if necessary from the conditioning chemical tank and transfer pump. 29

The WBT provides a means to accomplish the following:

1. Thoroughly mix and homogenize the waste.

2. Add chemicals for pH adjustment.

3. Control radwaste temperature.

Based upon solidification data supplied by the process manufacturer for various chemical solutions, the correct band of ratios of waste SA and catalyst is selected.

The control of waste material content before addition of SA provides the means for assuring more consistent results. When the radioactive waste solidification fill operation is terminated, the material within the container is allowed to solidify and then only SA and catalyst are added to seal the top surface of the solidified waste.

The dewatering module is located in a shielded cubicle on the auxiliary building operating floor (elevation 436'). It consists of a resin slurry dewatering pump and the associated piping and valves. 29 ~~19~~

Primary and Secondary spent resins are transfered from their respective holdup tanks to either a disposable liner in the solidification area or a liner which is already in a cask ready for transport in the truck bay. The resins may then be either solidified or dewatered for shipment. Dewater return is through the vendor's piping process skid to the dewater connection in the solidification area and from there to either the Excess Liquid Waste Holdup Tank or the Spent Resin Storage Tank. 29

19 Labyrinth shield walls separate the drumming station control room, the dewatering module and the container fill area from one another. Equipment is described in more detail in Section 11.5.3.2. 29

11.5.3.2 Equipment

The equipment comprising the solid waste system is described in Sections 11.5.3.2.1 through 11.5.3.2.7. Table 11.5-5 provides equipment design parameters. Refer to CNSI Operating Procedure : document SD-OP-020 and flow diagram 313-2101-E01. 29

11.5.3.2.1 Waste Storage Tanks and Pumps

19 Tanks containing radioactive waste and wetted parts of pumps are fabricated from stainless steel, type 304, except as noted. The chemical drain and the primary spent resin storage tanks and pumps are described in Section 11.2. Other radwaste tanks and pumps are the waste evaporator concentrates pump, nuclear blowdown spent resin storage tank, and nuclear blowdown spent resin storage tank pump, ~~and the WBT. The WBT is fabricated from type 316 stainless steel.~~ 29

11.5.3.2.2 Chemical Storage and Process Equipment

INSERT B

19 The SA, catalyst, sulfuric acid and sodium hydroxide are stored in tanks in a chemical storage area on the auxiliary building mezzanine floor at elevation 447', above the drumming control room and waste fill area. A chemical process module is also located in this area, with appropriate valving and pumps for directing SA to the waste container, or sulfuric acid and/or sodium hydroxide to the WBT. Containers of dry chemicals for addition to the SA or catalyst tanks are also stored in this area. The SA (UPC) and catalyst tanks are of coated carbon steel construction, whereas the sulfuric acid tank is constructed of 316 stainless steel and the sodium hydroxide is fabricated from polyethylene. 29

The chemical process module consists of the following skid mounted equipment:

AMENDMENT ~~19~~ 29
~~JUNE, 1980~~

INSERT B

Bulk cement and calcium hydroxide are stored in a bulk trailer located outside the Auxiliary Building truck access. A pneumatic type cement conveyor located in this same area, transfers the cement through a truck access area wall penetration to a portable hose leading to the fill head. The fill head normally located in the solidification area along with the piping process skid and hydraulic unit. The conditioning chemical storage and process area is located within a curbed area in the truck access. Liner ventilation equipment is located in a curbed area in the truck access. The discharge from the liner ventilation equipment is directed to the plant vent. 29

1. SA pump.

2. Catalyst pump.

3. Flow detectors to indicate solidification agent and catalyst flow.

4. Pressure switches in pump discharge lines. ~~14~~

5. Electrical terminal box.

6. Associated piping.

11.5.3.2.3 Radwaste Module

The radwaste module consists of the following skid mounted equipment:

1. Liquid radwaste pump. 29

2. Preserve switch in pump discharge lines.

3. Flow detector for radwaste flow.

4. Three motor operated valves: one to admit the WBT effluent; another to recirculate the WBT contents; and the last to discharge the WBT effluent to the disposable container. ~~19~~

5. Electrical terminal box.

6. Associated piping.

11.5.3.2.3.1 Dewatering Module

The dewatering module consists of the following skid mounted equipment:

1. Dewatering pump

2. Flow detector for dewatering flow.

3. Pressure switch in pump suction line.

4. A motor operated three-way valve to admit water from the WBT or the disposable container.

5. A manual valve to isolate the pump. 29

6. Electrical terminal box.

7. Associated piping.

11.5.3.2.4 Instrumentation and Controls

The system uses temperature, flow, pressure, and level instruments to monitor and/or control the process located throughout the system.

