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TMI Program Office
Attn: Mr. L. H. Barrett, Deputy Director
U. S. Nuclear Regulatory Commission
c/o Three Mile Island Nuclear Station
Middletown, Pennsylvania 17057

Dear Sir:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Submerged Demineralizer System

Attached, for your information, is the System Description Document that pertains to the SDS.

Sincerely,

GK Hovey

G. K. Hovey
Vice-President and
Director, TMI-2

GKH:LJL:djb

Attachment

cc: Dr. B. J. Snyder, Program Director, TMI Program Office

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GPU Service

SDD 527-A REV 2

DIVISION II
SYSTEM DESIGN DESCRIPTION
FOR

SUBMERGED DEMINERALIZER SYSTEM

FOR

TMI UNIT II RECOVERY

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FOR

SUBMERGED DEMINERALIZATION SYSTEM

APPENDICES

1.0 Introduction

1.1 System Functions

The Submerged Demineralizer System (SDS) is a temporary liquid radwaste processing facility designed to reconcentrate the fission products contained in the waters in the Reactor Building Sump and the Reactor Coolant System, reducing the fission product levels to a level acceptable for final treatment through the Epicor II System. To accomplish this decontamination process, the SDS has been designed to perform the following basic functions:

a) To decontaminate, by demineralization, the contaminated waters contained in the Reactor Containment Building and the Reactor Coolant System at TMI-2 to a level acceptable for processing through Epicor II.

b) To transfer the decontaminated waste water from the Submerged Demineralization System to the Epicor II System for further processing to further reduce radionuclide concentrations in the water.

c) To provide a location in the spent fuel pool for temporary storage of the spent high activity ion exchange vessels to take advantage of the shielding provided by the pool water.

d) To provide for the underwater loading of the spent vessels into their transport casks and the preparation for shipment of these casks.

e) To provide the capability to control, monitor and treat gaseous effluents prior to release to the atmosphere to meet the imposed requirements of Appendix B of the TMI-2 Interim Recovery Technical Specifications.

f) To provide for the installation, testing, operation, maintenance and decommissioning of the Submerged Demineralization System in compliance with "as low as reasonably achievable" radiation doses to personnel.

g) To process the radioactively contaminated waters independent from the operation of TMI Unit 1.

1.2 <u>References</u>

1.2.1 <u>Epicor System Description</u>

1.2.1.1 B&R Dwg. M-006

1.2.1.2 B&R Dwg. M-013

1.2.1.3 B&R Dwg. M-015

1.2.1.4 B&R Dwg. M-208

1.2.2 <u>Fuel Pool Waste Storage System Description</u>

1.2.2.1 B&R Dwg. M-014

1.2.2.2 B&R Dwg. M-127

1.2.2.3 B&R Dwg. M-128

1.2.2.4 B&R Dwg. M-131

1.2.2.5 B&R Dwg. M-174

1.2.3 <u>Radwaste Disposal System Description</u>

1.2.3.1 Reactor Coolant Liquid System Description

1.2.3.2 Miscellaneous Liquids System Description

1.2.4 <u>SDS Technical Evaluation Report</u>

1.2.5 <u>SDS Design Criteria</u>

1.2.6 <u>SDS Process Control Program</u>

1.2.7 <u>PWST System Description</u>

1.2.8 Reference Drawings

Burns & Roe Drawing 2076

Burns & Roe Drawing 2027

Burns & Roe Drawing 2045

Burns & Roe Drawing E-032

GPUSC Drawing 2R-950-21-001

GPUSC Drawing 2E-950-02-001

1.3 Summary Description of the System

The Submerged Demineralizer System (SDS) is a temporary liquid radwaste processing system located in the TMI-2, "B" Spent Fuel Pool and the area immediately adjacent to the spent fuel pool. The system is designed to reconcentrate the fission products contained in the Reactor Containment Building Sump and the Reactor Coolant System by the process of ion exchange.

The Submerged Demineralizer System utilizes a number of other systems to perform its various functions. These include:

1) The Surface Suction System as described in Appendix 12;

2) The WG-P-1 pump as described in the Fuel Pool Storage System Description. This pump and piping can be used as an alternate feed source from the Reactor Building sump to the feed tanks;

3) The upper Feed Tank System located in the "A" spent fuel pool as a storage source of the feed water to the SDS;

4) The Reactor Coolant Bleed Tanks and installed plant piping as depicted and described in Reference 1.2.2,

5) The Epicor-II System as described in Epicor II System Description as a polishing and sodium removal subsystem; and

6) The Processed Water Storage Tank System as depicted in the PWST P&ID #M74-PW01.

7) The Spent Fuel Cooling System piping.

8) The miscellaneous Waste Hold-up Tank and associated piping.

The Surface Suction System will be utilized as the primary means of delivering water from the Reactor Building Sump via penetration 626, through the SDS prefilters and final filter to the (4) four 15,000 gallon storage tanks located in the "A" spent fuel pool.

The pump is operated from the control panel (CN-PNL-1) which is located on the SDS cask support platform spanning the "B" spent fuel pool. This panel is located in close proximity to the SDS Filter Manifold which contains the valves for operation of the filter system and the pressure and differential pressure instrumentation which provide an indication of flow from the surface suction pump and the mechanical condition of the filters.

The filling operation of the four 15,000 gallon feed tanks is monitored at the level instruments WG-LI-1 & WG-LI-2. A digital level indication is also provided in the control panel (CN-PNL-1). The feed tanks will be filled to approximately 84% of capacity (50,000 gallons). A high level alarm will sound at 89% (53,400 gallons) and a high high alarm will sound at 90% (54,000 gallons) closing inlet valve WG-AV-02 (when in the automatic control mode) which is interlocked with the level switch (WG-LSH-01) on the bubbler in the WG-U-2 stand pipe.

SDS process flow is filtered prior to storage in the tank farm. The purpose of the filters is to remove particles from the process stream that are greater than 10 microns in size to prevent plugging of the ion exchange beds.

The four 15,000 gallon tanks (WG-T-2A through WG-T-2D) are tied together and function as one 60,000 gallon storage system which communicates with the WG-U-2 standpipe containing the SDS Submerged Feed Pump (527-G-01).

The tank farm, optionally may be filled by utilizing the WG-P-1 pump located at the 280' elevation of the Auxiliary Building. This pump takes suction in the Reactor Building sump via the Reactor Building sump auction line. This method of feed from the sump to the tank farm is an alternative method that could be employed should the requirement present itself.

The submerged SDS feed pump, located in the WG-U-2 standpipe, delivers water from the feed tank system to the SDS ion exchangers via the Feed Manifold and Ion Exchange Manifold.

The process water can be directed to either zeolite train "1" or zeolite train "2" or both trains simultaneously. Our present plans are to process through one train at a time during initial operations. As experience with operation of the system is obtained, we may elect to process through both trains simultaneously. Process sampling capability is provided to enable determination and evaluation of bed performance based on influent and effluent sampling.

From the train 1 or train 2 exchangers the process fluid is directed into a common line which directs the flow to either cation exchanger "A" or cation exchanger "B". This feature allows the final vessel to be removed from operation by switching to the standby vessel without shutting the system down for change out.

The ion exchanger vessels are contained in secondary containment boxes located approximately 15 feet below the surface of the pool water. The containment boxes have slotted openings in the containment box lids. This feature fulfills a two-fold purpose; 1) it allows the lids to close around the remote handling tools and 2) it allows pool water to flow into the top of the containment box, over and around the liquid disconnect coupling and out through the bottom of the containment box, into a common header for transport to the pool cleanup ion exchanger. The effluent of the leakage containment ion exchangers is returned directly to the pool.

From the effluent of the cation vessels the water passes through a 0.45 micron (3 micron absolute) filter which has been placed in the process stream to trap small resin fines which could be carried through the resin retention screens contained in each ion exchange vessel. The filter contains a differential pressure indicator (CN-DPI-PF01) to provide indication of particulate build up.

From the effluent of the resin trap filter the water is piped to two (2) existing piping systems through a common header. The preferred processing path will be through the spent fuel pool cooler piping located in the cask pit. This piping ties into the Reactor Coolant Bleed Tanks. From the Reactor Coolant Bleed Tanks the water will be processed via the Epicor II System located in the Chemical Cleaning Building. The optional path will be via the spent fuel pool submersible pump discharge piping connection located on the east side of the "B" spent fuel pool, to the Miscellaneous Waste Hold-up Tank (MWHT).

The EPICOR-II system is described separately in "EPICOR-II SYSTEM DESCRIPTION." The function of EPICOR-II in the SDS Processing scenario is to remove sodium which is a prerequisite to the removal of antimony (Sb-125). This sodium removal will be performed in the first EPICOR-II 6x6 liner. The next EPICOR-II liner will be used to polish the remaining residual radionuclides from the water. After processing and sampling by EPICOR-II, the water is pumped to the Processed Water Storage Tanks (two 500,000 gallon tanks) and retained for future disposition.

The Submerged Demineralizer System contains, as an integral part of the System, an MSA off gas unit. This unit is a 1,000 cfm unit containing HEPA prefilters and final filters and capability for charcoal adsorption. The off gas system also contains an off gas separator tank with a demister for the removal of entrained moisture in the off gas stream prior to treatment by the off gas unit.

The off gas separator tank is a 590 gallon tank located in the Unit 2 "B" spent fuel pool surge tank. The off gas separator tank is piped to a stand pipe, also located in the surge tank, which contains the off gas bottoms sump pump (527-G-02). Moisture from various operational functions performed during system operations, i.e., vessel filling operations, dewatering operations, sampling operations, leakage collection from the manifold boxes, and water removed by the integral demister is collected in the tank with tank level indication displayed on CN-LI-VA03. Automatic level control instrumentation initiates the sump pump at a preset level and transfers the collected water back to the WG-U-2 feed tank stand pipe. The off gas system discharges into the fuel handling building HVAC System.

Included in the system installation are two (2) 12,000 gallon monitor tanks which are installed in the FHB model room on the 305′ elevation. These tanks will be used to store flush water to be used in flushing of the system prior to vessel change out. The monitor tanks system includes pumps (SDS-P1A & SDS-P1B) and level instrumentation (SDS-LE1 & LE3, SDS-LT1 & LT3) The system may be operated locally or remotely from the SDS operating area located on the 347′-6" elevation of the fuel handling building. The design of the Monitor Tank System is such that it could be used for temporary hold-up of the SDS cation effluent should processing dictate that this would be advisable. The monitor tanks are accessed from the effluent of the resin filter by installed valving. The Monitor Tank System is further explained in the Monitor Tank System Description, Appendix 14 of this document.

1.4 System Performance Characteristics

The basic water processing strategy utilizing SDS for the decontamination of the Reactor Building Sump Water (625,000 gallons) and the Reactor Coolant System (90,000 gallons) incorporates the SDS in combination with EPICOR II. The clean-up or reconcentration of fission products is accomplished by demineralization and is enhanced by filtration of particulate matter greater than 10 microns in size in the SDS filtration sub system. Filtration is considered necessary for protection of the ion exchange beds.

Water is delivered to the prefilter and final filter at a flow rate of 10 to 30 gpm, 70° to 90°F, and then into the SDS feed tanks. The water will be transferred in 50,000 gallon batches. Analysis of sump water samples performed by Oak Ridge National Laboratories and GPU studies of filter loading and particule settling characteristcs indicate that little particulate matter should be encountered taking suction on the water surface. Based on these studies and analysis, the projected filter usage for the major portion of the sump is one (1) prefilter and two (2) final filters. Several additional filters could be expected to be required as the surface suction pump approaches the Reactor Building floor. Using the radionuclide concentrations detected in the ORNL sample program, expected curie loading would be less than one (1) curie per pre-filter and one (1) curie per final filter vessel, and would primarily contain Sr-90.

The expected radionuclide concentrations contained in the Reactor Building sump water and the Reactor Coolant System are represented in Appendix 8.

The actual demineralization process would begin in the first ion exchanger vessel in the SDS system. This section of the system is divided into two (2) parallel trains containing three (3) vessels in series. Either train may be operated individually or both trains simultaneously. The residence time necessary for proper ion exchange in the zeolite media dictates a nominal flow rate of 5 gpm per train in this section. For protection of downstream EPICOR II organic ion exchange media, the process fluid temperature is limited to 125°F.

To accomplish these goals, we intend to use a homogeneous mixture of Ionsiv IE-95 and Linde A zeolite in all four SDS liners. Ionsiv IE-95 has a high capacity and selectivity for Cs, and if used in the sodium form will provide for removal of Sr. It is our intention to use the IE-95 in the sodium form. Linde A has a high capacity and selectivity for Sr. Combining these two zeolites in the four SDS vessels will load most of the cesium and strontium in the first in-line vessel. Although the exact percentage mixture of these two types of zeolite has not been confirmed, it is anticipated that the first vessel can be loaded to about 60,000 curies Cs, and about 2,000 curies Sr. The remaining three vessels will contain any breakthrough and further polish the water.

An administrative limit of 60,000 curies of cesium, based on the DOE task force recommendation has been placed on the IE-95 zeolite liners, strontium will be limited to 6,000 curies per Linde "A" liner, or Sr effluent of less than 1 uCi/ml.

Extensive sampling will be performed at each point in the system where a decontamination factor can be expected. Basically, this amounts to influent and effluent samples at each ion exchanger vessel. The projected radionuclide concentrations at each sample point are specified in the SDS TER.

The EPICOR II system will be utilized as a polishing unit and for the removal of sodium which is key to the removal of trace quantities of ruthenium, recalcitrant species of cesium and strontium and primarily antimony. EPICOR II 6 x 6 liners for the removal of sodium are expected to be changed out at 25,000 gallons. This assumes a resin utilization factor of 80% and less than 10% sodium breakthrough. The RCBT's will be utilized as a hold up tank and monitoring station to attempt to limit EPICOR II liner radionuclide concentrations to less than 1 uci/gm. This will allow EPICOR II liners to be buried in shallow land burial facilities without solidification. The processing logic plan which depicts the decision making logic is shown in Table 1. Table 2 shows the various vessels, their sizes, function, projected exchanger media, and number of liners expected to be generated.

1.5 System Arrangement and Interfaces

The Submerged Demineralizer System is housed in the TMI Unit II Fuel Handling Building. The majority of the system components are located within the "B" spent fuel pool which will be flooded with water to afford radiation shielding for submerged components. Components that are not submerged are shielded with lead, steel and/or concrete. The remaining components are located in the "A" spent fuel pool (see Figure 1) or in the proximity of the spent fuel pools.

1.5.1 "A" Spent Fuel Pool SDS Components

The Unit II fuel handling building adjoins the Reactor Building and is located directly north of the Reactor Building. The "A" spent fuel pool is nearest the reactor building and measures approximately 24 feet wide, 65 feet long, and 41'-6" deep. The "A" fuel pool contains six tanks, which were installed shortly after the accident, for water storage. Two of the six tanks have a capacity of 25,000 gallons each and are located in the lower portion of the pool. The remaining four tanks have a capacity of 15,000 gallons each and are interconnected to have a total capacity of 60,000 gallons. These four tanks constitute the feed tanks for the SDS system.

The entire "A" spent fuel pool is covered with 3 feet thick concrete shield blocks. The "A" spent fuel pool will not be filled during SDS operation. The feed tanks can be filled using either the Reactor Building sump surface suction pump or the WG-P-1 pump both of which are tied directly to the feed tanks. The normal mode of filling the tanks would be to fill the tanks after filtering the water through the SDS prefilter and final filter which are submerged in the "B" spent fuel pool.

Interconnected with the feed tanks and located north of the feed tanks at the northwest corner of the "A" spent fuel pool is the WG-U-2 standpipe which serves as the well for pumping the liquid from the feed tanks. The feed pump which is located in the standpipe is connected to the feed manifold which is a few feet to the southeast of the standpipe and sits atop of the concrete shield blocks. The piping between the feed pump and the feed manifold all enter the feed manifold on the west side of the manifold. The piping connecting the feed manifold to the SDS process trains in the "B" spent fuel pool connect to the east side of the manifold and run east to the edge of the "A" pool before turning north to the "B" spent fuel pool. All piping above the concrete shield blocks are shielded with lead bricks.

1.5.2 "B" Spent Fuel Pool SDS Components

The Unit II "B" Spent Fuel Pool is directly north of and connected to the "A" spent fuel. The channel that connects the "A" and "B" pools has been sealed. Immediately north of the"B" pool proper are two small pools. The one on the west side is connected to the "B" pool by a large transfer canal and is called the cask pit. The cask pit is 10 feet wide, 10 feet long, and 43' 6" deep. On the east side of the cask pit is the surge chamber which is 10 feet wide, 10 feet long, and 17 feet deep. The surge chamber is connected to the cask pit by underwater piping.

The SDS cask support platform is located at the extreme south end of the "B" spent fuel pool. The cask support platform spans the pool in the east-west direction, sits on the pool curbing and is not submerged during operation. The cask support platform holds the RCS clean-up manifold, the filter manifold, the SDS effluent post-filter and the CN-PNL-1 control panel. The RCS clean-up manifold is located on the southeast corner of the cask support platform. All liquid process piping interconnecting with the feed tank system or SDS feed system enters or exits the "B" pool under the cask support platform at the east end of the RCS clean-up manifold. Under the RCS clean-up manifold the piping traverses the air space between the cask support platform and the water in a lead filled annulus called the RCS pipe chase. The piping exits the pipe chase underwater and travels to the various underwater components. At each place where the piping must come to the surface it does so via a shielded pipe chase since the shielding effect of the water and air is not adequate.

The filter manifold is located on the north side of the cask support platform midway between the east and west pool sides. The filter manifold provides the valving and instrumentation for the prefilter and final filter located just north of the filter manifold, underwater in the filter support rack.

Immediately west of the filter manifold is the post-filter unit which filters SDS cation exchanger effluent prior to transfer to processing by EPICOR II and/or storage.

Directly south of the post-filter is the CN-PNL-1 control panel.

Directly west of the post-filter, off of the cask support platform, located on the west pool curb is the high rad filter glove box. This glove box is used for sampling the filtration process and is connected to the prefilter and post filter through the filter manifold. The glove box has glove ports on the west side.

All operating stations on the cask support platform are accessed by the stairs on the southwest corner of the cask support platform just south of the high rad filter glove box and west of the CN-PNL-1 control panel.

The remainder of the area in the "B" spent fuel pool proper, north of the cask support platform contains the majority of the submerged components of the processing trains and the underwater storage racks for depleted ion exchangers and filter canisters. Four basic structures, resting on the pool floor, make up the processing and storage units. They are the filter support rack, the main process stream ion exchanger support rack, the pool clean-up ion exchanger rack, and the storage racks.

As mentioned previously, the filter support rack is located immediately north of the cask support platform midway between the east and west pool sides. Running along the east side of the "B" spent fuel pool between the north edge of the cask support platform and the north edge of the pool is the ion exchanger support rack which contains the two parallel trains of three each zeolite vessels and the two parallel cation vessels.

Just south of the north edge of the pool, midway between the pool sides, is located the pool cleanup exchanger rack which contains two ion exchanger vessels for maintaining clean pool water.

Each of these three racks rests on the bottom of the pool. Each rack has an operating platform which is a few feet above the water level to provide operator access. Remote handling tools for coupling and decoupling vessels are provided for changeout operations. Each rack has its own underwater lighting. Underwater storage for sixty (60) spent vessels is as follows: 1) the main storage rack runs along the west side of the pool between the cask support flatform and the north edge of the pool. The storage rack has three rows each having eight storage locations for a total of twenty-four slots, 2) four storage locations are provided on the pool floor in the space between the filter support rack and the pool cleanup exchanger rack (leakage containment ion exchanger rack) and eight locations are located on the pool floor in the space west of the ion exchanger support rack and east of the filter and leakage containment racks (total of 12), 3) four moveable spent exchanger racks of six locations each can be placed on top of the main storage rack giving twenty-four space for storage. Total of items 1, 2 and 3 is sixty storage spaces. Eight additional storage spaces can be provided by utilizing processing locations. Personnel access to the filter support rack and leakage containment rack operating platforms is by moveable personnel bridges which span the gap from the west pool curb to the west side of the working platforms. Access to the ion exchanger support rack operating platform is from the east pool curb.