~~In addition, there is a~~ The inplant control panel, power panel and radiation monitor are
19 located in the drumming station control room. ~~A description of these~~ 29
~~last items is as follows:~~ The CNSI control panel is also located in this same area.

1. Inplant Control Panel

   The inplant control panel is a standard enclosure of NEMA 12 construction. A functional flow chart showing valve positions, pumps, etc., is presented on its face. This provides a visual presentation of system performance and gives the operator full understanding of current system status. The control panel is designed to provide a display of operational controls and safety limits. All the required solid-state circuitry for manipulation of the system is located
19 within the panel. Manual override is provided to allow for system malfunction corrections or manual operation of the process. 29

   The control panel provides proof circuits which indicate that the various valves are properly positioned before the required pumps
19 start and that the pumps are operating.

The inplant control panel provides full operational control for resin and liquid waste transfer operations to the vendor's equipment. It is also used to interface with vendor equipment for dewater return and for flushing operations.

2. Power Panel

The power panel provides power for the operation of the various pump motors and valve motors in the system. 19

3. Proof of Flow Systems

Proof of flow circuitry and solid-state, thermally actuated flow switches for the dewatering, waste, solidification agent, and catalyst lines are furnished. Signals from the flow switches interface with the solid-state control panel to provide a method of preventing either operation of the pumps without liquids present so that the pumps are not damaged by being run "dry" or omission of o of the three components required to make a solidified mass of radioactive material in the disposable liner. ~~19~~ 29

4. Radiation Monitoring

INSERT C

A radiation monitoring is located on the wall of the control cubicle to alert the operator in the event of excessive radiation. In addition, two radiation sensors, one measuring the radiation level at the container or shield surface, the other measuring radiation six feet away, are located in the container fill area. These are connected to a radiation monitor located on top of the control panel. There is also a radiation sensor located near the WBT to measure radiation level in the WBT cubicle. The radiation monitor is located on the control panel. If excess radiation levels exist, an alarm is sounded and the fill operation is automatically terminated. If this occurs, a decision can be made to either dilute, ship a smaller volume and/or provide additional shielding. 19 19 29

The radiation sensors in the container fill area also serve to segregate filled containers by radiation level. This permits some low specific activity (LSA) shipments to be made.

The radiation monitors are in addition to those discussed in Sections 11.4, 12.1.4 and 12.2.4. 14

11.5.3.2.5 Waste Containers and Shielding

Compacted wastes are packaged in standard 55 gallon drums. Other wastes are packaged in 50 ft3 containers having dimensions of 4 feet in diameter and 4 feet high or other DOT Type A containers. ~~The container top has provision to connect a motor to an internal, disposable mixer.~~ Quick disconnect fittings are located in the container top for the following: 29 14

INSERT D

1. Venting from the container through a filter to the plant exhaust system.

2. Admission of liquid waste to the container. 29 19

INSERT C

Radiation monitoring is provided by the vendor's equipment in the following areas:

1. waste isolation valve of the piping process skid
2. liner fill head.
3. control room.

29

INSERT D

1. Dewater through a filter back to the Excess Liquid Waste Holdup Tank or Spent Resin Storage Tank.
2. Cement - Calcium hydroxide fill connection
3. Conditioning chemical supply
4. Vent to filters and plant vent
5. Radwaste supply flush.

3. Admission of SA to the container.

4. Admission of catalyst.

5. Admission of air for sparging.

6. Dewatering of resin slurry. 29

INSERT E

The processing of most of the waste volume will be handled in the solidification area behind a movable shield. Higher activity wastes, however, will be processed with the liner already in the transport cask located in the truck access area. A double lid cask top will be used to limit exposure in this area. After the waste process is complete, the fill head is removed, and the secondary cask lid is installed.

19

The expected container design for packaging radioactive filters and hardware is a 50 ft^3 container having a removable lid and a centrally located basket into which the filter or hardware is lowered. The lid is then replaced and liquid waste is packaged and solidified in and around the basket.

INSERT E

When the radiation level of the waste requires shielding, the container is completely enclosed in lead shields having 1-1/2 inch or 4 inch nominal thicknesses. A centrally located shield plug, approximately two feet in diameter, on the top of the shield is placed in position after filling by a pendant controlled overhead jib crane. 29

When the Curie content of radioisotopes packaged within a container exceeds DOT prescribed limits, the container and its shield are packaged within a DOT approved overpack for transport to the burial site.

11.5.3.2.6 Contamination Control Facilities

An adjacent decontamination area is provided for cleanup of contaminated containers. Exposed surfaces of filled containers or casks are surveyed by the health physics group to identify the presence of removable radioactive contamination prior to transfer to storage or shipment. Containers are decontaminated in the adjacent decontamination area, if required.