Immediately north of the ion exchanger support rack, the ion exchanger manifold is located on the pool wall that separates the"B" spent fuel pool from the surge chamber. The exchanger manifold is divided into two sections. The east portion is more heavily shielded and contains valving and instrumentation for feed water to the first zeolite in either zeolite train. The west two-thirds of the manifold contains all remaining valving and instrumentation for the ion exchanger process flow control.

Directly west on the same elevation is the leakage containment pump which circulates pool water through the leakage containment ion exchangers. The pump discharges underwater in the channel between the cask pit and the "B" spent fuel pool.

The shipping cask support platform sits on the floor along the south end of the cask pit. It supports the shipping cask to be used for transporting spent SDS ion exchanger and filter vessels. The dewatering station rests on the east side of the shipping cask support platform and is anchored to the concrete between the cask pit and the surge chamber. Personnel access to the dewatering station operating platform is from the east side. The yoke hanger assembly sits on the curb along the north side of the cask pit. The ion exchanger handling tools and the retrieval tool hang into the cask pit from hangers installed on the south side of the yoke hanger assembly.

The off-gas separator skid is located in the surge chamber. This unit consists of the off-gas separator tank and the off-gas bottoms pump standpipe. The off-gas separator tank has an integral moisture separator which separates the entrained moisture from gaseous releases vented through the tank. The tank communicates with the off-gas bottoms pump standpipe in which the off-gas bottoms sump pump resides. When the off-gas separator tank is filled, the off-gas bottoms pump transfers the contents of the separator tank back to the feed tank standpipe for reprocessing. All SDS processing component vents and drains are routed to the off-gas separator tank.

The surge chamber is covered with concrete shield blocks, a layer of lead bricks and steel deck plate. Off-gas piping and drains penetrate the shield plugs to connect to the off-gas separator skid. On the top of the surge chamger cover are located 1) the high rad feed sample glove box, 2) the intermediate level sample glove box, 3) the beta monitor manifold, 4) the annunciator panel, 5) the radiation monitor panel, and 6) the off-gas separator level instrument panel.

The high rad feed sample glove box is used to sample the feed water to the first zeolite vessel in either of the processing trains. The intermediate level sample glove box is utilized to sample all ion exchange vessel effluents starting with the first zeolite in each train. Both of these glove boxes are located on the north side of the surge chamber cover facing each other. Both glove boxes are accessed from the middle of the surge chamber cover area. The high rad feed glove box is located on the west side and faces west. The beta monitor manifold is located between the intermediate level glove box and the ion exchanger manifold. This manifold monitors the process stream at selected points for gross breakthrough and can indicate major activity trends in the process stream.

On the south side of the surge chamber cover are located the annunciator panel, the rad monitor panel and the off-gas separator tank level indicator. The majority of the system alarms and diagnostics are located here. They are discussed in detail in Section 2.2 of this document.

Located on the east pool curb adjacent to the ion exchanger manifold is the SDS off-gas blower and air filtration unit. The unit maintains a negative pressure on all vented SDS components and provides suction on the off-gas separator system. The blower exhaust is routed via ducting south along the east Fuel Handling Building wall to where it ties into the existing Fuel Handling Building ventilation system.

Installed immediately downstream of the blower, the off-gas sampling unit (PING 1A) continuously monitors the off-gas effluent for airborne radioactivity.

A chemistry laboratory is located on the floor space immediately north of the "B" spent fuel pool on the west side of the Fuel Handling Building.

Operator and supervision work area is provided on the south end of the new fuel storage pit cover which is located on the east side of the Fuel Handling Building, north of the "B" spent fuel pool.

Under the floor space occupied by the chemistry laboratory, at the next lower floor level (305' elevation, 42' below the fuel pool operating level) is located the SDS monitor tank system. This system consists of two 12,000 gallon tanks, each 8 feet in diameter and 32 feet high with associated pumps (2) and all related piping to effect recirculation, sampling and transfer of the contents of the tanks to storage or back to the SDS. The tanks are intended to be used to store processed water for flushing SDS piping prior to vessel changeout and/or maintenance. Flushing connections are provided on all of the manifolds and glove boxes. Flush water can be processed water or demineralized water. Flushing is accomplished by attaching rubber hose from the flushing water supply station to the flush connection on the component to be flushed. Flush water stations and air purge stations are located within close proximity of all components which may require water flush or air purge. All flush and purge connections are made via Hansen quick disconnent couplings.

1.5.3 SDS Interfaces to Other Systems

1.5.3.1 Electrical

All SDS electric power is tied into the Unit II BOP electrical systems at distribution panel PDP-6A, which is located at the 347'6" elevation of the Fuel Handling Building.

1.5.3.2 HVAC

The SDS MSA off-gas unit exhaust ducting penetrates the 347'-6" elevation at an existing penetration. The ducting ties into existing Fuel Handling Building ventilation ducting immediately below that penetration at elevation 341'-2".

1.5.3.3 Demineralized Water

The SDS demineralized water header is tied into the plant system at valve DW-V-272 located under the east curb of "B" spent fuel pool curb. An additional check valve, CN-V-DW-357, and isolation valve, CN-V-DW-355, were added just downstream of DW-V-272 to protect the plant demineralized water system.

1.5.3.4 Service Air

The service air tie-in to the SDS service air header is at the plant service air valve, SA-V-154, located adjacent to the demineralized water system valve addressed in Section 1.5.3.3.

1.5.3.5 Instrument Air

The SDS instrument air tie-in is at the plant instrument air valve, IA-V-175, located on the west side of the fuel pool curb.

1.5.3.6 EPICOR II

SDS effluent water can be transferred to EPICOR II from either the Reactor Coolant Bleed Tanks (RCBT) or the Miscellaneous Waste Holdup Tank (MWHT). The SDS effluent may be directed to either of these tanks by selecting the appropriate valving on the SDS transfer line at the 347'6" operating elevation of the Fuel Handling Building. The SDS interface to the MWHT is through valve SF-V-234 located under the east curb of the "B" spent fuel pool. The SDS interface to the RCBT's is through a spent fuel cooling line connection in the northeast corner of the cask pit. This line connects to valve SF-V-158 at the 305' elevation. Double isolation valves in the SDS transfer lire at the 347'6" elevation precede the plant isolation valves.

1.5.3.7 Processed Water Storage Tanks (PWST)

EPICOR II effluent is transferred to the PWST using the EPICOR II transfer pump. The PWST's are tied to EPICOR II at valve ALC-V-006. SDS effluent can also be transferred to the PWST"s from the monitor tanks or from the RCBT's. The PWST system is tied to the monitor tanks at valve PW-V-39 which is located in the Unit I/Unit II corridor.

1.5.3.8 WG-P-1 and Surface Suction Pumps

The pumps that can be used to pump the Reactor Building sump water to the SDS feed tanks are tied to the SDS system downstream of the Filter Manifolds. WG-P is part of the WG-6 task (Fuel Pool Waste Storage System) and is described in Reference 1.2.2 of this document. The surface suction system is described in Apendix 12 of this document.

1.6 System Design Requirements

1.6.1 General Design Requirements

1.6.1.1 The design basis considers the guidance in the following documents:

1.6.1.1.1 U.S.N.R.C. Reg. Guide 1.143, July 1978

1.6.1.1.2 U.S.N.R.C. Reg. Guide 1.140, March 1978

1.6.1.1.3 U.S.N.R.C. Reg. Guide 8.8

1.6.1.1.4 U.S.N.R.C. Code Guide 8.10

1.6.1.1.5 U.S. Code of Federal Regulations 10CFR20 App. B

1.6.1.1.6 U.S. Code of Federal Regulations 10CFR50 as imposed by Reg. Guide 1.143

1.6.1.1.7 U.S.N.R.C. Reg. Guide 1.21 June 1974

1.6.1.2 The process shall function in such a manner as to limit releases to the environment and limit plant personnel exposures levels to levels which are "as low as is reasonably achievable" in accordance with 10CFR Part 50, 10CFR Part 20, Regulatory Guide 8.8 and TMI II Recovery Technical Specifications.

1.6.1.3 System performance shall meet or exceed the decontamination factors presented in Table 8 of this document. The process provides the flexibility to accommodate variances in influent isotopic inventory by varying the filtration techniques and ion exchange media.

1.6.1.4 Capacity

1.6.1.4.1 The processing rate through the filters shall be 10 to 30 gpm. Filters are designed for operation with up to 20 psiΔP above normal system operating pressure.

1.6.1.4.2 Process flow rate is 5 gpm per train 10 gpm total through the zeolite beds and 10 gpm total through the cation vessels. Process flow rate is a function of residence time, and can be varied depending on the choice of resins.

1.6.1.4.3 Storage capacity of spent vessels is 60 vessels (not including the processing stations).

1.6.2 <u>Process Piping Design Requirements</u>

1.6.2.1 Piping is designed to ANSI B31.1 in accordance with the requirements of Regulatory Guide 1.143. Welded construction has been utilized to the maximum extent possible with butt welding utilized in higher anticipated radiation level areas to minimize "crud" traps.

1.6.2.2 The piping system has been designed for 150 psi 100°F service and utilizes schedule 40, type 304 stainless steel pipe and fittings.

1.6.2.3 All instrument tubing systems communicating with process media utilize type 304 welded stainless steel tubing and fitting. Process instrumentation generally is not fitted with isolation block valves as the instrumentation is designed to be maintenance free over the service life of the system.

1.6.2.4 Pressure sensing instruments communicating with high activity process fluids utilize liquid filled diaphragm isolation devices with filled capillary tubes communicating with the actual pressure indicating device. This minimizes the possibility of contaminated fluids entering the pressure indicator. The device may be removed remotely for calibration or replacement.

1.6.2.5 Valving in the process stream is contained in enclosed, shielded manifold boxes which are tied into the off gas handling unit and are self draining. Shielded access ports in the box are provided for inspection and maintenance of the valves. Valves are operated remotely utilizing reach rods which extend through the shielding plugs. Process valving is of the top entry type to facilitate maintenance and repair.

1.6.2.6 The process line pipe size is normally 1" based on the SDS Design flow rate of 5 to 10 gpm. Other line sizes are based on service requirements and function.

1.6.2.7 Piping runs which are not submerged or are not contained in manifold box are shielded as necessary to yield maximum exposure rates of 1 mr/hr general areas. In service radiation surveys will be conducted to insure that these limits are met and maintained.

1.6.3 Ion Exchange Vessel and Filter Vessel Requirements

1.6.3.1 Vessels are designed, fabricated and tested to the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, 1977 addendum through Winter '78.

1.6.3.1.1 The high integrity type 316L vessels will also be code stamped.

1.6.3.2 Filter vessels and lower activity ion exchange vessels are designed to 150 psi, 100°F using type 304 stainless steel.

1.6.3.3 Zeolite ion exchange vessels are designed to 350 psig, 400°F using type 316L stainless steel.

1.6.3.4 Zeolite vessels are designed to allow ease of removal of ion exchange media for future disposal.

1.6.3.5 All vessels utilize Hanson quick disconnect fitting to allow remote connection and disconnection.

1.6.4 Monitor Tank Requirements

1.6.4.1 Monitor tanks are designed, built, and erected to API 650, Appendix J except material is type 304L stainless steel.

2.0 Detailed Description of the System

2.1 Components

2.1.1 Submerged Demineralization System Pumps

2.1.1.1 Submerged S.D.S. Feed Pump (CN-P-IX01). The feed pump (CN-P-IX01) is located in the standpipe (WG-U-2) associated with the four 15,000 gallon waste storage tanks (located in the Unit #2 "A" fuel pool). It provides the capability to transfer liquid waste from the upper level waste storage tanks (WG-T-2A through 2D), through the SDS System for processing.

The pump is provided with a recirculation line, equipped with an orifice, which prevents inadvertent operation of the pump at a shutoff head. The recirculation line taps off of the pump discharge line in the feed pump manifold, and empties back into the twelve inch standpipe. The flow orifice provides for recirculation flowrate of 15 gpm at a 208 foot head.

The pump is a submersible centrifugal Goulds pump with a capacity of 30 gpm at 200 ft. total dynamic head. A pressure gage, temperature element and flow meter are installed on the pump discharge piping to provide a means of monitoring pump performance.

The feed pump motor is rated at five HP and is powered from a 480 VAC MCC panel (PDP-6A). The pump is controlled from a local control panel located near the feed pump standpipe (WG-U-2), above the "A" fuel pool. Pump operation is controlled with a start pushbutton, a stop pushbotton, and an auto/hand switch, all located on the local control panel. The start and stop pushbuttons control pump operation when the auto/hand switch is in either position. When the auto/hand switch is in auto, a low level switch which senses standpipe level, will stop the feed pump on a low level in the standpipe (WG-U-2).

2.1.1.2 Monitor Tank Transfer Pumps (P1A & P1B)

These pumps are two identical, electrical, double mechanical seal centrifugal Goulds pumps arranged in parallel. The system is designed to operate using one pump, the second pump is an installed spare. The pumps provide the capability to transfer processed water to either the 12' standpipe (WG-U-2) for reprocessing, the influent to Epicor II system or the SDS flush header. In addition the pump discharge can be directed back to the monitor tanks which allows these contents to be recirculated prior to chemical analysis and sampling. The pump is a Goulds double mechanical seal, centrifugal pump rated at 50 GPM with a total dynamic head of 111 feet.

Pump operation is controlled by start/stop pushbuttons located locally at the pump starter on the 305' elevation and remotely in control panel (SDS-LCP1) on the 347' elevation. A selector switch is also installed which aligns the monitor tank transfer pump to a particular monitor tank to allow the system to automatically trip the transfer pump in the event a monitor tank low low level condition is experienced.

2.1.1.3 Off Gas Separator Bottoms Pump (CN-P-VA04)

This pump, during normal operation, will automatically maintain the level in the off gas separator tank within a preset band (78" to 12"). In an automatic mode, pump operation will be controlled by an electrical switch associated with the off gas separator tank level indicator. The switch energizes the pump motor controller when the tank level reaches 6'6". The pump then operates, removing the separator tank contents, until the tank level reaches twelve inches, and the level switch de-energizes the pumps motor controller.

The off gas bottoms pump takes a suction on the off gas moisture separator tank well, and transfers the water to the feed tank standpipe (WG-U-2) for processing through the Submerged Demineralizer System.

The off gas bottoms pump is a submersible centrifugal Goulds pump powered by a 5 HP motor. It is capable of producing 30 gpm at a 55 ft. head. The pump, tank, and well are located in the spent fuel pool surge tank.

The control panel for the pump is mounted on a skid located above the surge tank. An on/off/auto switch is provided on the panel to allow manual operation of the pump. During normal operation, the switch will be placed in the automatic position. The pump is powered from the SDS power panel (PDP-6A).

2.1.1.4 Off Gas Blower (CN-E-VA05)

Submerged Demineralizer System Components (except for the monitor tanks which vent directly to the Fuel Handling Building Ventilation System) are maintained under a slight vacuum by the off gas blower. The blower is designed to exhaust 1000 cfm at the system design pressure. The off gas blower is designed to maintain a nominal differential pressure in the off gas header of 12" of water vacuum with a dirty prefilter, with 2" of water loss in the HEPA filters. The off gas blower is a ten inch, radial flow, centrifugal type with single inlet unit. Suction and discharge pressure gages are provided to monitor blower performance. The motor is a 5 HP., 460 volts, 3 phase, 60 Hz unit powered from the SDS Motor Control Center. The blower is mounted on the off gas unit skid which is located near the east wall of the "B" spent fuel pool. The pump is controlled with start stop pushbuttons located next to the off gas blower.

2.1.1.5 Leakage Containment System Pump (CN-P-LC06)

The leakage containment pump is designed to maintain an inward flow of fuel pool water into the leakage containment boxes which surround the SDS filters and demineralizers. The pump discharges the pool water, and any leakage from the vessel fittings, to a set of ion exchangers and then to the fuel pool. Post filter flush water is also directed to the leakage containment boxes. The leakage containment pump is a centrifugal pump which is mounted on the catwalk between the "B" fuel pool and the cask handling pool. The pump is driven by a three HP motor which is powered from the SDS motor control center. It is controlled with stop/start pushbuttons mounted on a pump control panel located next to the pump. The pump takes suction on a common header containing throttling valves which, through the use of manometers located on the ion exchange rack operators platform where the remote valve reach rods are also located, allow the flow through each containment box to be throttled to 10 gpm per box. The total flow through the pump is 100 gpm and is delivered as 50 gpm per leakage containment ion exchanger. The pump developes 120 gpm at 55 ft. total dynamic head.

2.1.1.6 RCS Manifold, Hi Rad Filter Manifold and High Rad Sample Glove Box Sump Pumps (CN-P-FL07, CN-P-SA08 and CN-P-RC09)

These pumps are mounted locally in the Hi Rad filter Manifold, Hi Rad Filter Sample Glove Box and the RCS Manifold. They provide the capability to transfer liquid waste from the sumps of these components to the feed tank standpipe (SG-U-2). The remaining SDS component sumps, unlike those above, do not need a similar arrangement since they gravity drain to the off gas separator tank or WG-U-2 standpipe (Feed Manifold).

The sump pumps are identical nutating pumps with a capacity of 0.50 gpm at 81 feet of dynamic head.

The pumps will be operated automatically to maintain level in these sumps within a preset band. This is accomplished by level switches in each sump which energizes the pump when the water level reaches 2 inches and de-energizes the pump when the water is removed. They will be powered from panel MP-CN-1 which also has a breaker to allow them to be de-energized manually.

2.1.2 Submerged Demineralization System Tanks

2.1.2.1 Off Gas Separator Tank (CN-T-VA02)

The moisture separator tank provides the capability of removing large amounts of liquid from ventilation and drainage lines associated with the Submerged Demineralization System. Drain lines throughout the SDS (except for the monitor tanks, the feed manifold and components discussed in 2.1.1.6 above which have a separate drain arrangement) combine into a common drain header that empties directly into the moisture separator tank.

Ventilation lines from various SDS components combine to join a common header. Just before this header runs into the off gas filtration unit, it forms a water trap which collects moisture from the ventilation exhaust and drains it into the off gas moisture separator tank. The tank is a vertically mounted stainless steel tank located (along with the off gas bottoms pump standpipe) in the spent fuel pool surge tank. It is 36 inches in diameter, ten foot in length and has a capacity of 590 gallons. The separator tank is vented back to the off gas header, just downstream of the moisture trap mentioned above. A demister assembly is located in the top of the tank to remove moisture from the tank's ventilated gases. The demister assembly has been tested in accordance with USAEC report MSAR-61-45. It will be capable of removing 99 percent of all free droplets of water, down to one micron in diameter, without any visible carryover.

A three inch drainline runs from the bottom of the tank to the off gas bottoms pump standpipe (CN-U-VA01). The standpipe is 16 inches in diameter and 16 feet long. It houses the off gas bottoms pump (CN-P-VA04).

The separator tank has a Barton type level instrument associated with it. The meter reads from zero percent to 100 percent full scale. The instrument also has a level control switch, which controls off gas bottoms pump operation, and a high level switch, which activates an alarm on high tank levels.

2.1.2.2 Submerged Demineralization System Monitor Tanks (SDS-T-1A & SDS-T-1B)

There are two 12,000 gallon tanks designed for collection and temporary storage of liquids that have been processed through the Submerged Demineralizer System. The monitor tanks are intended to be utilized as a storage location for flush water for the SDS. The monitor tanks have been designed to perform the function described in Appendix 14 and may be utilized when processing requirements necessitate. In this mode the liquids are stored in the tanks until an accurate sample of the tanks contents are analyzed, and the disposition (based on sample results) of the processed liquid is determined. Based on the sample results, the contents may be discharged to: 1) the feed pump standpipe (WG-U-2), 2) to TMI processed water storage tanks, 3) to the SDS flush water supply header or 4) to the Epicor II System via the MWHT or the RCBT's.

Process liquid, meeting the required radionuclide concentration levels, will be discharged to TMI process water storage tanks for future disposition.

Liquid not meeting the imposed requirements will be reprocessed through the Epicor II System, if it is determined that this system alone can reduce the activity levels sufficiently.

If activity levels are too high for the Epicor II System, the liquid will be pumped back to the feed pump standpipe for reprocessing through the SDS.

The tanks are vertically mounted, stainless steel tanks, located in the northwest corner of the Fuel Handling Building Model Room. The monitor tanks are atmospheric tanks built to API-650, Appendix J and meet the design criteria set forth in Regulatory Guide 1.143.