11.5.3.2.7 Handling Equipment

Equipment used for ~~transporting the~~ handling waste containers and ~~shield~~ equipment within the radwaste area and for truck loading includes the following: 29

~~1. Load pallet.~~

~~2. Load pallet and personnel shield.~~

~~3. Lift truck.~~ 29 ~~14~~

4. One ton jib crane.
5. Three ton jib crane.
6. Ten ton bridge crane.
7. Twenty ton hoist and monorail.
8. Three ton bridge crane.
9. Ten ton bridge crane.

~~The waste container and individual shield, if needed, are placed on a pallet by the ten ton bridge crane in the hot machine shop or by the overhead twenty ton hoist. If the radiation level of waste to be packaged is expected to be high, a pallet, having an additional 3 inch thick stainless steel shield, is used for additional protection of the operator. The waste container, shield and pallet are transported within the radwaste area at floor elevation 436' by the lift truck.~~ 29 ~~14~~

The one ton jib crane is located on a wall above the truck access floor at elevation 435'. It is used for hoisting chemicals and equipment ~~from~~ in the truck access area. ~~to the mezzanine floor.~~ It has a lift of 23 feet at a speed of 22 ft/min. ~~19~~ 29

The three ton jib crane is located on a wall above the ~~container fill~~ solidification area. ~~It is used to remove and replace the lead shield from the top of the container. It is also used to support the filter transfer lead cask while transferring a spent filter cartridge from the cask to the container. The flexible rubber hoses, used when filling a container, are also connected to this crane for removal of the hoses from the container, upon completion of the filling operation.~~ INSERT F It has a 23 foot lift at a speed of 11 ft/min. 29

INSERT F: It is used to handle the vendor's fill head and other equipment.

The ten ton bridge crane is used for transporting ~~waste containers,~~ compactible & non-compactible waste ~~either with or without a 1-1/2 inch lead shield,~~ in the low radiation level storage area at floor elevation 447'. It has a lift of 14 feet at a speed of 11 ft/min and a trolley speed of 65 ft/min. 29

The twenty ton hoist and monorail is used ~~as backup for the lift truck~~ to load the containers ~~and shield, if required, on either a pallet or~~ on a truck for transport to a burial site. It has a lift of 25 feet at a speed of 10 ft/min. 29

The three ton bridge crane is located over the radioactive filter area at floor elevation 463'. It is used in conjunction with a 3-1/2 inch thick lead filter transfer cask to remove spent radioactive filter
14 cartridges from the filter housings located in concrete cubicles on the floor below at elevation 452'-6". The trolley has a transfer mechanism which permits the hoist and the cask to engage a monorail which extends over the radwaste fill area. A hatch at floor elevation 463' is removed and the hoist lowers the cask to the radwaste area at floor elevation 436'. It has a lift of 47 feet at a speed of 22 ft/min and a trolley speed of 65 ft/min.

Another ten ton bridge crane is located in the hot machine shop. It is
14 chiefly used to service the machine shop. However, a portion of the floor area in the machine shop is partitioned from the rest of the shop for storage of unused containers, ~~and~~ 55 gallon drums, pallets, etc. 29
14 ~~shields and the overpack~~. The storage area is also serviced by this crane. The hoist has a lift of 24 feet at either 7 or 20 ft/min. The trolley has a speed of either 32-1/2 or 65 ft/min.

11.5.3.2.8 Waste Compactor

An electromechanical compactor, with a compressive force capacity of four tons, is used to compact dry wastes into 55 gallon drums. During compaction the drum is completely enclosed. A self-contained HEPA filter and blower system filters the air released in the compaction process before it is discharged to the auxiliary building atmosphere. An electrical interlock prevents operations of the compactor if the door, which encloses the drum, is not completely closed. This prevents injury to the operator and unfiltered air from escaping to the auxiliary building atmosphere. This compactor satisfies Occupational Safety and Health Act (OSHA) requirements.

11.5.3.2.9 Truck Loading Features

A wall penetration is provided between the fill and truck access areas to fill directly to containers on a truck. ~~if excess waste accumulates. Waste, chemical, and vent lines are provided with quick disconnects on both sides of the wall. The piping in the wall is stepped to permit two, intermediate, two inch thick lead shields to be inserted within the wall.~~ ~~19~~ 29

11.5.4 EXPECTED VOLUMES

The expected annual volume of solid radioactive wastes together with the associated Curie content of principal nuclides to be processed are described in Sections 11.5.4.1 through 11.5.4.4.