The tanks are vented directly through a vent line to the Fuel Handling Building Ventilation System. The influent line to each tank is equipped with an automatic isolation valve, which stops influent liquid flow when the level detector, associated with the tank, senses a high level.

Associated with each tank is a Foxboro type level detector. Its meter indication ranges from 0 to 400 inches full scale. These level detectors also provide high/low level signals to shut the tank influent automatic isolation valve on high level and to stop the monitor tank transfer pump on low level. In addition, these signals also feed the SDS alarm panel to alert the operator in the event that any of these conditions exist. Prior to transferring of processed liquids stored in the monitor tanks, the tank contents are recirculated using one of the two monitor tank transfer pumps through eductors to insure proper mixing. The valves and piping are set up to allow either tank to be recirculated using either pump or it is possible to set up simultaneous, independent recirculation of both tanks.

2.1.3 Filtration/Demineralization Units

2.1.3.1 Submerged Demineralizer System Prefilter

The prefilter is the first process vessel of the Submerged Demineralizer System. The prefilter is used to remove debris and suspended solids (greater than 125 microns in size) from the untreated radioactive waste water.

The prefilter unit is a stainless steel, type 304, vessel, with approximately 10 cubic feet of volume. The vessel, including the male half of the quick disconnect, is 4 feet, 5 1/2 inches in height and 2 feet outside diameter. The top of the vessel has four male Hansen disconnect fittings; an inlet nozzle, an outlet nozzle, a vent nozzle, and a dewatering nozzle.

Within the vessel is an enclosed area, constructed of 16 gage perforated plate. This cylindrical column constitutes the initial filtering unit of the prefilter vessel. The inlet nozzle consists of an open ended pipe equipped with (2) two internal ball check valves. The nozzle is located outside of the enclosed area, between the perforated plate and the prefilter vessel wall. The inlet nozzle extends down into the vessel approximately one-half the height of the vessel. The internals of the Hansen quick disconnect, on the inlet nozzle, have been removed to prevent plugging from debris in the waste water. The inlet nozzle is equipped with two ball check valves which prevent a reverse flow of water out of the vessel when the vessel is disconnected from the process stream.

Contained within the enclosed cavity (formed by the perforated plate) is a network of fifteen, 125 micron "Cuno" filter cartridges. The opening at the upper end of each filter seals around a nozzle which empties into an outlet header. The opening at the lower end of the filter is plugged. The cartridges are supported by springs (on the bottom) which aid in sealing the upper opening around the outlet nozzles.

The prefilter assembly is also equipped with a dewatering leg and a vent nozzle. The dewatering leg consists of a 1/2 inch stainless steel pipe, extending from the bottom center of the filter, around the outside of the perforated plate, and out the top of the vessel. It terminates with the male half of a Hansen quick disconnect. The vent consists of a short nipple (with the male half of a Hansen quick disconnect attached to the end) welded around an opening in the top of the vessel.

Pressure instruments have been installed in the system to monitor filter performance. There are pressure gages located on the influent and effluent lines to allow the operator to monitor the pressure that the filter is subjected to and to monitor the pressure drop across the filter. At a differential pressure of 20 psig above normal clean filter operating pressure the filter is considered loaded, and will be changed-out.

2.1.3.2 <u>Submerged Demineralization System Final Filter</u>

The final filter is the second mechanical filtration unit in the SDS. The filter is used to remove any suspended solids (greater than 10 microns in size) from the contaminated waste water. In the system, the final filter is located on the effluent side of the prefilter.

The final filter vessel shell is identical to the prefilter vessel shell. It is a stainless steel, type 304 vessel with approximately ten cubic feet of volume. The vessel, including the male half of the quick disconnects, is 4 feet 5 1/2 inches in height and two feet outside diameter. The top of the tank has four male quick disconnect fittings, an inlet nozzle, an outlet nozzle, a vent nozzle, and a dewatering nozzle

Arranged within the filter are three concentric circles of "Cuno" filters totaling thirty cartridges. The cartridges are mounted in the final filter in the same manner as they are mounted in the prefilter. A spring on the bottom seals the "cuno" filter against the effluent header nozzles.

The final filter inlet nozzle is a short nipple with the male half of a Hansen quick disconnect welded to it. The other end of the nipple is welded around an opening in the top of the vessel. The filter vent nozzle is constructed the same as the inlet nozzle.

The outlet nozzle is a short run of pipe extending from the filter effluent header, through the top of the vessel and ending with a male quick disconnect. The dewatering leg is a 1/2 inch pipe which runs from the bottom center of the vessel, up through the vessel, 8 inches from the vessel centerline. The line penetrates the top of the vessel, and ends with a male quick disconnect.

The flow path through the filter is as follows: the water enters the vessel through the inlet nozzle and flows down and around the "Cuno" filters. The water then passes through the cartridge and leaves the vessel through the outlet nozzle.

Both the prefilter and the final filter, when installed in the system, will set inside a secondary containment located underwater at the south end of the "B" fuel pool. The purpose of the secondary containment is to collect any leakage which might be present from the fittings associated with the vessel, and to provide support for the filter vessel.

Pressure instruments have been installed in the system to monitor filter performance. There are pressure gages located on the influent and effluent lines to allow the operator to monitor the pressure the filter is subjected to, and the pressure drop across the filter. At a differential pressure of 20 psig above normal clean filter operating pressure, the filter is considered loaded and will be changed-out.

2.1.3.3 Leakage Containment Ion Exchange Vessels

Leakage containment ion exchange beds are contained in a standard vessel, identical in size to the filtration unit vessels, (4 feet, 5 1/2 inches in height and 2 feet in diameter).

These vessels are equipped (as are the filtration vessels) with four nozzles on the top. Three nozzles terminate with the male half of a 1 1/2 inch Hansen quick disconnect. The fourth is a three inch fitting with a screwed pipe cape closure.

The inlet nozzle is a short run of pipe, which extends from the quick disconnect, down into the vessel, and empties into a spray ring. The ring is a 1 1/2 inch pipe rolled into a 12 inch diameter ring, located horizontally near the top of the vessel. There are six 5/16 inch diameter holes drilled through the bottom of the ring. The holes are covered by a one inch long 3/4 inch diameter, .007 inch screen cup (Johnson screen), which is welded around the hole.

The vent nozzle is a short nipple welded around a hole in the top of the vessel. A three inch in diameter, .007 inch screen cup is welded around the hole on the inside of the vessel as a resin retaining device.

The outlet line from the vessel serves two purposes. It is the normal outlet line, and it serves as a dewatering leg. The outlet line is a 1 1/2 inch straight pipe which extends from just off the vessel bottom, up through the center of the vessel and penetrates the top of the vessel. The bottom end of the pipe is enclosed within a screened area, which act as a resin retaining screen.

The fourth nozzle on the vessel is used as an access opening. It is a three inch nozzle welded around an opening in the top of the vessel. The nipple is capped with a three inch screwed pipe cap.

The influent water enters the vessel through the inlet nozzle. Water sprays out into the ion exchange media from the spray ring holes. The water is forced down through the media, and up through the outlet line where it leaves the vessel.

The leakage containment ion exchangers will also be enclosed by a secondary containment, however, the containments will not have covers on them like the zeolite vessel containments. They will be located at the center of the north end of the "B" fuel pool. The ion exchange vessels are provided with pressure gages on the influent and effluent lines. The gages are used by the operator to monitor pressure drops across the ion exchange medias. Curie loading will be calculated from sampling results of the influent and effluent samples from each vessel in the process train.

2.1.3.4 Zeolite Ion Exchange Vessels

Zeolite ion exchange beds are 4 feet, 5 1/2 inches in height and 2 feet in diameter. These vessels are high integrity 316L stainless steel, designed to withstand 350 psig at 400°F and have 3/8" thick walls.

Each of these vessels are equipped with five (5) nozzles on the upper head. Three of these are 1 1/2 inch nominal pipe size fitted with the male half of a 1 1/2 inch Hansen quick disconnect fitting. The other two are 3 inches (nominal pipe size) and closed with standard, gasketed bolt-on flanges.

The inlet nozzle is a short nipple extending from the Hansen coupling into the vessel then leading to a spider-type inlet spray header. There are four spray outlets each terminating in a 3" OD Johnson screen, 1 1/2 inches in length with a gap size of 0.006 inches. At the inlet to each screen a 0.32 inch drilled passage assures the proper distributing at each outlet.

The vent nozzle is a short 1 1/2 inch (NPS) nipple extending through the top of the vessel. A three inch diameter, .007 inch screen cup is welded around the pipe on the inside of the vessel as a resin retaining measure and the outside end is provided with a 1 1/2 inch male Hansen fitting.

The outlet line consists of three 1 1/2 inch (NPS) segments, two of these are straight stainless steel pipe segments and the third is a 24 inch long flexible convoluted stainless steel hose connecting the pipe segments. The flexible portion allows for differential heating of the vessel components. The bottom pipe segment extends from 1/8 inch from the bottom of the liner, through an inverted 6 inch OO Johnson screen (0.007 gap) to mate with the hose. The screen is welded to the outlet pipe segment and the vessel head to form a sealed area and thus act as a resin retainer to prevent zeolite escape from the bed.

The two 3 inch nozzles on the vessel head are used for general vessel access and loading and unloading the zeolite media. Each is constructed of a short 3 inch schedule 160 pipe welded to the vessel head and provided with a standard ANSI flanged closure. Each blind flange is drilled and tapped for a 1/4 inch NPT vent connection, if required. A 3/4" OO Johnson .007 inch screen cup, one inch in length is welded to the inner side of each blind flange to prevent resin fines from entering the vent line.

Zeolite vessels will be located (when installed in the system) in secondary containments that are the same as those used with the prefilter and final filter. The leakage containment pump takes a suction off the bottom of all the containments and draws any leakage from the vessel fittings along with pool water down through the containment to the pump and discharges through the leakage containment ion exchangers back into the pool. The zeolite vessels are located along the east wall of the "B" fuel pool.

2.1.4 Containment Manifolds

2.1.4.1 Hi Rad Filter Manifold Containment

A majority of the valves, instruments, and piping runs, associated with the prefilter and final filter form the filter manifold which is housed in a shielded, ventilated containment. This manifold is located on the cask support platform at the south end of the "B" fuel pool.

The containment is 3 feet, 6 inches wide, 6 feet 10 inches long and 1 foot 10 inches deep. It is constructed from 3/16 inch thick stainless steel plates and frames. Shielding is provided on the outside of the containment on the top and sides. The bottom of the containment is sloped to one end for drainage. Any collected fluids will energize CN-LE-FL06, activate the local alarm and initiate sump pump 527-G-07, which pumps the water back to the WG-U-2 standpipe. The containment box is ventilated and maintained at a negative pressure by the SDS Off Gas System. The intake and exhaust connections are 2 inch lines located at opposite sides of the containment box. Access ports are provided for maintenance of the valves and instruments and are shielded with lead blocks. Valve operation will be performed using valve extensions which protrude through the top shield.

2.1.4.2 <u>Feed Pump Manifold Containment</u>

Valves, piping, and instruments associated with the feed pump are housed in a ventilated containment. This manifold is located in the northwest corner of the "A" fuel pool, next to the waste storage tank standpipe (WG-U-2).

The containment is approximately 4 feet 9 inches long, 2 feet 2 inches wide, and 1 feet 9 inches deep. It is constructed of 3/16 inch stainless steel plates and support frames. Lead shielding is provided on the sides of the containment. A carbon-steel block, 5 inches thich, 4 feet 9 inches long, and 2 feet 2 inches wide, is used as a top and shield for the containment. Six inch diameter access holes are provided through the top of the containment for maintenance of the valves and instruments. Valve operation will be performed using valve extensions which protrude through the top shield. The valve reach rod extensions utilize lead collars under the lead block which cover the six inch diameter access holes. This feature prevents radiation streaming at the valve stems. Ventilation intake and exhaust lines are provided at opposite ends of the containment. The containment is ventilated and maintained at a negative pressure by the SDS off gas system. The bottom of the containment is sloped to one end for drainage toward the drain line which gravity drains to the feed pump standpipe (WG-U-2).

The containment houses a pressure instrument, temperature detector and a flow element. The feed pump discharge valve, feed pump recirculation valve, and manifold flushing valves are operated from this containment.

2.1.4.3 Ion Exchange Manifold Containment

The ion exchange manifold containment houses valves, piping, and instruments associated with the ion exchange manifold. The manifold is located on the walkway between the "B" fuel pool, and the "B" spent fuel pool surge tank.

The containment is 13 feet 3 inches long, 3 feet 6 inches wide and 2 feet 4 inches deep. It is constructed of 3/16 inch stainless steel plating and reinforced with stainless steel supports.

The containment is divided into two sections, a high level section and a low level section. Piping runs and associated equipment, subjected to waste which has not been processed through a zeolite train, are located in the high level area. The south end of the containment box has an external shielded chimney which overchanges the "B" fuel pool wall and descends to the water surface and is partially submerged underwater. With the exception of sampling and flushing lines, piping enters the containment underwater (into this dropoff) for shielding considerations.

A one inch thick carbon steel plate covers the low level area and a five inch thick carbon steel plate covers the high level area. The sides of the containment are shielded with lead according to the radiation levels estimated to exist.

The containment is ventilated and maintained at a negative pressure by the SDS Off Gas System, Liquid leakage and gravity drains to the moisture separator tank. The air intake nozzle is located in the low level area, and the exhaust is in the high level area.

2.1.4.4 Reactor Coolant System Cleanup Manifold

The RCS cleanup manifold was developed in order to establish tie-in points in the SDS System which can enable it to process the Reactor Coolant System via a direct tie-in through mini-decay heat or another appropriate system. The RCS cleanup manifold is located on the south-east corner of the SDS cask support platform. The RCS cleanup manifold is four feet wide, four feet long and two feet high. The manifold is ventilated and maintained at a negative pressure by the SDS Off Gas System, and is pumped to the WG-U-2 standpipe. The manifold is shielded and the valves are operated from outside of the containment using valve hand-wheel extensions. Valve and instrument access holes and valve extension shielding is accomplished using the techniques described for the other manifolds.

2.1.5 Off Gas and Liquid Separation System

2.1.5.1 Off Gas Heater

The 9 KW off gas heater is provided to decrease the relative humidity of the gases to insure proper operation of the prefilter, HEPA filters and charcoal adsorption bed.

During normal operation, the off gas heater cycles on and off automatically to control the air temperature downstream of the heater at 122°F by means of a temperature element sensor.

A second temperature element is installed at the same location as the element mentioned above. The second element activates a high temperature alarm and interrupts power to the heater, if heater effluent air temperature reaches 200°F.

A temperature indicator is installed on the heater influent line. It allows the operator to monitor heater differential temperature and thereby evaluate heater performance. A flow indicator, also mounted on the heater influent line, allows the operator to determine whether sufficient air flow exists for heater operation.

An interlock is installed in the heater controller which prevents heater operation if the off gas blower circuitry is de-energized.

2.1.5.2 Off Gas System Filters

Exhaust gases, from components ventilated by the Vent and Drain System, will pass through four filters in the off gas System before being exhausted to the plant vent stack. The four filters consist of a roughing filter, two HEPA filters, and a charcoal adsorber.

All four filters are equipped with differential pressure detectors. These instruments allow the operator to monitor filter loading, and determine when a filter needs replacing.

DOP test connections are provided on the effluent side of each filter. All filters will be DOP tested after the off gas filtering unit is installed in the SDS, and individual filters will be DOP tested when replaced.

The roughing filter is a waterproof, fiberglass type filter, compatible with the air stream. The filter is designed to withstand a pressure drop of 8 inches W.G., either new, wet or loaded with dust, for at least 15 minutes without damage. At a differential pressure of 5 inches W.G. the filter will be replaced.

There are two HEPA filters installed in the off gas unit designed to be 99.97 percent efficient for particles down to 0.3 microns in aize. The filters are 24 inches by 24 inches square and 11 1/2 inches deep. The filter medium is principally inorganic fiber. Organic fibers will not exceed 5 percent. At a differential pressure of 2 inch W.G. the filter will be replaced. The system also utilizes a charcoal adsorber bed for the removal of radioactive Iodine.

2.1.6 Major System Valves

2.1.6.1 Submerged Ion Exchange Manifold Influent Automatic Isolation Valve (CN-V-IX24)

The automatic isolation valve is a 1 1/2 inch solenoid operated ball valve. It is located in the high activity area of the submerged ion exchange manifold containment, at the north end of the "B" fuel pool.

The valve incorporates an automatic shutdown function to preclude the consequences of adverse conditions from occuring which might damage equipment and/or cause injury to personnel. Feed Isolation Valve (CN-V-IX-24) is controlled from the Feed Shutdown System Relay Panel (RP-1). The "Auto-Trip" selector switch in the "Auto" position energizes the Feed Isolation Valve Solenoid Valve (CN-UY-IX24) admitting air to CN-V-IX24 to open providing a trip signal is not present. Trip signals from Off-Gas Header Influent Pressure High High Switch (CN-PISH-VA28) or IX Manifold General Area Radiation High (CN-RAH-IX03) deenergize CN-UY-IX24 on an adjustable 5 to 50 second time delay. Trip signals from IX Manifold Effluent in Line Radiation High (CN-RSH-IX04) or Leakage Containment System Influent Radiation High (CN-RSH-LC05) deenergize CN-UY-IX24 on an adjustable 5 to 30 minute time delay. Instantaneous closure is affected by placing the "Auto-Trip" selector switch in the "Trip" position, or upon loss of power to either RP-1 or the solenoid valve or upon loss of air to the solenoid valve.

2.1.6.2 Monitoring Tank Fill Isolation Valves

The Monitor Tank fill isolation valves are designed to automatically isolate the monitoring tanks if the tanks are filled above a pre-set level.

2.1.7 Dewatering Station

The dewatering station is located in the cask pit at the north end of the Unit 2 Spent Fuel Pool. It consists of two containment boxes positioned underwater, one for filter vessels and one for ion exchange vessels, along with associated piping, valves and instrumention. Shielding is provided by the Spent Fuel Pool water and by utilizing lead shielding on pipe runs above water going to the off gas separator tank. To limit exposure during vessel coupling and uncoupling, the system is also equipped with Hansen quick disconnects atttached to flexible hoses which allow the operation to be conducted remotely.

The purpose of the dewatering station is to dewater filter and ion-exchange vessels by the use of air to meet the commercial low-level waste burial site criteria of being less than one (1) gallon of free standing water or less than 0.5% of total volume, whichever is more restrictive.

The dewatering process involves passing a constant air flow of 20 CFM at 40 psig through the spent vessel for a fixed amount of time. This time interval will be determined from dewatering measurements conducted on unspent vessels during the functional test program.

The spent filter and ion-exchange vessels will not be dewatered until they are to be moved from the Spent Fuel Pool "B" for shipment or interim storage elsewhere on Three Mile Island. When this occurs, they will first be processed by the dewatering station and then loaded underwater into an appropriate shipping cask prior to removal from the Spent Fuel Pool.

2.1.8 Remote Operating and Manipulating Tools

2.1.8.1 Hansen Connect/Disconnect Tools

The Hansen Connect/Disconnect tools are fabricated from stainless steel and are mounted on the Ion Exchanger, Filter, Leakage Containment and Dewatering Station racks.

Operation is achieved by a mechanism that disengages a 1 1/2" stainless steel female Hansen coupling, and couples it to a 1 1/2" male Hansen attached to the Ion Exchanger or Filter vessel.

Each vessel has three (3) nozzles associated with SDS operation: inlet, outlet and off gas, and each nozzle has a separate tool to connect the appropriate hose to the corresponding vessel nozzle. The coupling operation is performed from approximately twenty (20) feet away from the vessel from the operators work platform located at each station. The platforms are located approximately (2) two feet above the pool water level. A quarter ton electric hoist is provided on a monorail overhead for ease of lifting, and lowering the tools into position.

These tools provide the means of remotely coupling and uncoupling filter and exchanger vessel connections while keeping radiation exposure to the operator minimal.

The prefilter inlet nozzle diaphragm valve is mounted on the tool with a reach rod for remote operation. This is provided because the prefilter inlet Hansen internals have been removed to preclude the possibility of solids being trapped in the coupling.

The Dewatering Station utilizes two (2) tools per vessel, an inlet air connection and an outlet connection that directs effluent to the off gas separator tank.

2.1.8.2 <u>Exchanger and Filter Vessel Lifting and Positioning Tools</u>

2.1.8.2.1 <u>Unspent Vessel Tool</u>: The unspent vessel lifting tool is constructed from stainless steel. It consists of two (2) J-hooks which pivot and are attached to a lifting shaft. The hooks are aligned with the vessel by a guide arm that fits into a notch in the vessel upper skirt. The tool also has a set of guide arms to position the vessel properly in the containment box. These arms have dissimilar guides that mate with slots in the containment boxes and storage racks to insure the orientation of the vessel nozzles is always correct when placed in a containment box. The bottom of the containment boxes also utilize a guide assembly which mates with the bottom of the vessel to keep the vessel from rotating or tipping after the handling tool is released.

The Fuel Handling Building Overhead Crane is used to manipulate the lifting tool.

The J-hooks are engaged manually into lifting lugs welded to the vessel upper skirt at the pool curb prior to lowering the vessel into the pool. Disengagement occurs once the vessel is positioned and its weight is released from the tool. The weight of the hook itself allows the hook to drop clear of the lifting lug and the tool can be removed.

A spring actuated locking mechanism located on the J-hooks keeps the vessel from inadvertently disengaging the hooks if the vessel is accidently bumped. The locking device is unlatched manually from above the water surface by means of a pull cable.

This tool is used only for loading unspent Exchanger and Filter vessels into containment boxes. The manual latching requirement precludes the use of the tool for the movement of spent vessels. When not in use it is stored in the cask pit on the yoke hanger assembly.

2.1.8.2.2 Spent Vessel Tool: The spent vessel tool is basically identical to the unspent tool with the following differences:

a) This tool is used to move spent vessels from containment box to containment box, or to a storage rack, or to the Dewatering Station for dewatering, or to the Shipping Cask for removal from the pool.

b) The lifting shaft is longer to prevent inadvertent lifting of a spent vessel too near the surface of the pool. The shaft is long enough such that when the crane hook is at its top travel, the vessel will remain submerged and property shielded.

c) The J-hooks are engaged and disengaged using air operated cylinders. The locking mechanism is spring loaded and must be unlatched manually.

This tool is also stored in the cask pit on the yoke hanger assembly when not in use.

2.1.8.3 Recovery Tool

The recovery tool is fabricated from stainless flanged pipe sections which serve to allow the length of the tool to be altered necessary by adding or deleting pipe sections.

The tool is manipulated by the Fuel Handling Building Overhead Crane or can be sttached to one of the 1/4 ton hoists located on each rack for Hansen tool manipulation.

There are three (3) attachments associated with the recovery tool, two (2) types of J-hooks and a flexible hose handling attachment.

This tool is a general recovery tool to be used for miscellaneous recovery and manipulation which may arise during the course of operation.

2.1.8.4 Moveable Spent Vessel Rack Lifting Device

The moveable spent rack lifting device is constructed from carbon steel with stainless steel locking pins. The pins are engaged and disengaged by air actuated cylinders.

The device is manipulated using the Fuel Handling Building overhead crane and is used to lift and position the four (4) moveable spent storage racks.

2.1.8.5 Vessel Nozzle Plugging Tool

The nozzle plugging tool is constructed of stainless steel. It consists of a mechanism for remotely placing a plug in the 1 1/2" male Hansen on the vessels. Once the plug is in place, the tool releases and disengages from the plug.

This tool is manipulated using the Fuel Handling Building Overhead Crane and is operated manually.

2.1.8.6 Pressure Instrument Diaphragm Removal Tool

The diaphragm removal tool is fabricated from carbon steel bar stock and is manipulated manually. It is used to remotely loosen the diaphragm of the Ashcroft pressure indicators located in manifold boxes and glove boxes for maintenance, removal or replacement.

2.1.9 Sampling Devices

Sampling of the SDS process stream is accomplished by utilizing three sample boxes. These devices provide central locations where intermediate and high level radioactive samples can be taken for evaluating the system performance. They are:

1. Hi Rad Filter Sample Glove Box
2. Hi Rad Feed Sample Box
3. Intermediate Level Sample Glove Box

In addition, samples can also be taken at other SDS locations which are not part of the process stream and, thus, do not require special boxes. These locations are:

1. Leakage Containment Pump Area.
2. Monitor Tank Pump Area.

2.1.9.1 Process Stream Sampling

The process stream water is sampled at various stages of treatment using centralized sample boxes. These sample box containments are designed to be completely sealed. A negative pressure between 0.75 and 0.95 inches of water is maintained inside the sample boxes by the SDS Off-Gas System. Each sample box is also equipped with a differential pressure gauge and a low differential pressure alarm. All sample boxes are double wall construction with lead shot between the walls to provide shielding during sampling activities or are internally shielded. Additional lead sheet has been added to the exterior of each box to further reduce occupational exposures where required. The sampling boxes and the locations which they monitor in the process stream are discussed separately below.

2.1.9.1.1 Hi Rad Filter Sample Glove Box

This sample box is located on the west wall at the southwest corner of the "B" Fuel Pool deck. There are two sample points inside the glove box; the influent of the prefilter and the effluent of the final filter. These two sample points incorporate a continuous loop sampling design. Throttling of the process stream is required using CN-V-FL-3 for the prefilter influent sample and CN-V-FL-6 for the final filter effluent sample. To prevent the sample box sump from overflowing, a sump pump is installed which transfers the waste water to the SDS Feed Tank Standpipe.

2.1.9.1.2 Hi Rad Feed Sample Box

This sample box is located on the surge tank cover at the north end of the "B" Fuel Pool. The box contains only one sample point which is used to obtain influent samples to the first zeolite in each processing train. This information coupled with other data is necessary for calculating the ion exchanger vessel loading and efficiency. Since flow does not continuously go through the sample line, it is necessary to recirculate through the lines prior to taking a sample. The sump in this box is designed to gravity drain to the off-gas separator tank.

2.1.9.1.3 Intermediate Level Sample Glove Box

This sample box is located on the surge tank cover, next to the beta monitor manifold, at the north end of the "B" Fuel Pool. The box contains eight (8) sample points which provide the capability to monitor individual ion exchanger bed performance.

The samples are taken from the following system points:

1. Train #1, Zeolite "A" Effluent.
2. Train #1, Zeolite "B" Effluent.
3. Train #1, Zeolite "C" Effluent.
4. Train #2, Zeolite "A" Effluent.
5. Train #2, Zeolite "B" Effluent.
6. Train #2, Zeolite "C" Effluent.
7. Trains #1 and #2, Cation Influent.
8. Trains #1 and #2, Cation Effluent.

Flow for this sample box comes from a diverter valve in the beta monitor manifold. After placing this valve in the sample position, it is necessary to first recirculate process fluid through the sample line prior to taking a sample. The sump in this box is designed to gravity drain to the off-gas separator tank.

2.1.9.2 Other Sampling

The remaining SDS sample locations, due to the low level of radioactive water which they handled, do not employ special shielded sample boxes. These components are the monitor tanks, which contain SDS flush water, and the leakage containment system which keeps the Fuel Pool water from becoming contaminated. These areas are discussed separately below.

2.1.9.2.1 Leakage Containment System

The leakage containment sample points are located on the operating platform in the north end of the "B" Fuel Pool. Since the water being processed is pool water and potential leakage from various SDS components, it does not require an enclosed manifold or special sample box. There are two sample points in the leakage containment system, the leakage containment ion exchangers influent and effluent. The influent sample point will provide an indication of component leakage and the effluent sample will provide an indication of containment ion exchanger removal efficiency.

2.1.9.2.2 Monitor Tank System

The monitor tanks and pumps are located in the Fuel Handling Building Model Room at the 305' elevation. The monitor tanks are sampled locally at the discharge of the respective pump. The monitor tank contents are recirculated via the pumps through installed eductors in each tank and then sampled. The sample is a "grab sample" taken from a spigot. These tanks will contain only process water used for flushing SDS components.

2.2 Instruments, Controls, Alarms and Protective Devices

2.2.1 Instrumentation and Controls

Instrumentation and controls are located on the 347'6" elevation of the Unit II Fuel Handling Building except for local start capability for the Monitoring Tank Transfer Pumps P1A and P1B, local Monitor Tank Level Indication SDS-L1-1A and SDS-L1-3A and SDS Monitor Tank Transfer Pumps Discharge Flowmeter readout. Radiation monitoring is performed at the Radiation Monitoring Panel (RMP-1) and the packaged Off Gas Radiation Monitor (Eberline PING-1A). The RMP-1 contains linear ratemeters and a multi-point recorder for the seven Beta detectors (CN-RE-IX04, -LC05,-PM07,-PM08,-PM09,-PM10, and-PM11) and the two gamma detectors (CN-RE-IX03 and CN-RE-VA06).

The Beta detectors are G-M tubes monitoring the process water through teflon tubing windows located in the Beta monitor manifold. A nylon window is used on the suction of the containment water pump and nylon tubing on the exchanger manifold effluent. The high voltage and 12 VDC required to power these units is distributed through fan-out connectors in the radiation monitoring panel. The pulse discriminator output provides a positive six volt square pulse for every negative input pulse from the G-M tube that exceeds the discriminator threshold level. The output of the pulse discriminator is connected to the input of the linear ratemeter/alarm where it is displayed as a count-rate. The gamma detectors consist of a G-M tube, self-contained high voltage power supply, pulse amplifier, low voltage regulator, and line driver with output to an electronic readout/alarm channel. CN-RE-IX03 is the area monitor detector mounted on top of the radiation monitoring panel (RMP-1). CN-RE-VA06 is the off-gas detector mounted on the off-gas header before the off-gas heater.

Both channels are recorded on the multi-point recorder (CN-RR-RR16).

Measurement of the off-gas effluent beta particulate, iodine 129 and noble gases is accomplished through the packaged PING-1A sample system. Ambient background radiation is also measured and subtracted from the activity in the air measurement providing higher sensitivity to the radiation level in the process stream. Sample intake goes through a filter paper on which any particulate is deposited, then through a charcoal cartridge which traps the iodines, then into the gas chamber and is exhausted back into the off-gas ducting. Local indication and recording are provided on the PING-1A.

Start/Stop control for the Surface Suction Pump (SWS-P-1) is located on SDS Control Panel CN-PNL-1 with stop capability at the local starter. Control for pump WG-P-1 is also located on CN-PNL-1 with "Remote-Local" selector switch. Filling of the 60,000 gallon tank farm is controlled from CN-PNL-1, where controls are located for WG-AV-01 and WG-AV-02 as well as various alarms and digital feed tank farm level indication. Tandem bubblers provide local feed tank farm level indication. The open/close/auto switches for WG-AV-01 and WG-AV-02 are located on CN-PNL-1. Level Switch High (WG-LSH-1) is interlocked with LOG-AV-02 to close on high level if WG-AV-02 is in the auto position.

The SDS Feed Pump, (CN-P-IX01), Off-Gas Bottoms Pump (CN-P-VA04), Leakage Containment Pump (CN-P-LC06), and the MSA Off-Gas Blower (CN-P-VA05) are all controlled from their respective local starters. The Feed Pump has an "Auto/Manual" key-operated override switch. In the "Auto" position, low level in the Feed Standpipe as sensed by CN-LCL-IX10 will deenergize the Feed Pump. In the "Manual" position, this shutdown is bypassed.

The Off-Gas Bottoms Pump has an "Auto/Off/On" key-operated selector switch. In "Auto", CN-LC-VA03 will function to start the pump on high level in the Off-Gas Separator and stop the pump on low level.

The MSA Off-Gas Blower and Leakage Containment pumps have simple "Start/Stop" push buttons.

The feed pump discharge flow is measured and totalized by CN-FQI-IX01 which is a vortex shedding type flowmeter with totalizer. It then passes the Feed Isolation Valve (CN-V-IX24) which is controlled from the Feed Shutdown System Relay Panel (RP-1). The "Auto-Trip" selector switch in the "Auto" position energizes the Feed Isolation Valve Solenoid Valve (CN-UY-IX24) admitting air to CN-V-IX24 to open providing a trip signal is not present. Trip signals from Off-Gas Header Influent Pressure High High Switch (CN-PISH-VA28) or IX Manifold General Area Radiation High (CN-RAH-IX03) deenergize CN-UY-IX24 on a 5 to 50 second time delay. Trip signals from IX Manifold Effluent in Line Radiation High (CN-RSH-IX04) or Leakage Containment System Influent Radiation High (CN-RSH-LC05) deenergize CN-UY-IX24 on a 5 to 30 minute time delay. Instantaneous closure is affected by placing the "Auto-Trip" selector switch in the "Trip" position.

Downstream of CN-V-IX24 are two (2) vortex shedding type flowmeters with totalizers to measure the flow into either Ion Exchange Train. The vortex flow meters have a local readout.

Local Pressure instrumentation is located throughout the process in areas such as the inlet and outlet of each exchanger of filter. Many of these pressure indicators are unnecessary for system operation but provide indication of individual exchanger performance. The pressure gauges are weatherproof and liquid filled such that the process pressure is sensed through a remote diaphram.

Feed temperature is measured in the feed manifold (CN-TI-FX01) and in the RCS cleanup manifold (CN-Tl-RC07). Measurement is made with thermocouples with hot junctions welded to the feed lines. The thermocouple is connected directly to the input of a digital readout temperature indicator. The indicator and housing are on a support stand mounted on top of the manifold.

The SDS System is flushed using deionized or low activity processed water whose flow is measured through a nutating disc positive displacement flowmeter coupled to a batch register/controller CN-FQIC-DW22. The register reads out in total gallons. The flow is controlled with the off-on action of solenoid valve CN-V-DW-339.

The system is started by setting the total gallons desired with the dial on the batch register and pressing the start button. This will energize CN-V-DW39 allowing water to flow through the meter. The register will count down the gallons of water to zero where it will de-energize CN-V-DW-339, shutting off water flow.

The Leakage Containment System surrounding all of the Ion Exchangers, Pre and Final Filters has flow orifices with manometer readout to indicate positive flow into each containment from the pool water. The Leakage Containment Pump has a local pressure gauge on its discharge.

An Off-Gas System maintains a negative pressure on the five SDS manifolds and three sampling glove boxes. Each manifold or glove box as well as the Off-Gas Header Influent has a Pressure Differential Indicator/Switch. Pressure differential is sensed through a 1/4-inch pipe nipple and 3/8-inch O.D. tubing connected to the low pressure side of a pressure differential indicator/switch (high pressure side vented to atmosphere). The sensed pressure differential is indicated on a 0 to 1 inch of water scale (0 to 15 inches of water on the Off-Gas Header Influent). A low pressure (high vacuum) switch actuates a local audible horn at .25 inches of water for the filter, feed and RCS manifolds and the Hi Rad Filter Sample Glove Box. A remote alarm and flashing alarm window on Annunicator Panel No. 1 is actuated by low pressue switches at .25 inches of water for the Ion Exchangers and Beta Monitor Manifolds and the Hi Rad Feed and Intermediate Sample Glove Boxes. The Off-Gas Header Influent Presure High Switch actuates a remote alarm and flashing alarm window on Annunicator Panel No. 1.

The Off-Gas Filtration unit has a 9 KW heater on the inlet sized to dehumidify air from 100% to less than 70% relative humidity at rated flow. The heater has an on-off controller with temperature indication from a thermocouple mounted near the heater. Protective thermodiscs de-energize the heater at 285°F and 320°F as does a fan interlock, should the off-gas blower be secured or a loss of power occur. The off-gas blower is started and stopped through a local controller. Filter differential pressures, inlet and outlet temperatures, flow indication, and inlet and outlet pressure indication are provided locally.

The controls and instrumentation of the SDS Monitor Tanks consist of controls for the transfer pumps and inlet valves and indication for tank level, pump discharge flow and pressure. The SDS Monitoring Tank Transfer Pumps P1A and P1B can be started and stopped locally on the 305' elevation of the Fuel Handling Building or remotely at the SDS Feed and Monitor Tank Panel (SDS-LCP1) on the 347'6" elevation. Run/Stop indication is provided both locally and remotely. A selector switch permits the operator to choose the correct monitor tank/transfer pump alignment which in turn aligns the appropriate tank's low-level switch to trip the pump.

Pump discharge pressure is displayed locally and on SDS-LCP1 via a pressure transmitter. A local readout flowmeter/totalizer is located on the common pump discharge. Level indication for T-1A and T-1B are readouts locally on SDS-LCP2 and remotely on SDS-LCP1.

SDS Monitor Tank Inlet Valves SDS-V002A and B are controlled from SDS-LCP1. The valves close automatically on a high level in their respective tanks. The valves can only be opened if the high level alarm has cleared.

Local presure and/or flow indication is provided in each of the three (3) sampling glove boxes.

2.2.2 Alarms

Annunicator panel No. 1

All field contacts are closed during normal operation and will open for alarm condition. The alarms work as follows:

A sensing voltage of 120 VAC is applied through the individual annunicator points via a field contact. Opening of the field contact (signaling an alarm condition) will remove the 120 VAC causing that point-light to flash and sound the horn. Depressing the "Acknowledge" push button will silence the horn and change the light to a steady-on condition. Closing the field contact (process return to normal) will turn off the light. The annunicator point is then reset for another sequence. Depressing "Lamp Test" push button will illuminate all point lights.

Annunciator Panel No. 1 includes the following alarm points:

	ALARM	ACTUATED BY
1.	Feed Valve Closed	
2.	Exchanger Manifold Low Diff. Pressure	CN-DPSL-VA04
3.	Hi Rad Samples Low Diff. Pressure	CN-DPSL-VA11
4.	Beta Monitor Sample Return Low Flow	CN-FSL-M18
5.	Off Gas System High Pressure	CN-PISH-VA28
6.	Beta Monitor Manifold Low Diff. Pressure	CN-DPSL-VA10
7.	Inter-Rad Samples Low Diff. Pressure	CN-DPSL-VA09
8.	Off Gas Filter Unit High Temperature	CN-TSH-VA04
9.	Off Gas Separator High Level	CN-LSH-VA03
10.	SDS Monitor Tank T-1A Level Hi/Lo	SDS-LSHL-1
11.	SDS Monitor Tank T-1B Level Hi/Lo	SDS-LSHL-3
12.	Leakage Containment Pump Low Pressure	CN-PSL-LC17

SDS Control Panel (CN-PNL-1)

The SDS Control Panel alarms function in an identical way to Annunicator Panel No. 1. SDS Control Panel CN-PNL-1 includes the following alarm points:

ALARM	ACTUATED BY
1. Lower Waste Storage Tanks Level Hi	WG-LSH-3
2. Upper Waste Storage Tanks Level Hi Hi	WG-LSH-1
3. Pump WG-P-1 Seal Leakage	WG-PS-17
4. Pump WG-P-1 Flow Outlet Temp Hi	WG-TSH-15
5. Upper Waste Storage Tanks Level Hi	WG-LSH-1A

Radiation Monitoring Panel

The Radiation Monitoring Panel Common Alarm (CN-RAH-IX04) is located on top of the Panel. It consists of a bell alarm, alarm light and a silence and test pushbutton. The alarm is actuated when the field contacts open (deenergized state) from the following alarm points:

ALARM	ACTUATED BY
1. IX Manifold General Area Rad. Hi	CN-RSH-IX03
2. Off Gas Header Influent Rad. Hi	CN-RSH-VA06
3. "A" Zeolite Beds Effluent Rad. Hi	CN-RSH-PM07
4. "B" Zeolite Beds Effluent Rad. Hi	CN-RSH-PM08
5. "C" Zeolite Beds Effluent Rad. Hi	CN-RSH-PM09
6. Cation Beds Influent Rad. Hi	CN-RSH-PM10
7. Cation Beds Effluent Rad. Hi	CN-RSH-PM11
8. Leakage Containment System Influent Rad. Hi	CN-RSH-LC05
9. IX Manifold Effluent in Line Rad. Hi	CN-RSH-LX04

Off Gas Sampler

The Off Gas Sampler contains Alert and High Level Alarm and Normal light. The Alert and High Alarms have identical circuits with adjustable trip points and inputs from the Particulate, Iodine and Gaseous readouts. Exceeding the trip point energizes the lamp on the front panel and changes the state of the alarm relay. Relay logic is reversible and alarms may be locking or non-locking, selectable by internal switches. The reset of a locked alarm is accomplished by pushing the lit alarm light. In addition to the above, the High Alarms activate a flashing light and sound a bell.