11.5.4.1 Activity Levels

The activity level of the wastes generated directly from operation of the nuclear steam supply system is based upon reactor plant operation at a base load factor of 80 percent power with reactor coolant activity levels determined on the basis of fission product diffusion through cladding defects in 0.12 percent of the fuel rods. The system is conservatively designed to accommodate solid wastes generated by plant operations with up to 1 percent fuel defects. Source term data used for system design are presented in Section 11.1.

every six full power months of operation and that one of the three nuclear blowdown system filters will require cartridge renewal, normally for high ΔP, weekly. All other filters are assumed to be renewed annually. These replacement rates are approximations only since sufficient specific operational data is not yet obtainable (see Table 11.5-4).

The maximum expected activity of expended filter cartridges shipped from the site is conservatively based upon a shielding criteria of a maximum contact dose rate.

11.5.4.4 Miscellaneous Solid Wastes

The annual volume of miscellaneous solid wastes processed by the solid waste hydraulic baler is assumed to amount to 350, 55 gallon drums of compacted refuse. The wastes consist of rags, coveralls, ventilation filter cartridges and various other potentially contaminated refuse. The activity of this refuse is low level and does not present a radiation hazard (less than 1.0 Ci/yr). 3

11.5.5 PACKAGING

11.5.5.1 Evaporator Bottoms and Chemical Samples

Evaporator bottoms, concentrated to 12 percent, or less, boric acid in the boron recycle or waste evaporator, are stored in the heat traced 5000 gallon waste evaporator concentrates tank. Lines from this tank to the ~~WBT are also heat traced.~~ discharge waste control valve (MCV-2). Chemical samples are stored in a 600 gallon chemical drain tank. ~~When a sufficient quantity has accumulated for packaging, the waste is transferred to the WBT in batches of 700 gallons or less. This waste volume will fill three 50 ft^3 containers when solidification and catalyst chemicals are added in the normal proportions.~~ 14 ~~14~~ 29 ~~14~~

INSERT G

INSERT G

when a sufficient quantity has accumulated in either waste tank, its contents are recirculated for at least two volume changes and a sample is taken. The sample is used by The Process Control Program for test solidification. After sampling, the waste volumes are then transfered to the vendor's equipment for processing.

AMENDMENT 29

The liquid waste is recirculated by the recirculating/radwaste pump and the mechanical mixer is started to thoroughly homogenize the waste. This procedure also emulsifies or holds in suspension small quantities of other wastes, such as oil and anti-foam agents. Sulfuric acid and/or sodium hydroxide can be added from their respective tanks, if required, until a pH meter in the recirculation line indicates a steady reading of 6.0 to 7.0. A sample can be withdrawn for analysis if required. 19

Based upon solidification data provided by the process manufacturer for various chemical analyses, the desired waste temperature is maintained by the WBT heater and the correct band of ratios of waste, catalyst and SA is selected. In addition, small samples are periodically solidified using the selected proportions to assure complete solidification. 14

A radiation sensor located in the WBT cubicle is used to determine the size of the lead shield required for the 50 ft3 container. It is anticipated that the 1-1/2 inch thick lead shield will be more than adequate and that in many cases no shielding will be required. The container (with or without shield, as required) on a pallet is located in the fill area by a lift truck. Five connections are made to the container with flexible wire and fiber braid reinforced hoses designed for 1500 psig (6000 psig minimum burst pressure). These hoses have quick disconnects and are enclosed within a fill shield assembly. An electrical connection is also made to a disposable level probe and temperature probe within the container. 29 19

The hoses are connected as follows:

1. Vent to the auxiliary building exhaust system.

2. Waste from the WBT.

3. Solidification agent.

4. Catalyst.

5. Station air for sparging of the mixture.

The control panel is placed in the fill and solidify mode and fill, flush and termination of flow are done automatically under control of a level probe in the container. Provisions are also made for automatic flushing of lines from the radwaste module to the WBT and to the container. Radiation monitors located at the container (or shield) surface and 6 feet away actuate an alarm if the radiation level exceeds that anticipated. Should an alarm be actuated, the operation is automatically terminated. A decision is then made concerning dilution, shipping of a lower volume or provision of additional shielding.

The air sparger is started and waste is pumped by the radwaste module from the WBT to the disposable container. Flow is stopped when the container level probe indicates the container is 50 to 60 percent full. Equal proportions of catalyst and SA are added to fill the container and the air sparger stopped when solidification reactions increase the backpressure. Normal proportions of waste to SA to catalyst are 2.5 to 1 to 1.