The Off Gas Sampler contains the following alarm points:

ALARM	ACTUATED BY
1. Off Gas Particulate Sample Rad. Hi	CN-RSH-VA12
2. Off Gas Charcoal Sampler Rad. Hi	CN-RSH-VA13
3. Off Gas Ion Chamber Sampler Rad. Hi	CN-RSH-VA14

A failed alarm consisting of a NORMAL light being deenergized is actuated when the count rate drops below one count per minute. The alarms are disabled during the use of the check source.

Local Annunicators

Local annunicators with audible horns include the following alarm points:

ALARM	ACTUATED BY
1. Filter Manifold Containment DP Lo	CN-DPSL-VA01
2. Hi Rad. Filter Sample Box DP Lo	CN-DPSL-VA02
3. Feed Manifold Containment DP Lo	CN-DPSL-VA03
4. RCS Manifold Containment DP Lo	CN-DPSL-VA12
5. Filter Manifold Containment Sump Level Hi	CN-LS-FL06
6. Hi Rad Filter Sample Glove Box Sump Level Hi	CN-LSH-SA07
7. RCS Manifold Containment Sump Level Hi	CN-LSH-RC09

All field contacts are closed during normal operation and will open for alarm condition. A sensing voltage of 120 VAC is applied through field contact.

Opening of the field contact (signaling an alarm condition) will interrupt the 120 VAC causing the annunicator bullseye light to flash and sounding an audible horn. Depressing the "Silence/Test" push button will silence the horn and change the light to a steady-on condition. Closing the field contact (process return to normal) will turn off the light. The annunicator point is then reset for another sequence. Depressing the "Silence/Test" push button will illuminate the bullseye light. There are two independent valves, one for each tank, located on the influent lines to the monitor tanks. They are 1 1/2 inch motor operated ball valves. The actuators associated with these valves are interlocked with the monitor tank level transmitters. Position switches are provided on each valve actuator with indication on the SDS control panel. These valves are electrically interlocked to ensure that both cannot be opened at the same time.

Associated with the valve is an (open/close) hand switch providing the electrical interlock with the other valve permits, and the tank level is not high, each inlet valve can be opened manually using its associated hand switch. Closure of the valves can be accomplished manually; at any time, using the hand switch. The valves will close automatically if the tank level is high.

3.0 Submerged Demineralizer System Modes of Operation

3.1 Off Gas System

3.1.1 System Start-Up

Prior to operating any portion of the Submerged Demineralization System, the Vent and Drain System comprising the Off Gas System and the liquid separation module must be operating. A prerequisite for the operation of these systems is operation of the Fuel Handling Building HVAC system.

3.1.2 System Operation

During normal operation, the off gas filtration unit is designed to require little operator action. The unit should be periodically checked to ensure that temperatures, flows and radiation levels are within the normal ranges.

Increasing differential pressure across the roughing filter, charcoal filter, or the HEPA filters is an indication that the filters are retaining dirt and other airborne particulate. These components should be replaced as required to insure that flow through the ventilation unit is adequate.

The off gas moisture separator tank level should be monitored periodically to insure that the level control system is functioning properly. During initial component venting (i.e. venting of the prefilter and final filter), or other operations during which large amounts of liquids are dumped into the Vent and Drain System, moisture separator tank level should be monitored more frequently.

3.1.3 System Shutdown

The purpose of the Ventilation System is to ensure that all ventilated gases, from the Submerged Demineralizer System components, are filtered and monitored for radiation. Shutdown of the Off Gas System will preclude filtration and monitoring of the air, and should not be performed unless dictated by other casualty/operational considerations. To secure the Off Gas System, secure the off gas blower and then place the system in a normal shutdown line-up.

3.2 Feed Tank Filling Operation

3.2.1 Fill Operation Start-Up

The feed tank filling operation involves SDS, the feed tank system and TMI-2 equipment. Prior to system operation, system operators will be required to have in operation the SDS Off Gas System and the Leakage Containment System.

These support systems must be in operation at the onset of and throughout the duration of, the fill operation. After system operators have completed the line up to fill the feed tanks, they will start the temporary surface suction pump, or the WG-P-1 pump or the waste transfer pumps, and commence filling these tanks. Initially, all system parameters will be continuously monitored until proper operation of the system has been verified.

3.2.2 Normal Operation

The feed tank filling operation will be a batch filling process (the tanks will be filled, the water processed, and then the tanks refilled). During normal filling operation, no water will be processed through the Submerged Demineralizer System.

System parameters will be periodically monitored while filling the feed tanks. SDS filters will be replaced if instruments indicate they are expended. Changing out a filter requires the filling operation to be secured.

Periodic sampling will be performed to provide an indication of the approximate chemical and radionuclide content of the liquid stored in the tanks, and an indication of the performance and loading of the filters.

A fill completion time calculated from the fill rate and volume should be used as a back-up method of feed tank level determination.

3.2.3 Securing the Filling Operation

When the feed tanks have been filled to the desired level, (50,000 gallons) the operators will secure the temporary surface suction pump, WG-P-1 or the waste transfer pump.

3.3 Processing the Filtered Water

3.3.1 Processing System Start Up

Throughout the duration of the processing, the SDS Off Gas System and Leakage Containment System will be in operation.

The ion exchange vessels will be filled and vented prior to installation into the system. Line venting will be accomplished on initial system start-up, and will not be repeated on subsequent restarts. With all vessels installed in the system, the operators will align the system for operation. The submersible feed pump will be started after the submerged ion exchange manifold and the transfer lines to Epicor II via the RCBT or MWHT are aligned for operation. Throttle valves will be adjusted to provide the proper flow rates through the system. Initial system operation will utilize one (1) train of ion exchangers at flow rate of 5 gpm.

The system will be surveyed for indication of leakage or radiation streaming on system start ups, and during initial operation.

System sampling will be performed immediately after start-up to verify expected system performance. During initial operation data will be recorded from all system instrumentation to establish baseline data points, for future reference and system trouble shooting. When sufficient operating experience has been gained, the data points necessary to support the Process Control Program will be recorded each shift.

3.3.2 Processing System Operation

Once the flow rate is established, the system functions with little operator action. Instrumentation is provided on the system monitoring panels and at various locations throughout the system as described in previous chapters to monitor system parameters. Operators will insure that proper system flow rates are maintained.

Periodic sampling (at various sample points) will be performed to verify bed performance and decontamination factors.

3.3.3 Processing System Shutdown

When it has been determined that a process demineralizer is expended or the batch depleted, the operator will secure the feed pump and flush the system with demineralized water, or processed water.

The expended exchanger in the train is then removed, and stored in storage racks in the "B" Fuel Pool. Expandable plugs are installed in each Hansen connector and the vessel is connected to the storage vent header.

3.4 Special Evolutions

3.4.1 Cation Vessel Change Out

Replacement of a vessel located in the forth (4) exchange position does not dictate securing the process evolution. When it is determined a cation vessel needs to be replaced in the forth bed position, the standby vessel is valved into the system. The spent vessel is then isolated. The vessel is then flushed and removed from the system; it is stored and a new vessel is installed in its place.

3.4.2 Leakage Containment Ion Exchanger Vessel Replacement

There are two leakage containment ion exchangers arranged in parallel in the system. Both ion exchangers are in service simultaneously. When it is determined that the ion exchangers must be replaced, one vessel will be placed in standby service and the remaining spent vessel will be utilized to perform the decontamination function while the standby vessel is replaced. When this evolution is complete the new vessel will be placed in service and the second vessel will be placed in standby and subsequently replaced. After both vessel have been replaced the system will be returned to normal operation utilizing both vessels. The standby vessel is used in order to eliminate the need to secure the process evolution due to leakage containment vessel replacement.

3.4.3 Ventilation Filter Replacement

When a ventilation filter requires replacement, the Submerged Demineralization System will be shutdown. After a suitable period, the Ventilation System will be shutdown and the filter replaced.

On loss of the SDS Off Gas System, the SDS will be shutdown and system components sealed until the off gas system is restored to service. Unit II Control Room notified. Appropriate radiation control procedures will be instituted.

3.5 Transfer of Water from SDS to EPICOR II

There are three major pathways available for the SDS effluent to be transferred.

The pathways to WDL-T-1A, 1B, and 1G (Reactor Coolant Bleed Holdup Tanks) will represent the predominant method for transferring SDS effluent. This scheme uses existing piping on the 347' elevation of the Fuel Handling Building to transfer water through the Spent Fuel Cooling System to the Radwaste Disposal System. In the Radwaste Disposal System, the effluent can be directed to the Reactor Coolant Bleed Holdup Tanks for eventual EPICOR II processing or for transfer to other locations within the plant.

Another pathway, which utilizes the submersible pump connection on the 347' level of the Fuel Handling Building, leads directly to WDL-T-2 (Miscellaneous Waste Holdup Tank). From this tank, the water can be directed to EPICOR II for processing or to other locations within the plant. This particular pathway presents the possibility of using the Miscellaneous Waste Holdup Tank as surge capacity between SDS and EPICOR II for direct series processing. WDL-T-2 represents approximately 19,000 gallons of surge capacity which would allow SDS to run a maximum of 33 hours (at 10 GPM) while EPICOR II is shut down for liner change out or for maintenance.

The third pathway is the line to the Monitor Tank System although it is not intended to use the Monitor Tanks to receive SDS effluent. This system is capable of collecting and monitoring decontaminated liquid effluent from the SDS and transferring it to the Processed Water Storage Tanks or back to SDS for recycle of the water through the system. The Monitor Tank System is intended to be used as a source of flush water for the SDS.

Source Tank	Receiving Tank
WDL-T-1A, 1B, 1C	EPICOR II
	WDL-T-2
	DH-T-1
	Unit I Tanks
	MDCT
	WDL-T-1A, 1B, 1C
	Tank Farm
WDL-T-2	EPICOR II
	WDL-T-1A, 1B, 1C
	Unit I Tanks
	WDL-T-5
	WDL-T-8A, 8B
	Tank Farm
SDS-T-1A, 1B	PW-T-1, 2
	SDS Recycle
	SDS Flush
	WDL-T-1A, 1B, 1C
	WDL-T-2

3.6 Staffing Levels

3.6.1 System Operations

During system operation, the staffing levels will be as follows:

1.	Operations Department	Two (2) Operators
2.	Chemistry Department	One (1) Chemistry Technician
3.	Radcon Department	One (1) Health Physics Technician

In addition, during vessel movement evolutions, a fuel handling building crane operator will be supplied by the Maintenance Department. These manpower levels are subject to change as a result of lessons learned from the initial operation of the system.

3.6.2 System Outages

During outages, the system will be routinely surveyed by at least one operator and one health physics technician.

4.0 Abnormal Operating Conditions and Emergency Events

4.1 Types of Events Considered

Design and operating parameters of the SDS have included consideration of abnormal operating conditions and emergency events which might arise. The following are noted as situations which may occur:

Abnormal Operating Conditions

Loss of SDS Off-Gas System

Leakage of the SDS into the Spent Fuel Pool

Loss of Instrument Air

Loss of Electric Power

Emergency Events

Fire

Vessel Drop in the Spent Fuel Pool

Cask Drop

Man in the Spent Fuel Pool

4.2 Abnormal Operating Conditions

4.2.1 Loss of SDS Off-Gas System

4.2.1.1 Design Criteria to Mitigate Effects

Upon failure of the off-gas system such that flow through the system is lost, CN-V-IX-24 automatically closes. This action interrupts process flow through the SDS, thereby precluding processing operations with the off-gas system not functioning. This design feature has been incorporated to enable control over the possible generation of airborne radionuclide particulates and gases.

4.2.1.2 Response

Upon loss of the SDS Off-Gas System, the SDS will be shut down and its components isolated until the off gas system is restored to service. The Unit II Control Room will be notified immediately. Any unnecessary personnel will be evacuated from the area until such time as Health Physics personnel determine the area is safe. Self-contained breathing apparatus or respirators will be used by remaining essential personnel, if required, during implementation of corrective action.

4.2.2 Leakage from SDS Into the Spent Fuel Pool

4.2.2.1 Design Criteria to Mitigate Effects

The SDS has been designed to minimize the possibility of leakage. Metallic piping has been designed and fabricated using all welded construction; flanges are not used. Process components, the ion exchange vessels, are located within containment enclosures to restrict the spread of radioactive contamination within the Spent Fuel Pool in the event that a Hansen coupling to a vessel should leak. Valve enclosures are drained to the off-gas separator to control radioactive liquids should a valve leak occur; airborne radioactive contamination is controlled by ventilating the valve enclosures to the off-gas system. Area radiation monitors will provide indication and alarm of increases in the general area radiation levels.

4.2.2.2 Response

If a leak in the submerged piping of the SDS is either detected or suspected, the processing operations will be suspended. The Unit II Control Room will be notified immediately. Area radiation monitoring, in addition to the monitoring in place, will commence. Continuous air samples will be taken to determine the existence of increased airborne radiation levels. Should it be necessary, personnel will be evacuated from the area. Causative factors will be defined; corrective action will be planned and implemented.

4.2.3 Loss of Instrument Air

4.2.3.1 Design Criteria to Mitigate Effects

CN-V-IX-24 automatically shuts upon loss of instrument air causing termination of the feed to SDS.

Response

Any loss of system air will be reported to the Unit II Control Room. Since this abnormal operating condition does not require immediate corrective action, an action plan will be developed and implemented to correct the causative factor.

4.2.4 Loss of Electric Power

4.2.4.1 Design Criteria to Mitigate Effects

Upon loss of electric power SDS processing will be automatically terminated; feed pump operation will be terminated, off-gas system operation will be terminated, CN-V-IX-24 will close.

4.2.4.2 Response

Implement those actions that may be necessary for loss of the SDS off-gas system.

4.3 Emergency Events

4.3.1 Fire

4.3.1.1 Design Criteria to Mitigate Effects

Many of the SDS components remain submerged while in operation. Futhermore, the use of flammable substances has been minimized in the above-water portion of the system. Fire fighting equipment is available in the SDS operating area. The probability for fire in the area of the "B" Spent Fuel Pool, the location of the SDS, is extremely low.

4.3.1.2 Response

Upon detection of fire in the Fuel Handling Building, processing operatins of the SDS will be terminated and the system shut down. Unnecessary personnel will be evacuated from the area. If possible, personnel in the area will fight the fire with available fire fighting equipment. The Station Fire Brigade will be assembled.

4.3.2 Vessel Drop in the Spent Fuel Pool

4.3.2.1 Design Criteria to Mitigate Effects

SDS vessel handling will be done only underwater. Movement of the vessels will occur under stringent observation of operators. The SDS vessels have been designed with sufficient strength to discourage rupture if dropped within the pool. If component (vessel or piping) damage were to occur, such that small amounts of radioactive water is released to the Spent Fuel Pool, the pool and its cleanup systems will limit dispersal of radionuclides and provide cleanup capability for the contaminated pool water. Crane operators will receive training prior to handling the spent vessels.

4.3.2.2 Response

SDS processing operations will be terminated. The operator will immediately notify the Unit II Control Room in the event of a dropped vessel. An immediate visual inspection of system components and instrumentation will then be made to note any indication of possible damage. If damage has occured to any system components, the operator will take corrective action as necessary.

4.3.3 Cask Drop

Cask drop analysis is provided in the SDS TER, Section 7.5. This analysis yields the conclusion that, while the unlikely probability exists that a cask drop could result in a significant cleanup effort, the public health and safety is not compromised.

4.3.3.1 Design Features to Mitigate Effects

Should a cask drop occur, the Fuel Handling Building Ventilation System will be operated to limit radionuclide dispersion to the atmosphere to within Technical Specification limits. The cask handling procedures strictly limit the area above which the shipping casks will be handled and ensure that a cask drop will not damage critical plant hardware.

4.3.3.2 **Response**

SDS processing operations will be terminated. All unnecessary personnel will be immediately evacuated from the area in order to minimize personnel exposure. Any injured personnel will be removed from the area via proper emergency techniques. The Unit I and Unit II Control Rooms shall then be notified, in addition to Health Physics personnel. The Control Room will periodically announce that unnecessary personnel are to remain clear of the accident site. Once the damage and/or danger is assessed, follow-up actions will be initiated to recover from the effects of this accident.

4.3.4 **Man in the "B" Spent Fuel Pool**

4.3.4.1 **Design Criteria to Mitigate Effects**

SDS operation will be performed with full-time Health Physics support. These personnel have knowledge of required actions in the event of gross contamination of the worker due to falling in the Fuel Pool. Eye wash stations are available in the operating area. Plant showers and other services necessary to decontaminate workers are available.

4.3.4.2 **Response**

If a man falls into the "B" Spent Fuel Pool, processing and equipment handling will be stopped and the man will be retrieved from the pool. Unit II Control Room and Health Physics personnel will be notified.

5.0 Maintenance

5.1 Maintenance Approach

The SDS has been designed specifically to be virtually maintenance free; however, some minimal maintenance requirements are expected. To provide ALARA radiation exposure during maintenance all system piping, glove boxes and manifolds are provided with flush connections. All components will be flushed prior to maintenance work. Maintenance requirements for the SDS can be categorized into the following broad general areas:

1. Instrument maintenance and calibration.
2. Pump maintenance.
3. Valve maintenance.
4. Hansen coupling maintenance.
5. Off gas filter system maintenance.

The maintenance approach for each of these areas is described below.

5.1.1 Instrument Maintenance and Calibration Approach

Instrumentation calibration will be performed on a routine basis in accordance with the normal site calibration frequency in accordance with AP 1027 Preventive Maintenance. Maintenance on electronic portions of instrumentation outside the pressure boundary will be performed in accordance with vendors manuals as required and will generally present no special requirements. Pressure indicating devices which communicate with the process fluid are of the isolation diaphram and filled capillary tube type and are located within the various manifold boxes. These instruments would normally not require maintenance and are intended to be replaced remotely should problems develop.

5.1.2 Pump Maintenance

5.1.2.1 Feed Pump and Off Gas Bottoms Pump

The SDS feed pump and off gas bottoms submerged pumps are intended to be replaced rather than repaired.

5.1.2.2 SDS Manifold and Glove Box Sump Pumps

The manifold and glove box pumps will be replaced rather than repaired.

5.1.2.3 Pool Clean-Up System Pump

The pool clean-up system pump is located in an accessible area on the pool curb and is not expected to become contaminated. Normal plant maintenance practices will be utilized should repair become necessary.

5.1.3 Valve Maintenance

All key system valves communicating with contaminated process fluid are located within the various manifold boxes. These valves are accessible through ports in the manifold box covers. The valves are of the top entry type for use of maintenance. The manifold boxes can be flushed and drained to minimize surface contamination prior to commencing maintenance activities. Existing generic plant maintenance procedures will be used where possible. Special procedures will be developed for equipment which is unique to the SDS.

5.1.4 Hansen Coupling Maintenance

The female Hansen couplings, which are part of the flexible hoses connecting the system to the vessels, contain "O" rings which could become worn or damaged through continued use. These may be replaced underwater either manually or through the use of remote tools. Experience with the system will dictate frequency of replacement.

5.2 Corrective Maintenance

Prior to performing any maintenance activity on SDS components associated with the pressure boundary or other contaminated portions, the system will be flushed using either demineralized water or low activity processed water. The system will then be drained and the necessary surveys and swipe samples taken to determine the appropriate work procedure to maintain ALARA conditions.

When work is to be accomplished within the manifold boxes, a survey and swipe samples will be taken in the box and the box will be flushed if contamination is detected. Photographs which were taken of the boxes prior to installation of the covers will be used as required to determine work space and component location.

For removal of isolation diaphram type pressure instruments a special tool as described in Section 1.8 will be utilized to allow the remote removal and replacement of the instrument.

The feed pumps have been supplied with special shielded sleeves as described on CNSI Drawing 527D-A-5012. The pumps will be pulled into these sleeves and sealed; then new pumps installed.

5.2.1 Retesting Requirements

Repairs and maintenance which violate the integrity of the pressure boundary will require post-maintenance testing at normal operating pressure and temperature. This will be accomplished using low level processed water or demineralized water.