The five flexible hoses and one electrical lead are disconnected by chains attached to the overhead jib crane which lifts and snaps the quick disconnects free. The fill shield assembly is removed and the lid shield is installed on the container shield cask by use of the pendant controlled jib crane. The container is automatically sealed when the disconnects are freed. The filled container is stored in a storage area until shipment. ~~14~~ ~~19~~ 29

11.5.5.2 Spent Resin

Resin in a demineralizer is considered spent when its decontamination factor falls below a permissible level or the demineralizer surface dose rate exceeds its limit. The spent resin, from demineralizers in the primary system is stored in a 350 ft^3 storage tank. The spent resin from demineralizers in the secondary system is stored in a 600 ft^3 nuclear blowdown system storage tank. The resin stored in the primary system is allowed to decay for a period of up to several months but not less than 30 days. The resin stored in the nuclear blowdown system storage tank is surveyed to determine the minimum decay period required. This period is expected to be less than 30 days.

When a sufficient quantity of resin has accumulated and decayed, the resin is sampled for radiation level and packaged. Prior to packaging, resin sluice water is recirculated in the tank to form a slurry which is transferred to the Vendor ~~WBT~~ by nitrogen cover gas pressure. Dewatering of the resin ~~after fill of the WBT is accomplished through a filter within the WBT. Other liquid radwaste may be added to the WBT.~~ is accomplished using the vender's equipment with the water being returned either to the Excess Liquid Waste Holdup Tank or the Spent Resin Storage Tank. ~~19~~ 29

19 ~~When filling the container with resin slurry, an additional flexible hose connection must be made to the container for dewatering the resin slurry. With this connection, six hoses are now connected to the container. Filling of the container with resin slurry and dewatering are performed simultaneously. When the container is approximately 50 percent filled with dewatered resin the fill operation is terminated. The resin is then solidified by the addition of SA and catalyst as described in Section 11.5.5.1. The air sparger is operated continuously during the fill operation.~~ 29

19

The radiation level of the primary resin is expected to require use of ~~the~~ a 4 inch lead shield on some occasions. The radiation level of the nuclear blowdown system resin is expected to require not more than ~~the~~ a 1-1/2 inch lead shield. 29

The primary spent resin storage tank has a two inch discharge line located along the tank center line, protruding from its top and extending to within 3 inches above the dished head bottom. In preparation for packaging, the discharge valve is opened and the center discharge tube cleared by backflush with a burst of flush water from the reactor makeup water system. Pressure to 100 psig is available, if required. Flush water may continue to be added if needed to obtain a reasonable slurry. The discharge valve is then closed. Loosening of the resin is achieved by introducing nitrogen through seven spargers at the tank bottom. Resin sluice water can be recirculated through the spargers to loosen
19 the resin if desired. When the nitrogen pressure increases to that required for resin transfer, the resin discharge valve is opened. ~~and the resin transfer to the WBT for chemical adjustment as necessary.~~ Nitrogen continues to bubble through the resin bed to maintain a gas pressure for transfer of the resin until the ~~WBT~~ liner reaches the full level. The liner vent during this operation is directed to the plant vent. 29

The nuclear blowdown system spent resin storage tank is discharged by use of a procedure similar to that used for the primary spent resin storage tank. The resin slurry is discharged through a 2 inch nozzle located at the tank bottom. Prior to discharge, this line is flushed with resin sluice water or demineralized water. The resin sluice pump is started to loosen and fluff the resin. When a resin and water slurry is established within the tank, nitrogen gas is bubbled into the tank bottom pump suction connection to loosen and mix the resin and pressurize the tank. When the tank gas pressure increases to that required for resin transfer, the resin slurry discharge valve ~~to the WBT~~ is opened. Operation of both tanks from this point is similar. 19 29

Upon communication from the vendor that the transfer is complete ~~Upon receipt of a signal from the level probe in the WBT~~, the resin discharge and nitrogen supply valves are closed and a tank vent valve is opened to discharge the nitrogen cover gas from the storage tank. In addition, the flush water supply valve is opened to backflush and forward flush and decontaminate the resin transport line. A flow diagram of the primary resin system is provided by Figure 11.2-2, Sheet 3. Figure 10.4-15 describes the nuclear blowdown resin storage tank. 29 ~~19~~

A flow of approximately 40 gpm is required to transfer the resin slurry to the liner ~~WBT~~ in the radwaste area. It is anticipated that approximately 1300 std ft^3 and 2200 std ft^3 of nitrogen gas will be the maximum required for each resin transfer operation from the 350 ft^3 primary resin storage tank and 600 ft^3 nuclear blowdown resin storage tank, respectively. Actual gas pressure required, as well as system operation will be verified using nonradioactive resins during preoperational testing. 29 ~~19~~

The nitrogen system is set to supply nitrogen to the resin storage tanks at a pressure of 100 psig, if needed. The resin storage tanks are designed for 150 psig. Relief valves on the primary and nuclear blowdown resin storage tanks are set to relieve at 110 psig and 140 psig, respectively. The primary resin storage tank relieves to the waste holdup tank. The nuclear blowdown resin storage tank relieves to the nuclear blowdown system reservoir by way of an open drain.

11.5.5.3 Filter Disposal

Filters are of the disposable cartridge type contained in housings having hinged tops. They are replaced when surface dose rate or pressure drop exceeds established levels. Filters which are potentially radioactive are located in individual cubicles in an area close to the drumming station area. If the radiation level of the cartridge requires shielding during removal, a concrete plug in the floor above the housing is removed and ~~a filter cask, with 3-1/2 inches of lead encased in stainless steel and its bottom removed, is located in the stepped opening.~~ another plug with a hole in it is placed in the stepped opening. A filter cask with 3½" lead encased in stainless steel is placed over the hole 29

The filter housing is opened and the cartridge is drawn into the cask by the use of special tools having extension rods. ~~The filter cask is equipped with a lead glass viewing port in the top. The cask is lifted by an overhead crane and its bottom is attached.~~ Once the filter is in place, the cask bottom is slid closed and the tops installed 29 The cask is then transported by an overhead crane to a hatch at floor elevation 463' of the auxiliary building. This hatch is located above the drumming station area on the floor below. The cask is lowered into the drumming station area. ~~its bottom is removed and the cask is raised above a shipping container by a 3 ton jib crane. Filters with high radiation levels are placed into a container of special design which has a centrally located, perforated basket into which the filter cartridge is lowered. The filter cartridge is detached from the grapple hook after it is within the cask. Filters with low radiation levels are randomly dropped into containers used for liquid waste. The space around filters with either high or low radiation levels is filled with liquid waste which is solidified.~~ 29

Filters are then removed from the cask and deposited in a high integrety container for disposal.

11.5.5.4 Radioactive Hardware

Radioactive hardware can consist of damaged or used equipment or instruments, which due to geometry or materials of fabrication, cannot be readily decontaminated. Such material is disposed of in much the same way as are filter cartridges or as compacted waste, depending upon radiation levels.

11.5.5.5 Compacted Waste

An electromechanical compactor provides four tons of compressive force for the compaction of compressible waste into 55 gallon drums. During compaction the drum and compacting mechanism are enclosed and the enclosure is vented to the auxiliary building atmosphere through a HEPA filter by a blower. The blower and filter are contained within the compactor. The compactor conforms to current OSHA requirements. The compactor will not operate unless the door is closed, preventing the operator from injury and preventing escape of unfiltered air to the atmosphere.

11.5.6 STORAGE

INSERT H

Filled containers are stored either on the radwaste operating floor at grade or on a mezzanine floor 11 feet above the operating floor, depending upon container activity. Filled 50 ft^3 containers requiring 1-1/2 or 4 inch thick individual lead shields are stored on the operating floor which has storage capacity for at least 10 containers. These shielded containers are located between concrete walls and 3 inch thick steel plates for additional shielding. 29

Containers requiring no shielding are stored on the upper floor. This floor has sufficient load capacity to permit storage of liners having individual 1-1/2 inch thick lead shields, if required. Storage capacity for 20, 50 ft^3 containers is provided. These containers are also located behind concrete walls for additional shielding.

INSERT H

Compactable waste and filled containers of compacted waste are stored in the shielded areas of the radwaste operating floor and on the mezzanine floor 11 feet above. Contaminated hardware and tools may also be stored in this area.

No credit is taken for decay in storage since spent resins will have had at least a one month decay period in either of the spent resin storage tanks before solidification, when required. Evaporator bottoms do not normally require a decay period.

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14 The area adjacent to the compactor has a storage capacity of approximately 10 drums. Additional onsite storage is provided to accommodate one full offsite shipment of compacted waste.

Storage areas for solidified wastes, based on estimates presented in Section 11.5.4, are thus capable of accommodating greater than 30 days waste generation.

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11.5.7 SHIPMENT

Shipment, in accordance with applicable regulations, is made as necessary dependent upon operational considerations and storage area availability.

11.5.8 POTENTIAL FOR RELEASES

11.5.8.1 Potential for Release during Container Filling

The filling operation is automatically terminated under any of the following conditions:

1. Overfill, indicated by the level probe. The waste is still within the container. The container at the normal stop, or full, condition is actually only about 95 percent full.
2. Loss of ~~electrical power to the level probe~~ air.
3. ~~Overpressure in the waste pump discharge line.~~ 29
4. ~~Overpressure in the vent line from the container.~~

3. High pressure in the fill head/liner.

Various other controls such as radiation monitoring, high level alarm, fill head TV camera, etc., are used by the operator to terminate a fill operation if a problem is encountered. 29

5. Indication of no flow in any of the feed lines.
6. Excessive radiation, indicated by either the radiation monitor at the container surface or 6 feet away. 29

There is no airborne release to the atmosphere in the fill areas. Air in the container and gas, if any, from the waste entering the container are vented to the building exhaust through a local filter. Only one line feeds waste to the container. This is flushed with water as the final phase of the fill cycle. When the lines are disconnected, the quick disconnects automatically seal so that no drippage occurs.