Replacement of the off gas system HEPA filters will require the performance of the system DOP tests to verify filter efficiency.

5.3 Preventive Maintenance and Inservice Inspection

5.3.1 Preventive Maintenance

The pool clean-up system pump will be checked to ensure that oil is visible in the oil reservoir at regular intervals.

Periodic surveys of the manifold boxes will be performed to determine leak integrity of valve stem packing. This will be accomplished when the system is shut down for vessel change out and can be performed by removing a valve access plug and taking a swipe sample of the drain sump.

The MSA off gas unit drive shaft "O" ring seals will be checked every six (6) months using a soap bubble test. The "O" ring can be replaced externally should a leak occur.

Periodic lubrication of the threaded portion of the crank shaft will be accomplished in accordance with the MSA technical manual. Flexible coupling and bearing will be checked periodically and bearing lubrication monitored to determine a maintenance frequency.

5.3.2 Inservice Inspection

Inservice inspection consists of periodic physical inspection of components.

Valves, pumps, instrument connections, motors and other active components will be routinely inspected to determine degradation and to spot potential problem areas. Instrument readings will be taken daily and compared to previous data to develop trend information which may indicate system degradation or potential problem areas. This information will be evaluated by the engineering staff and corrective measures recommended as deemed appropriate.

6.0 Acceptance Testing

The SDS testing can be subdivided into three general catagories:

1. Construction Testing
2. "Cold" Functional Testing
3. "Hot" Functional Testing.

6.1 Construction Testing

Construction testing will consist of fluid system flushing, flow verification and pressure testing and continuity testing and alarm set point checks of all electrical and instrument circuits. Additionally, all instruments (which were purchased initially with factory calibration certification) will be recalibrated. DOP testing has been performed on the off gas HEPA filters. Initial equipment mechanical checkout, including vibration testing, lubrication checks and initial run in have been completed. Vessels will be required to pass a hydrostatic test in accordance with the ASME Boiler and Pressure Vessel Code, Division 1. HEPA filters must pass a test certifying them to be 99.95 percent efficient on particles 0.3 microns or larger in size.

6.2 "Cold" Functional Testing

The system will be aligned in its normal operating mode and filled with demineralized water. System operating procedures will be proof tested (red lined) and baseline data will be taken from system instrumentation. This information will be compared with the design points to verify system performance to be in accordance with the design. The system will be required to perform to the design points specified in this document (Appendix 7). The system will be required to perform operations which are described in Section 3 of this document. Set points, alarm points and system trip points will be verified. Tank level indication will be verified. Remote tool operability will be demonstrated. Filter and ion exchanger handling operations will be demonstrated.

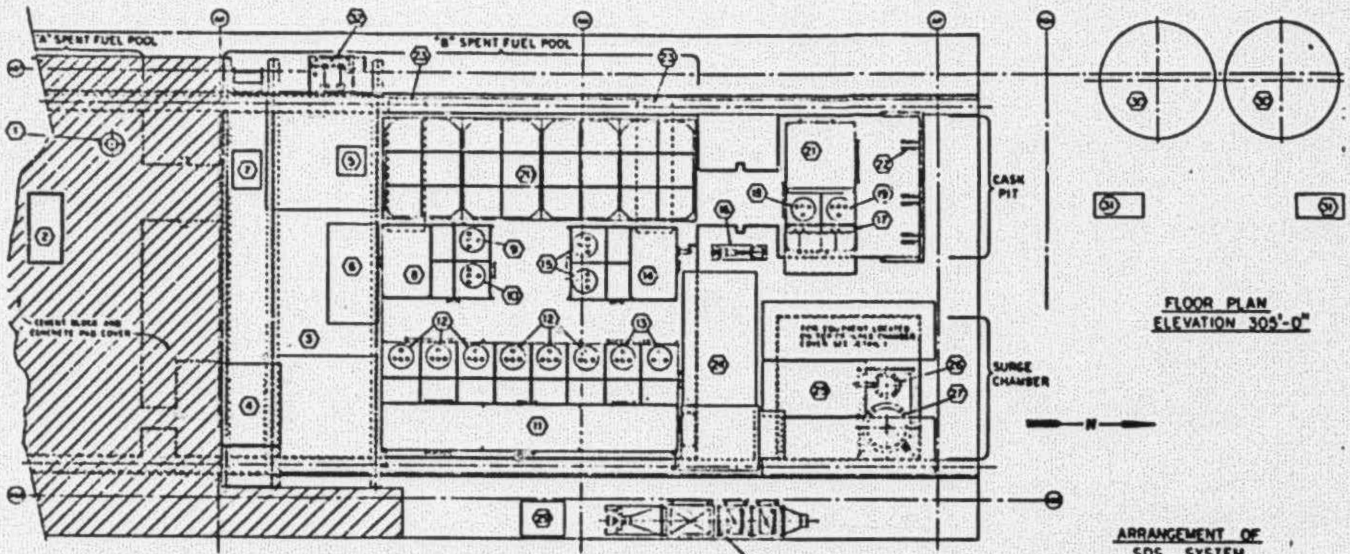
6.3 "Hot" Functional Testing

The initial operation of the system is planned to be used as a part of the system testing program. The initial processing will utilize water contained in the Reactor Coolant Bleed Tanks which is of low specific activity. This information will allow additional data to be taken including surveys of pipe and tank shielding areas to determine potential "shine" areas. Instrument readings will be taken and some DF (decontamination factor) verification can be expected.

6.4 Ancillary Testing

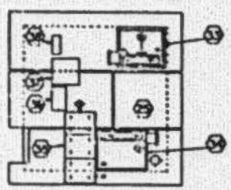
The following ancillary testing has also been performed both on and off site

1. Dewatering testing of ion-exchange columns.
2. Dewatering testing of filter vessels.
3. Ion-exchanger column testing.
4. Distribution header testing of ion-exchange vessels.
5. Channeling testing of ion-exchange vessels.
6. Polishing system column testing.
7. Filter loading testing.



FLOOR PLAN ELEVATION 347'-6"

FLOOR PLAN ELEVATION 305'-0"



DETAIL 1

ARRANGEMENT OF SDS SYSTEM

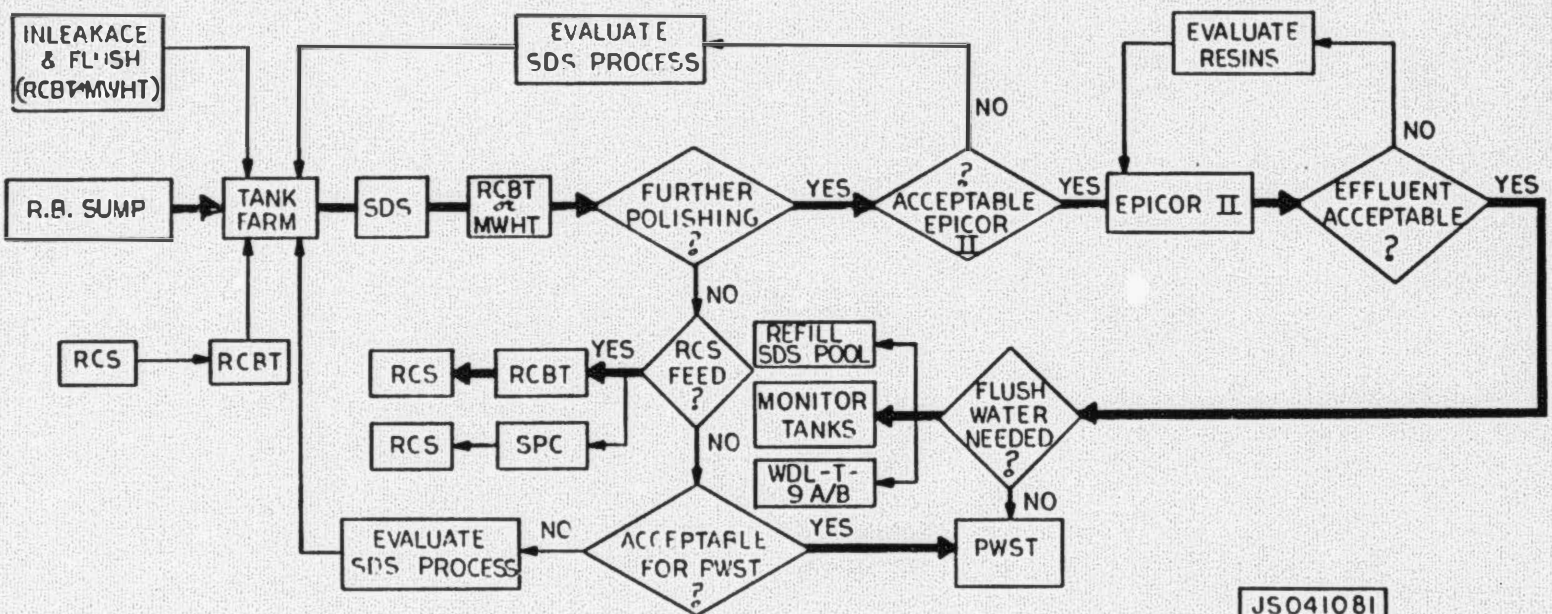
FIGURE 1

1	FEED PUMP STAND PIPE
2	FEED PUMP MANIFOLD
3	CASK SUPPORT PLATFORM
4	RCS CLEAN-UP MANIFOLD
5	SDS EFFLUENT POST FILTER
6	FILTER MANIFOLD
7	CONTROL PANEL CN-PNL-1
8	FILTER SUPPORT RACK
9	PRE-FILTER
10	FINAL FILTER
11	EXCHANGER SUPPORT RACK
12	ION EXCHANGER
13	CATION EXCHANGER
14	LEAKAGE CONTAINMENT SUPPORT RACK
15	LEAKAGE CONTAINMENT ION EXCHANGER
16	LEAKAGE CONTAINMENT PUMP

17	DEWATERING STATION SUPPORT RACK
18	ION EXCHANGER DEWATERING STATION
19	FILTER DEWATERING STATION
20	SPENT EXCHANGER STORAGE RACK
21	SHIPPING CASK SUPPORT PLATFORM
22	TOOL HANGER
23	MOVEABLE PERSONNEL BRIDGE
24	EXCHANGER MANIFOLD
25	SURGE CHAMBER COVER
26	OFF-GAS PUMP STAND PIPE
27	OFF-GAS SEPARATOR
28	OFF-GAS FILTER UNIT
29	OFF-GAS SAMPLING
30	MONITORING TANK
31	MONITORING TANK PUMP
32	HI-RAD FILTER GLOVE BOX

33	HI-RAD FEED SAMPLE GLOVE BOX
34	INTERMEDIATE LEVEL SAMPLE GLOVE BOX
35	BETA MONITOR MANIFOLD
36	ANNUNCIATOR PANEL
37	RAD MONITOR PANEL
38	OFF-GAS SEPARATOR LEVEL INSTR PANEL

PROCESSING LOGIC PLAN



JS041081

Table 2

LINER RADIONUCLIDE LOADING CRITERIA

BASIS: (1) Non-Proprietary Ion-Exchange Material
(2) 600,000 Gallons Sump Water
(3) 90,000 Gallons RCS Water

SYSTEM	VESSEL POSITION	SIZE	FUNCTION	EXCHANGER	CHANGEOUT CRITERIA	REASON FOR CHANGEOUT	CURIES DEPOSITED	No. of LINERS
SDS	1	2 x 4	Cs Removal & Sr removal	IE-95/ Linde A	60,000 Ci(Cs)	- Zeolite Radiation Stability - Shipping Cask Limit	60,000 Curies (Total Cs) 2,000 Curies Sr	12-15
SDS	2	2 x 4	Same as SDS No. 1	IE-95/ Linde A	Same as SDS No. 1	- Same as SDS No. 1	N/A	1/train
SDS	3	2 x 4	Same as SDS No. 1	IE-95/ Linde A	Same as SDS No. 1	- Same as SDS No. 1	N/A	1/train
SDS	4	2 x 4	Same as SDS No. 1	IE-95/ Linde A	Same as SDS No. 1	- Same as SDS No. 1	N/A	1/train
EPICOR-II	5	6 x 6	Na Removal	Strong Acid Cation Mixed Cation/ Anion	25,000 Gals. or 20 Ci γ-emitter Na break	- Minimize Na Breakthrough - Operational Convenience - Liner handling limit (Bare Pick) - Shipping considerations	<20 Curies γ-emitters	20-30
EPICOR-II	6	6 x 6	Polishing	Organic Cation/Anion	20 Ci γ-emitter	Liner Handling limit Shipping Considerations	<20 Curies γ-emitters	<5
EPICOR-II	7	4 x 4	Polishing Backup	Organic Cation/Anion	20 Ci γ-emitter	Same as EPICOR-II 6	<20 Curies γ-emitters	<5

Appendix No. 1

to

Submerged Demineralizer System

System Design Description

Title

S.D.S. Pumps

APPENDIX 1

SDS PUMPS

PUMP DETAILS

Identification	CN-P-IX01
Noun Name	Feed Pump
Manufacturer	Goulds Pump Inc.
Model No.	VIS (3 x 6 ALC - 45TG)
Type	Submersible/Centrifugal
Standard Material Designation	Stainless Steel
Rated Speed	3500 RPM
Rated Capacity	30 GPM
Rated Total Dynamic Head	240 Ft.
Design Temperature	100°F
Lubricant	Water

MOTOR DETAILS

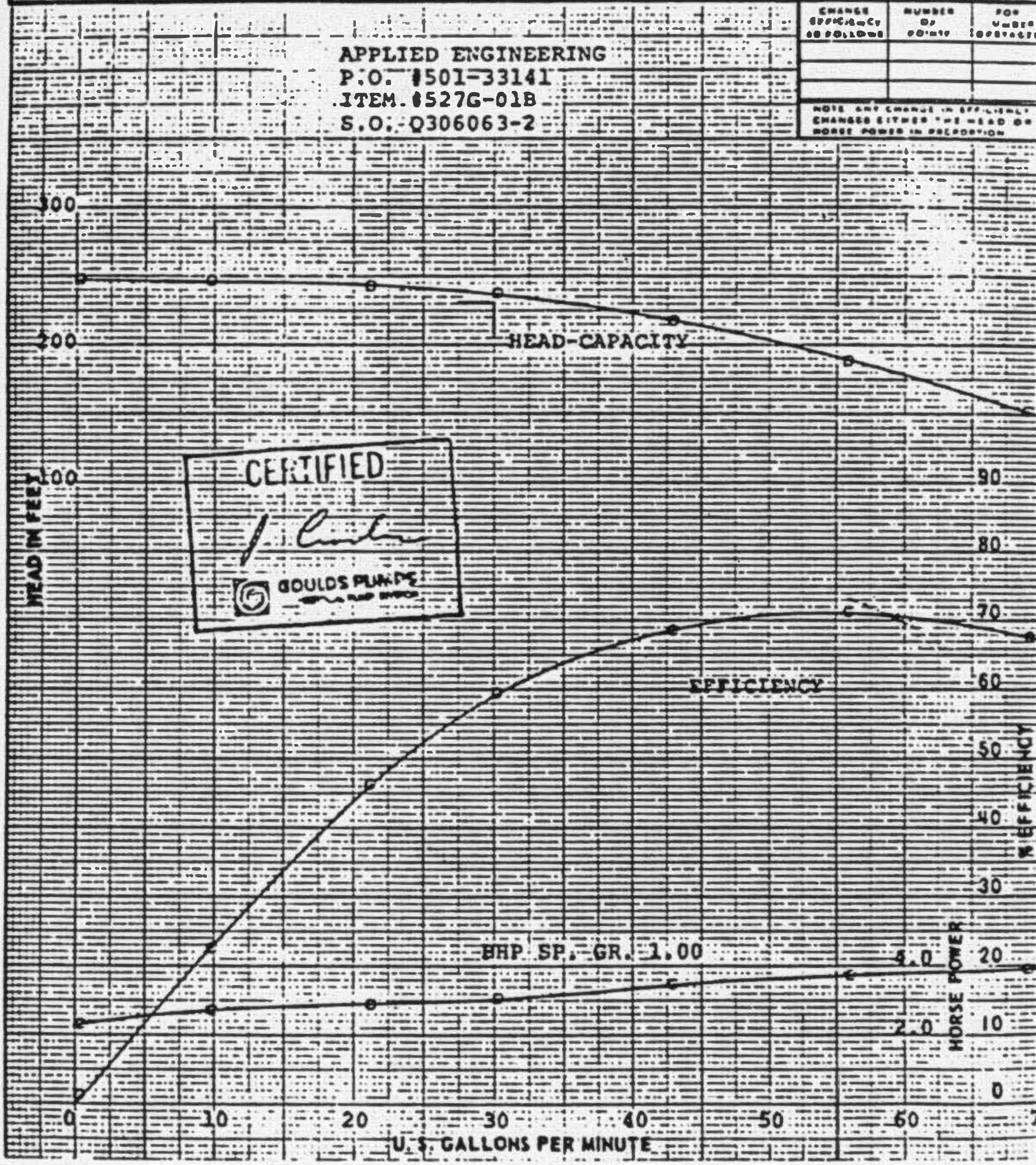
Manufacturer	Franklin
Type	Submersible
Enclosure	Hermetically Sealed
Rated Horse Power	5 HP
Rated Speed	3500 RPM
Lubricant/Coolant	Water Cooled
Power Requirements	460 Volts, 3 phase 60 Hz, 5.9 Amps
Power Source	SDS PDP 6A

REFERENCE

Drawing No.	DS-527-G-01, Rev. 1

CURVES SHOW APPROXIMATELY THE CHARACTERISTICS WHEN PUMPING CLEAR NON-AERATED WATER. NO GUARANTEE IS MADE EXCEPT FOR THE RATED POINT

NOTE: NO COLUMN LOSSES ARE INCLUDED



APPENDIX 1 SDS SDD CN-P-1X01

IMPELLER CLOSED	GOULDS PUMPS	PERFORMANCE FOUR STAGE	
3 3/4" DIA.	VERTICAL PUMP DIVISION	3 X 6ALC	DEEP WELL TURBINE PUMP
HP –		AS RUN	RPM
DATE 1-28-80 BY JC	INDUSTRY, CALIFORNIA	CURVE SHEET NO.	T-80-040

Appendix 1 (Cont'd)

SDS PUMPS

PUMP DETAILS

Identification	SDS-P-1A and SDS-P-1B
Noun Name	Monitor Tank Transfer Pumps
Manufacturer	Goulds Pumps Inc.
Model No.	3196 "ST"
Type	Double Mechanical Seal - Centrifugal
Standard Material Designation	Stainless Steel
Rated Speed	3500 RPM
Rated Capacity	50 GPM
Rated Total Dynamic Head	111 Ft.
Design Temperature	500°F
Lubricant	Water