There are no physical barriers in the immediate fill ~~area~~ areas to contain spills. since the radiation sensors automatically stop the fill operation if radiation, above a safe operating level, is detected. The incorporation of a concrete curb would not permit use of the lift truck. Floor drains in the area would be plugged as a result of solidification of the urea-formaldehyde solidification agent in the unlikely event of a significant spill. In addition Spills from the shipping container would need to be drained to a special container since spilled material could not be mixed with the contents of any other tank. 29 ~~14~~

The floor surfaces have a special nonporous finish to permit decontamination of the surface, if required.

11.5.8.2 Potential for Release from Storage Tanks

11.5.8.2.1 Waste Evaporator Concentrates Tank

Essentially all radioactive gases are stripped from the concentrates in the waste evaporator. A normally closed vent is ducted to the auxiliary building exhaust system. A water seal, set for 2 feet of water, vents to the waste evaporator concentrates tank cubicle which is serviced by the auxiliary building exhaust system. 14

normal plant operating conditions. Overflow protection is provided by a high level alarm at the solid waste system control panel. Excess water can either be pumped or drained to the waste holdup tank. Overflow, if it occurs, is to the waste holdup tank through a relief valve.

The tank is enclosed within a concrete cubicle with entrance from an overhead shield slab. Any leakage is directed to the floor drain tank through a floor drain.

11.5.8.2.4 Nuclear Blowdown Spent Resin Storage Tank

This tank contains only trace amounts of radioactive gas. The gas is normally contained in the tank by a closed vent valve. The tank is vented to the cubicle, which is serviced by the building exhaust system, only during transfer of resin from the demineralizers or at the conclusion of resin transfer from this tank to the radwaste packaging area.

Overflow is not anticipated since the nuclear blowdown spent resin storage tank capacity is sufficient to accommodate at least 30 days waste generation under normal plant operating conditions.

Overflow protection is provided by a high level alarm at the solid waste system control panel. Excess water can either be pumped or drained to the nuclear blowdown system reservoir. Overflow, if it occurs, is to the nuclear blowdown system reservoir through a relief valve.

The tank is enclosed within a concrete cubicle with entrance from an overhead shield slab. Any leakage is directed to the nuclear blowdown system reservoir through a floor drain.

~~11.5.8.2.5 Waste Blending Tank~~

~~The WBT is used to precondition radioactive liquid waste and resin prior to packaging. Waste will not be stored in this~~ 29 ~~19~~

tank except for the quantity prepared for immediate packaging and solidification. Any radioactive gases that may have been present in evaporator concentrates or chemical drains would have been released either in the respective storage tanks or during operations prior to storage. However, the WBT is vented to the building exhaust system through a filter and water trap. The vented point is located at the top of the tank. The WBT is equipped with normal and high level probes. Overflow is not anticipated since filling of the WBT is closely monitored prior to the solidification operation. The cubicle housing is designed to contain the WBT contents in the event of a tank rupture. 29 ~~19~~

11.5.8.3 Radwaste Module Cubicle

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The radwaste/recirculation pump and appropriate valving are located within a concrete cubicle beneath the WBT cubicle. A 6 inch high concrete curb contains any leakage which may occur in this area. The cubicle is serviced by the building exhaust system. 29

TABLE 11.5-5 (Continued)

SOLID WASTE SYSTEM

EQUIPMENT DESIGN PARAMETERS

Urea Catalyst Tank	
Quantity	1
Volume, gal	5000
Type	Horizontal
Design Pressure	Atmospheric
Design Temperature, °F	150
Urea Formaldyhyde Concentrates (UFC) Storage Tank	
Quantity	1
Volume, gal	5000
Type	Horizontal
Design Pressure	Atmospheric
Design Temperature, °F	150
Urea Formaldehyde Concentrates (UFC) Day Tank	
Quantity	1
Volume, gal	750
Type	Vertical
Design Pressure	Atmospheric
Design Temperature, °F	150
Sodium Hydroxide Addition Tank	
Quantity	1
Volume, gal	200
Type	Vertical
Design Pressure	Atmospheric
Design Temperature, °F	150