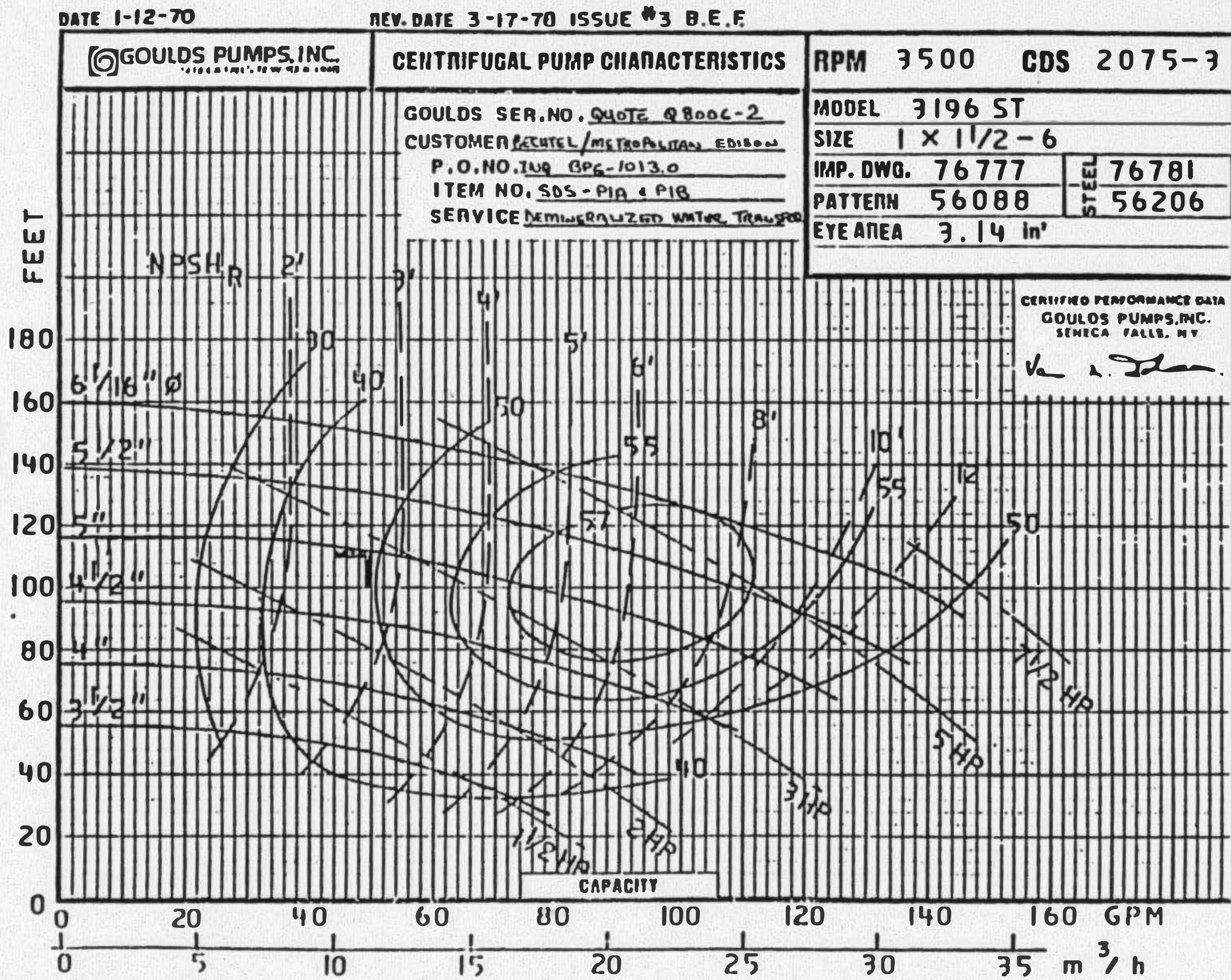
MOTOR DETAILS

Manufacturer	Reliance
Type	P
Enclosure	ODP
Rated Horse Power	5 HP
Rated Speed	3500 RPM
Lubricant/Coolant	Oil/Air
Power Requirements	460 Volts, 3 Phase 60 Hz, 6.6 Amps
Power Source	SDS-STR-1 and SDS-STR-2

REFERENCE

Drawing No.	2-M080A, Rev. 0

APPENDIX 1 SDS SDD SDS-P-1A & SDS-P-1B



Appendix 1 (Cont'd)

SDS PUMPS

PUMP DETAILS

Identification	CN-P-VA04
Noun Name	Off Gas Bottom Pump
Manufacturer	Goulds Pumps Inc.
Model No.	WP 3881
Type	Submersible
Standard Material Designation	400 Series Stainless Steel
Rated Speed	3450 RPM
Rated Capacity	30 GPM
Rated Total Dynamic Head	65 Ft.
Design Temperature	100°F
Lubricant	Water

MOTOR DETAILS

Manufacturer	Franklin
Type	Submersible
Enclosure	Hermetically Sealed
Rated Horse Power	1 HP
Rated Speed	3450 RPM
Lubricant/Coolant	Oil
Power Requirements	460 Volts, 3 Phase 60 Hz, 3.5 Amps
Power Source	SDS-PDP 6A

REFERENCE

Drawing No.	DS-527-G-02, Rev. 2

PERFORMANCE RATING Gallons Per Minute

WP-3881 Series No. ▶		WP0511S WP0512S
HP ▶		½
RPM ▶		1750
Total Dynamic Head Feet of Water	5	160
	10	133
	15	90
	20	50
	25	20
	30	0

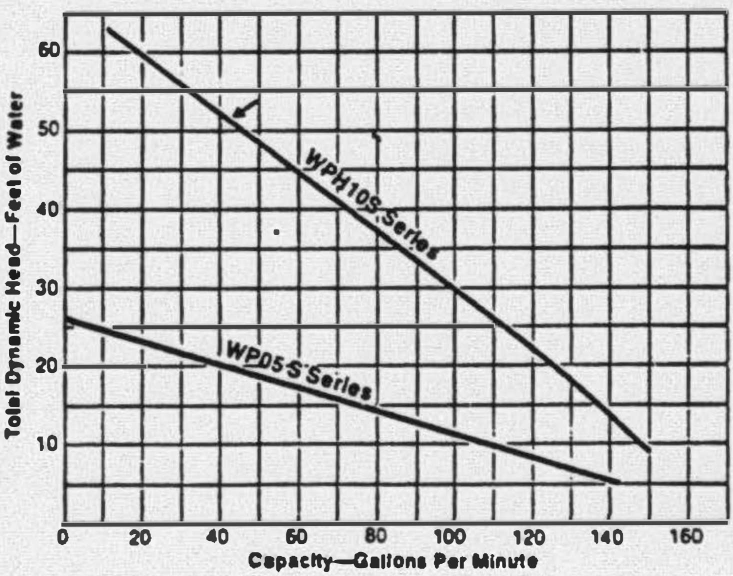
WPH 3881 Series No. ▶		WPH1012S WPH1032S WPH1034S
HP ▶		1
RPM ▶		3450
Total Dynamic Head Feet of Water	10	147
	20	124
	30	98
	40	71
	50	45
	60	18

SPECIFICATIONS

WP-3881 Series	HP	Volts	Phase	RPM	Solids	Max. Amps	Wt.
WP0511S	½	115	1	1750	1½	11.0	60
WP0512S	½	230	1	1750	1½	6.5	60

WPH-3881 SeriesNo.	HP	Volts	Phase	RPM	Solids	Max. Amps	Wt.
WPH1012S	1	230	1	3450	¾"	11.0	70
WPH1032S	1	208/230	3	3450	¾"	7.0	70
WPH1034S	1	460	3	3450	¾"	3.5	70

PERFORMANCE CURVE



APPENDIX 1
SDS SDD
CN-P-VA04

Appendix 1 (Cont'd)

SDS PUMPS

PUMP DETAILS

Identification	CN-P-LC06
Noun Name	Leakage Containment System Pump
Manufacturer	Goulds Pumps Inc.
Model No.	3196 MT-A-60
Type	Centrifugal
Standard Material Designation	316 S.S.
Rated Speed	1750 RPM
Rated Capacity	120 GPM
Rated Total Dynamic Head	55 Ft.
Design Temperature	100°F
Lubricant	Water

MOTOR DETAILS

Manufacturer	Westinghouse
Type	Type S
Enclosure	TEFC
Rated Horse Power	3 HP
Rated Speed	1750 RPM
Lubricant/Coolant	Oil/Air
Power Requirements	460 Volts, 3 Phase 60 Hz, 4.8 Amps
Power Source	SDS-PDP 6A

REFERENCE

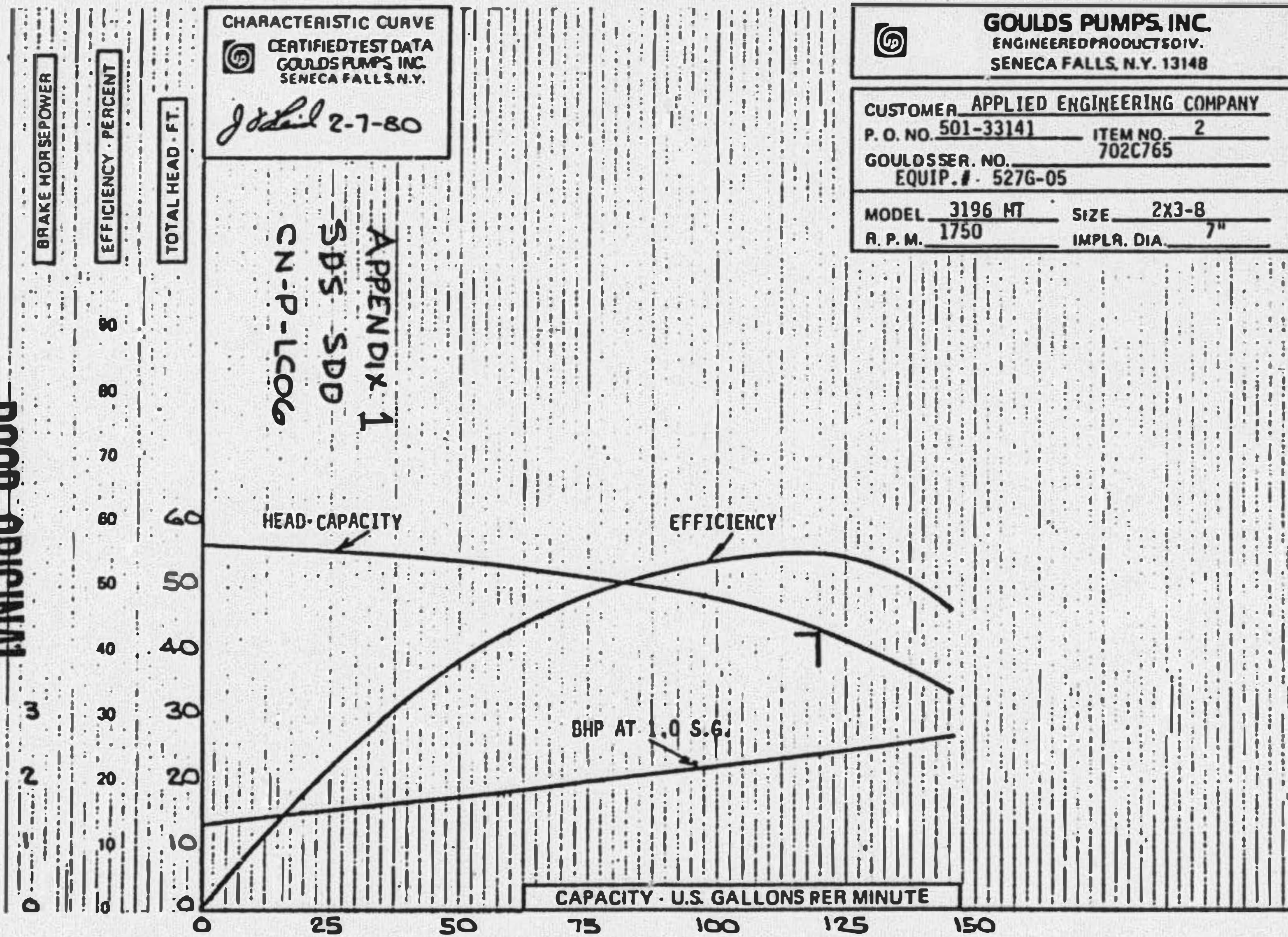
Drawing No.	DS-527-G-05, Rev. 2

A-26845

GOULDS PUMPS, INC.
ENGINEERED PRODUCTS DIV.
SENECA FALLS, N.Y. 13148

CUSTOMER APPLIED ENGINEERING COMPANY
P. O. NO. 501-33141 ITEM NO. 2
GOULDS SER. NO. 702C765
EQUIP. # - 527G-05
MODEL 3196 MT SIZE 2X3-8
R. P. M. 1750 IMPLR. DIA 7"

CHARACTERISTIC CURVE
CERTIFIED TEST DATA
GOULDS PUMPS INC.
SENECA FALLS, N.Y.
2-7-80



Appendix 1 (Cont'd)

SDS PUMPS

PUMP DETAILS

Identification	CN-E-VA05
Noun Name	Off Gas Blower
Manufacturer	Buffalo
Model No.	5E
Type	Radial Flow Centrifugal Type "E"
Standard Material Designation	Sheet Steel
Rated Speed	3510 RPM
Rated Capacity	1000 CPM
Rated Static Pressure	12" W.G.
Design Temperature	104°F
Lubricant	Oil

MOTOR DETAILS

Manufacturer	Westinghouse
Type	K
Enclosure	TEFC
Rated Horse Power	5 HP
Rated Speed	3510 RPM
Lubricant/Coolant	Oil/Air
Power Requirements	460 Volts, 3 Phase 60 Hz, Amps
Power Source	SDS-PDP 6A

REFERENCE

Manual	MSA Off Gas Air Filtration System Instuction Manual

"E" and "RE" BLOWERS and EXHAUSTERS

Buffalo

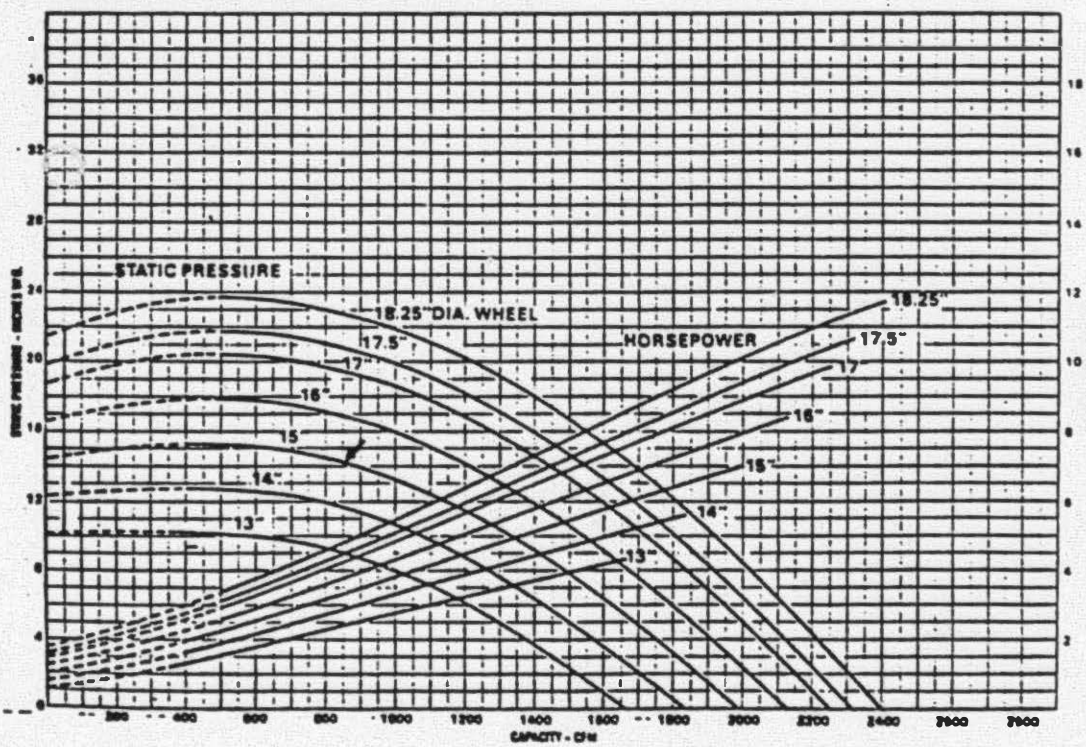
CAPACITIES and STATIC PRESSURES

SIZE 5 E BLOWER FABRICATED STEEL (F.S.)

Ratings are for standard air at .075 lbs per cubic feet density at 70°F 29.92" Hg. Performance data in the tables and curves is for standard wheel diameters which are carried in stock. When suitable, select a stock size for fastest delivery. Special wheel diameters to meet intermediate ratings can be determined upon request to your Buffalo Sales Engineer.

	3500 R.P.M.							
Capacity	18.25" Wheel		17.0" Wheel		15.0" Wheel		13.0" Wheel	
C.F.M.	S.P.	B.H.P.	S.P.	B.H.P.	S.P.	B.H.P.	S.P.	B.H.P.
400	23.5	3.0	20.3	2.6	15.1	1.9	10.2	1.3
500	23.8	3.4	20.4	2.9	15.2	2.2	10.1	1.5
600	23.5	3.7	20.3	3.3	15.1	2.5	10.0	1.7
700	23.3	4.2	20.1	3.7	14.9	2.9	9.7	2.0
800	23.0	4.6	19.8	4.0	14.5	3.2	9.2	2.3
900	22.5	5.0	19.3	4.5	14.0	3.5	8.7	2.6
1000	22.0	5.5	18.6	4.9	13.3	3.8	8.0	2.8
1100	21.0	6.0	17.7	5.3	12.3	4.2	7.1	3.1
1300	19.0	6.9	15.8	6.1	10.4	4.9	5.0	3.5
1500	16.7	7.9	13.3	6.9	7.9	5.5	2.4	4.0

3500 R.P.M. PERFORMANCE CHART



APPENDIX 1 SDS SDD CN-E-VA05

POOR ORIGINAL

Appendix 1 (Cont'd)

SDS PUMPS

PUMP DETAILS

Identification	CN-P-FL07, CN-P-SA08, and CN-P-RC09
Noun Name	High Rad Filter Manifold, High Rad Filter Sample, and RCS Manifold Sump Pumps
Manufacturer	Gormann-Rupp Industries
Model No.	20501-000
Type	Nutating
Standard Material Designation	Polypropylene and Polyphenosulfide
Rated Speed	1550
Rated Capacity	0.50 CPM
Rated Static Pressure	80.85 Ft.
Design Temperature	180°F
Lubricant	Water

MOTOR DETAILS

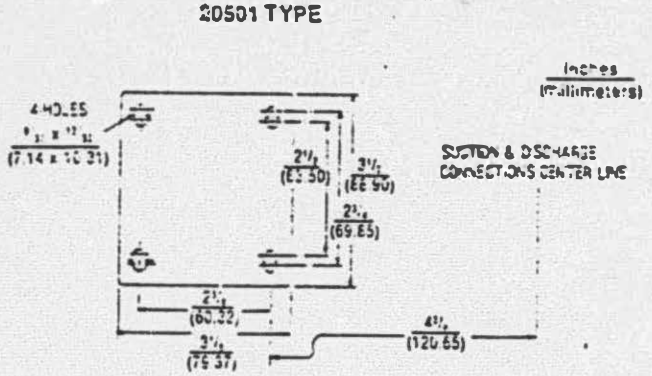
Manufacturer	Gormann-Rupp Industries
Type	PSC
Enclosure	TEFC
Rated Horse Power	0.18 HP (135 Watts)
Rated Speed	1550
Lubricant/Coolant	Oil/Air
Power Requirements	115 Volts, 2 Phase 60 Hz, 1.3 Amps
Power Source	MP-CN-1

REFERENCE

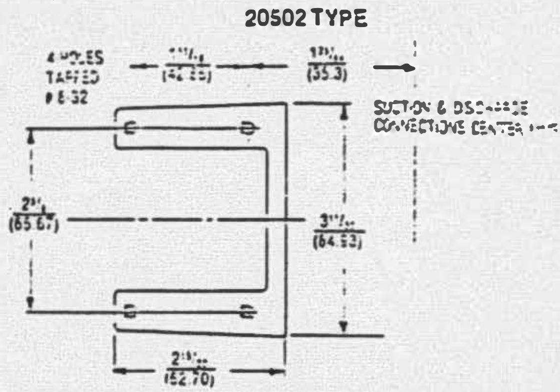
Drawing No.	DS-527-G-06, Rev. 3 DS-527-G-07, Rev. 3 DS-527-G-08, Rev. 1

MOUNTING BASE DIMENSIONS

20501 TYPE



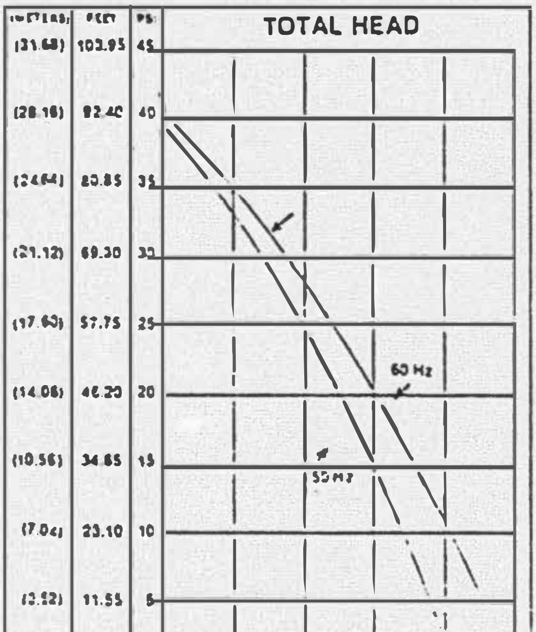
20502 TYPE



MODEL NUMBER	MOTOR										PLUG TYPE	CORD LENGTH	BEARING
	VOLTS	HERTZ	RPM	AMPS		WATTS		SHELL	TYPE	CLASS			
				50 Hz	60 Hz	50 Hz	60Hz						
20501-000	115	50/60	1550	1.65	1.30	150	135	TEFC	PSC	B	Standard 3-Prong	60" (1.52m)	Ball
20501-001	240	50/60	1550	.60	.55	150	135	TEFC	PSC	B	None	60" (1.52m)	Ball
20502-000*	115	60	1550	N/A	1.4	N/A	134	OPEN	PSC	B	Standard 3-Prong	60" (1.52m)	Ball
20502-001**	220	50	1550	N/A	N/A	N/A	N/A	OPEN	PSC	B	None	60" (1.52m)	Ball

*Open shaded pole motor also available for OEM quantity applications.
**This model available at a later date.