14 19 29 19

TABLE 11.5-5 (Continued)

SOLID WASTE SYSTEM

EQUIPMENT DESIGN PARAMETERS

Sulfuric Acid Addition Tank	
Quantity	1
Volume, gal	100
Type	Vertical
Design Pressure	Atmospheric
Design Temperature, °F	150
Waste Blending Tank	
Quantity	1
Volume, gal	800
Type	Vertical
Design Pressure	Atmospheric
Design Temperature, °F	180

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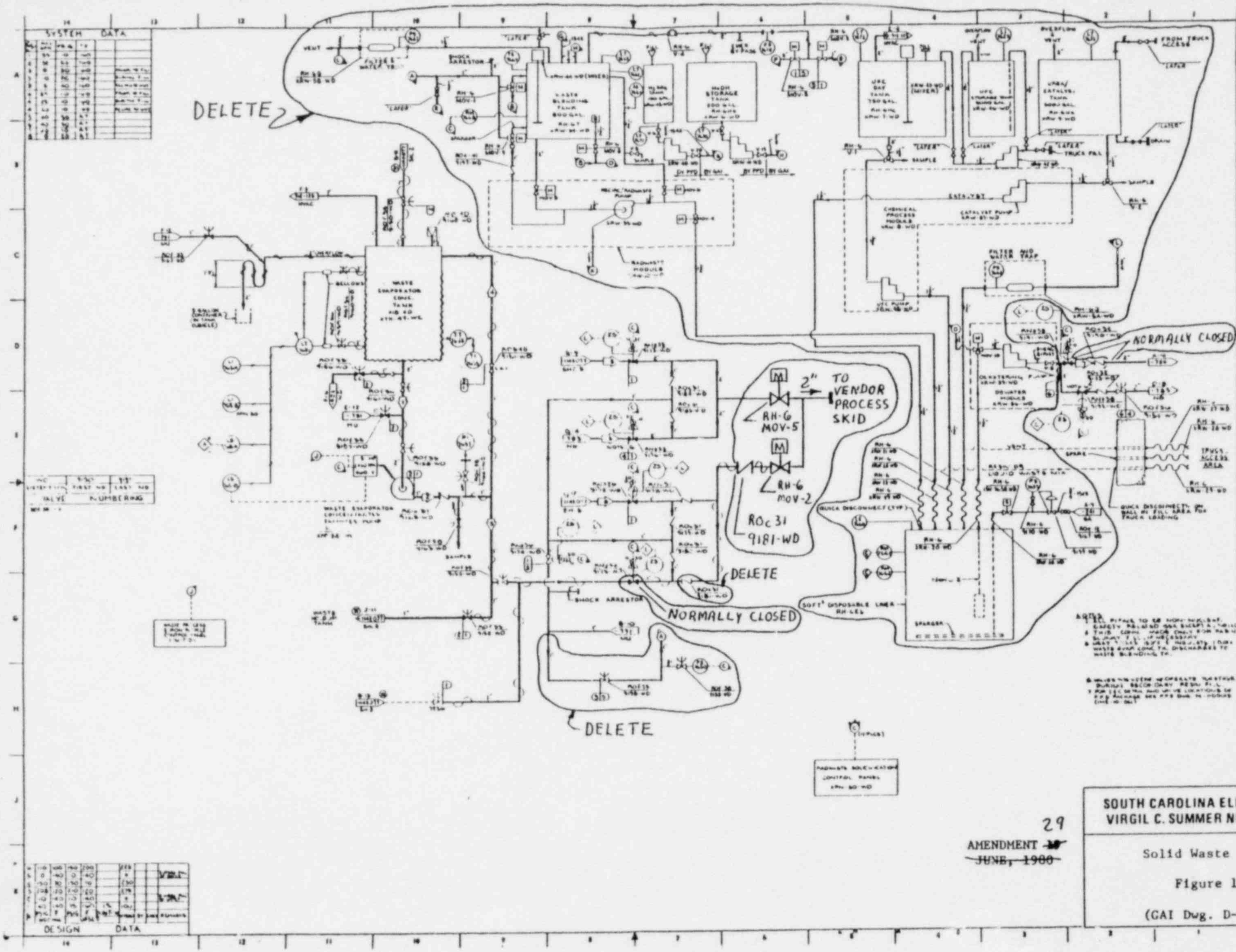
AMENDMENT ~~19~~ 29
~~JUNE, 1980~~



AMENDMENT ~~28~~ 29
~~JUNE, 1980~~

SOUTH CAROLINA ELECTRIC & GAS CO
VIRGIL C. SUMMER NUCLEAR STATION

Solid Waste Disposal

Figure 11.5-1

(GAI Dwg. D-302-732)