Motor Numbers:
U.L. File No.: 115v & 240v TEFC models (E-40513, E-45205, E-53469) 115v & 240v Open models (E-27255)
CSA No.: 115v & 240v TEFC models (LR5319) 115v & 240v Open models (LR4353)



CN-P-RC09
CN-P-FL07
CN-P-SA08

MATERIALS OF CONSTRUCTION

BODY	Glass Reinforced Polypropylene
MOTOR	TEFC/PSC (Totally enclosed fan cooled permanent split capacitor)
	Open PSC
	Open Shaded Pole (not shown)
DISC	Glass Reinforced Ryton®
SPRING	316 Stainless Steel
DRIVE COUPLING	Anodized Aluminum
DRAWN CUP	Zinc Plated Steel
BELLOWS	Polypropylene
INLET O.D.	½" (12.7 mm)
OUTLET O.D.	½" (12.7 mm)

Note Consult Factory For:

1. Performance of liquid more viscous than water.
2. PSI in pressurized system
3. Water temperatures above 180°F (82°C) at 15 PSI (Discharge Pressure).

APPENDIX 1 SDS SDD

GORMAN-RUPP INDUSTRIES

DIVISION OF THE GORMAN-RUPP COMPANY

Telephone 419 886-3001 Telex #98-7444

POOR ORIGINAL

Appendix No. 2

to

Submerged Demineralizer System

System Design Description

Title

SDS Filter Vessels

Appendix No. 2

PREFILTER/FINAL FILTER

VESSEL DETAILS

Identification (Prefilter/final filter)	F-10001 through F-10002 (Prefilter) F-20001 (Final Filter)
Number Installed	Two (2)
Manufacturer	APCO
Installation	Vertical
Outside Diameter/Height, ft. in.	2 Ft. 1/2 In./4 Ft. 5 1/2 Inch
Shell Thickness	3/16 Inch
Shell Material	Stainless Steel (304)
Design Pressure/Temperature	150 PSIG/100°F
Volume	10 Cubic Feet
Prefilter Size	3/16 Inch Roughing Screen/125 Micron Cuno
Final Filter Size	10 Micron Cuno

Appendix No. 2

POST FILTER

VESSEL DETAILS

Identification	5EH*N D1596-1
Number Installed	One (1)
Manufacturer	Pall Trinity
Installation	Vertical
Outside Diameter/Height, ft. in.	10 5/8 In./3 Ft. 5 7/16 Inch
Shell Thickness	0.165 Inch
Shell Material	Stainless Steel (304)
Design Pressure/Temperature	150 PSIG/100°F
Volume	0.61 Cubic Feet
Post Filter Size	0.45 Micron/Normal/3.0 Micron Absolute

Appendix No. 3

to

Submerged Demineralizer System

System Design Description

Title

SDS Demineralizer Vessels

Appendix No. 3

ZEOLITE DEMIN VESSELS

VESSEL DETAILS

Identification	D-10011 through D-10018 (Permutit) D-20021 theough D-20042 (Buffalo Tank)
Humber Installed	Six (6)
Manufacturer	Permutit/Buffalo Tank
Installation	Vertical
Outside Diameter/Height, ft. in.	2 Ft. 1/2 In./4 Ft. 5 1/2 Inch
Shell Thickness	3/8 Inch
Shell Material	Stainless Steel (316L)
Design Pressure/Temperature	350 PSIG/400°F
Volume	10 Cubic Feet

Appendix No. 3

LEAKAGE CONTAINMENT ION EXCHANGE VESSELS

VESSEL DETAILS

Identification	D-00001 through D-00010
Number Installed	Two (2)
Manufacturer	APCO
Installation	Vertical
Outside Diameter/Height, ft. in.	2 Ft. 1/2 In./4 Ft. 5 1/2 Inch
Shell Thickness	3/16 Inch
Shell Material	Stainless Steel (304)
Design Pressure/Temperature	150 PSIG/100°F
Volume	10 Cubic Feet

Appendix No. 4

to

Submerged Demineralizer System

System Design Description

Title

Waste Storage Tanks

Appendix No. 4

WASTE STORAGE TANKS

VESSEL DETAILS

Identification	WDL-T-2A through 2D
Manufacturer	Hemminger Co.
Capacity - Gallons	60,000 Gal. (Total)
Installation	Horizontal
Outside Diameter/Height, ft. in.	11 Ft. 6 In./21 Ft.
Shell Material	Stainless Steel
Shell Thickness, In.	1/4 Inch
Design Temperature, °F	200°F
Design Pressure, PSIG	14 PSIG
Corrosion Allowance, In.	None
Design Code	ASME Section VIII, Div. 2
Code Stamp Required	Not Stamped

Appendix No. 5

to

Submerged Demineralizer System

System Design Description

Title

SDS Monitor Tanks

Appendix No. 5

SDS MONITOR TANKS

VESSEL DETAILS

Identification	SDS-T-1A through SDS-T-1B
Manufacturer	Buffalo Tank
Number Installed	Two (2)
Capacity - Gallons	12,000 Gal. Each
Installation	Vertical
Outside Diameter/Height, ft. in.	8 Ft./32 Ft.
Shell Material	Stainless Steel (304)
Shell Thickness, In.	3/16 Inch
Design Temperature, °F	Amb.
Design Pressure, PSIG	Atmospheric
Corrosion Allowance, In.	None
Design Code	API-650, Appendix J
Code Stamp Required	API-650, Appendix J

Appendix No. 6

to

Submerged Demineralizer System

System Design Description

Title

SDS Off Gas Separator Tank

Appendix No. 6

SDS OFF GAS SEPARATOR TANK

VESSEL DETAILS

Identification	CN-T-VA02
Manufacturer	APCO
No. Installed	One (1)
Capacity - Gallons	590 Gal. Each
Installation	Vertical
Outside Diameter/Height, ft. in.	36 In./10 Ft.
Shell Material	Stainless Steel (304)
Shell Thickness	3/16 Inch
Design Temperature, °F	100°F
Design Pressure, PSIG	16 PSIG
Corrosion Allowance, In.	None
Design Code	ASME Section VIII, Div. 1
Code Stamp Required	ASME Section VIII, Div. 1

Appendix No. 7

to

Submerged Demineralizer System

System Design Description

Title

S.D.S. Instrument List

Table 7.0
SDS INSTRUMENT INDEX

FUNCTIONAL CODE UNDER
REMARKS: I - INDICATION
C - CONTROL
A - ALARM

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-PI-FL01	Filtration Manifold Influent Pressure gage	Filter Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-FL02	Filter Influent Sample Pressure gage	High Rad Filter Sample Glove Box	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-FL03	Prefilter Influent Pressure gage	Filter Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-FL04	Prefilter Effluent Pressure gage	Filter Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-FL05	Final Filter Effluent Pressure gage	Filter Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-FL06	Filter Effluent Sample Pressure gage	High Rad Filter Sample Glove Box	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX07	Feed Pump Discharge Pressure gage	Feed Pump Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX08	IX Manifold Influent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX09	Train #1 IX "A" Effluent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX10	Train #1 IX "B" Effluent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX11	Train #1 IX "C" Effluent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX12	Train #2 IX "A" Effluent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX13	Train #2 IX "B" Effluent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX14	Train #2 IX "C" Effluent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX15	Cation Effluent Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I
CN-PI-IX16	IX Manifold Flushline Pressure gage	IX Manifold	Ashcroft	1279S	0-160 psi	N/A	I

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-PI-LC17	Leakage containment Pump Discharge Pressure gage	Above Leakage Containment IX	Ashcroft	1279S	0-60 psi	N/A	I
CN-PI-LC18	Leakage containment IX "A" Effluent Pressure gage	Above Leakage Containment IX	Ashcroft	1279S	0-60 psi	N/A	I
CN-PI-LC19	Leakage containment IX "B" Effluent Pressure gage	Above Leakage Containment IX	Ashcroft	1279S	0-60 psi	N/A	I
CN-PISH-VA28	Off Gas Header Influent Pressure gage, switch, hi, switch hi-hi	Off Gas ventilation unit	Dwyer	3015	0-15" H_2O	5&7" H_2O	I,C,A
CN-PAH-VA28	Off Gas Header Influent Pressure High Alarm	Annunciator Panel #1	Ronan	X2-1003	N/A	5" H_2O	A
CN-PI-VA29	Off Gas Blower Suction Pressure gage	Off Gas ventilation Unit	Later	Later	0-15" H_2O	N/A	I
CN-PI-VA30	Off Gas Blower Discharge Pressure gage	Off Gas Ventilation Unit	Later	Later	0-15" H_2O	N/A	I
CN-PI-SA33	Removable sample cylinder Pressure gage	Intermediate Level Sample Glove Box	Ashcroft	1000TA	0-160 psi	N/A	I
CN-PI-SA34	Cation IX Effluent Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I
CN-PI-SA35	Train #2 IX "C" Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I
CN-PI-SA36	Train #1 IX "A" Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I
CN-PI-SA37	Train #1 IX "B" Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I
CN-PI-SA38	Train #2 IX "A" Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I
CN-PI-SA39	Train #2 IX "B" Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I
CN-PI-SA40	Train #1 IX "C" Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I
CN-PI-SA41	Cation IX Influent Sample Cylinder Pressure gage	Intermediate Level Sample Box	Ashcroft	1000 TA	0-160 psi	N/A	I

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-PI-SA42	High Rad Feed Sample Pressure gage	High Rad Feed Sample Box	Ashcroft	1279S	0-160 psi	N/A	1
CN-PI-DW43	Dewatering Station Demin Water Pressure gage	Dewatering Station	Ashcroft	1220	0-160 psi	N/A	1
CN-PI-DW44	Dewatering Station Air Supply Pressure gage	Dewatering Station	Ashcroft	1220	0-160 psi	N/A	1
SDS-PI-6	Monitor Tank Transfer Pump 1B Discharge Pressure (Local)	Pump Discharge Piping	Robertshaw	S-775-DM-4 1/2	0-100 psig	N/A	1
SDS-PT-9	Monitor Tank Transfer Pump 1B Discharge Pressure Transmitter	Monitor Tank Subsystem	Fosboro	E11GM-ISAB1	4-20 MADC 0-100 psig	N/A	1
SDS-PI-9	Monitor Tank Transfer Pump 1B Discharge Pressure	Panel LCP-1	Magnetica	1151VB420	4-20MADC 0-100 psig	N/A	1
SDS-PI-8	Monitor Tank Transfer Pump 1A Discharge Pressure (Local)	Monitor Tank Subsystem	Robertshaw	S-775-DM-4 1/2	0-100 psig	N/A	1
SDS-PT-10	Monitor Tank Transfer Pump 1A Discharge Pressure Transmitter	Monitor Tank Subsystem	Fosboro	E11GM-ISAB1	4-20 MADC 0-100 psig	N/A	1
SDS-PI-10	Monitor Tank Transfer Pump 1A Discharge Pressure (Panel)	Panel LCP-1	Magnetica	1151VB420	4-20 MADC 0-100 psig	N/A	1
CN-FE-IX01	Feed Pump Discharge Flow Element	Feed pump discharge piping	Fischer Porter	10LV2201AB3C	N/A	N/A	1
CN-FI/FQI-IX01	Feed Pump Discharge Flow Indicator/Totalizer	Feed Pump Manifold	Fischer Porter	50LV2114A2B	0-20 gpm	N/A	1
CN-FE-IX03	Train #1 Influent Flow Element	IX Manifold influent piping	Fischer Porter	10LV2201AB3C	N/A	N/A	1
CN-FI/FQI-IX03	Train #1 Influent Flow Indicator/Totalizer	IX Manifold	Fischer Porter	50LV2114A2B	0-20 gpm	N/A	1
CN-FE-IX04	Train #2 Influent Flow Element	IX Manifold influent piping	Fischer-Porter	10LV2201AB3C	N/A	N/A	1
CN-FI-FQI-IX04	Train #2 Influent Flow Indicator/Totalizer	IX Manifold	Fischer-Porter	50LV2114A2B	0-20 gpm	N/A	1

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-FE-LC05	Prefilter Containment Flow Element	Prefilter containment effluent piping	Fluid Flow Products	301	N/A	N/A	1
CN-FI-LC05	Prefilter Containment Flow Indicator	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	1
CN-FE-LC06	Final Filter Containment Flow Element	Final Filter Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	1
CN-FI-LC06	Final Filter Containment Flow Indicator	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	1
CN-FE-LC07	Train #1 IX "A" Containment Flow Element	Train #1 IX "A" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	1
CN-FI-LC07	Train #1 IX "A" Containment Flow Indicator	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	1
CN-FE-LC08	Train #1 IX "B" Containment Flow Element	Train #1 IX "B" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	1
CN-FI-LC08	Train #1 IX "B" Containment Flow Indicator	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	1
CN-FE-LC09	Train #1 IX "C" Containment Flow Element	Train #1 IX "C" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	1
CN-FI-LC09	Train #1 IX "C" Containment Flow Indicator	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	1
CN-FE-LC10	Train #2 IX "A" Containment Flow Element	Train "2 IX "A" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	1
CN-FI-LC10	Train #2 IX "A" Containment Flow Indicator	Containment Support Ra[illegible]	Dwyer	1223-36	0-18" H_2O	N/A	1
CN-FE-LC11	Train #2 IX "B" Containment Flow Element	Train #2 IX "B" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	1
CN-FI-LC11	Train #2 IX "B" Containment Flow Indicator	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	1

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-FI-LC12	Train #2 IX "C" Containment Flow Element	Train #2 IX "C" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	I
CN-FI-LC12	Train #2 IX "C" Containment Flow Element	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	I
CN-FE-LC13	Cation IX "A" Containment Flow Element	Cation IX "A" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	I
CN-FI-LC13	Cation IX "A" Containment Flow Element	Containment Support Rack	Dwyer	1223-36	0-18 H_2O	N/A	I
CN-FE-LC14	Cation IX "B" Containment Flow Element	Cation IX "B" Containment Effluent Piping	Fluid Flow Products	301	N/A	N/A	I
CN-FI-LC14	Cation IX "B" Containment Flow Indicator	Containment Support Rack	Dwyer	1223-36	0-18" H_2O	N/A	I
CN-FI-VA17	Off Gas Header Influent Flow Indicator	Off Gas Header	Dwyer	Mark II	0-7000FPM	N/A	I
CN-FSL-PM18	Beta Monitor Manifold Effluent Flow Switch	Beta Monitor Manifold	Fluid Components	12-64-4	N/A	Later	A
CN-FAL-PM18	Beta Monitor Manifold Effluent Low Flow Alarm	Annunciator Panel #1	Ronan	X2-1003	N/A	Later	A
CN-FI-SA19	Off Gas Sample Station Air Supply Flow Indicator	Off Gas Sample Station	Eberline	Ping 1A		N/A	I
CN-FI-SA20	Off Gas Sample Station Sample Flow Indicator	Off Gas Sample Station	Dwyer		0-100 lpm	N/A	I
CN-FI-DW21	Dewatering Station Air Purge Flow Indicator	Dewatering Station	SK Instruments	18123	5-25 cfm	N/A	I
CN-FQIC-DW22	Dewatering Station Demineralizer Water Flow Totalizer/Controller	Dewatering Station	Hershey Products Niagra	01B10	5-15 gpm	N/A	C,I
SDS-FM-13	SDS Monitor Tank Transfer Pumps discharge Flow	Transfer Pumps Discharge	Brooks	9457 AB7C1A2A	18-132 gpm	N/A	I
CN-TE-IX01	Feed Pump Discharge Line Temperature Element	Feed Pump discharge piping	Thermo Electric	TSC-2-5-316G -316-26-1L-3-1	N/A	N/A	I

Table 2.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-TI-IX01	Feed Pump Discharge Line Temperature Indicator	Feed Pump Manifold	Analogic	Type "J" PI-2452	0-199.9°F	N/A	I
CN-TI-VA03	Off Gas Heater Influent Temperature Indicator	Off Gas Header	Moeller	4900	25-125°F	N/A	I
CN-TE-VA04	Off Gas Heater Effluent Temperature Element	Off Gas Header	Moeller	4900	N/A	N/A	I,C,A
CN-TI-VA04	Off Gas Heater Influent Temperature Indicator	Off Gas Header	Chromalox	3803	0-400°F	N/A	I
CN-TSH-VA04	Off Gas Heater Effluent Temperature High Switch	Off Gas Header	Chromalox	3803	N/A	Variable	C
CN-DPSL/DPI-VA01	Filter Manifold Containment DP Indicator/Switch	Filter Manifold	Dwyer	3001	0-1" H_2O	.25"	A,I
CN-DPAL-VA01	Filter Manifold Containment DP Low Alarm	Filter Manifold	Ronan	X15-1001S	N/A	.25"	A
CN-DPSL/DPI-VA02	Hi Rad Filter Sample Box DP Indicator/Switch	Hi Rad Filter Sample Box	Dwyer	3001	0-1" H_2O	.25"	A,I
CN-DPAL-VA02	Hi Rad Filter Sample Box DP Low Alarm	Hi Rad Filter Sample Box	Ronan	X15-1001S	N/A	.25"	A
CN-DPSL/DPI-VA03	Feed Manifold Containment DP Indicator/Switch	Feed Manifold	Dwyer	3001	0-1" H_2O	.25"	A,I
CN-DPAL-VA03	Feed Manifold Containment DP Low Alarm	Feed Manifold	Ronan	X15-1001S	N/A	.25"	A
CN-DPSL/DPI-VA04	IX Manifold Containment DP Indicator/Switch	IX Manifold	Dwyer	3001	0-1" H_2O	.25"	A,I
CN-DPAL-VA04	IX Manifold Containment DP Low Alarm	IX Manifold	Ronan	X15-1001S	N/A	.25"	A
CN-DPI-PF01	Post Filter DP Indication	Post Filter	Meriam Inst. Co.	1126	0-50PSID	N/A	I
CN-TAH-VA04	Off Gas Heater Effluent Temperature High Alarm	Annunciator Panel #1	Ronan	X2-1003	N/A	Variable	A

Table 2.0
SMS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-TIC-VA05	Off Gas Heater Effluent Temperature Instrument Controller	Off Gas Header in Control Panel	Chromalox	3803	0-400°F	N/A	I,C,A Receive's input from CN-TE-VA04 (Under Remarks)
CN-TI-VA06	Charcoal Filter Temperature Indicator	Charcoal Filter	Moeller	4900	50-400°F	N/A	I
CN-TI-RC07	RCS clean-up Manifold Influent Temperature Indicator	RCS Clean-up Manifold	Analogic	PI-2452	0-199.9°F	N/A	I
CN-TE-RC07	RCS Clean-up Manifold Influent Temperature Element	RCS Clean-up manifold influent Piping	Thermo Electrical	TSC-2-J-316-26-IL-3-I	N/A	N/A	I
CN-DPI-VA05	Off Gas Roughing Filter DP Indicator	Off Gas Header	Dwyer	2001	0-1" H_2O	N/A	I
CN-DPI-VA06	#1 Off Gas HEPA Filter DP Indicator	Off Gas Header	Dwyer	2004	0-4" H_2O	N/A	I
CN-DPI-VA07	Off Gas Charcoal Filter DP Indicator	Off Gas Headee	Dwyer	2003	0-3" H_2O	N/A	I
CN-DPI-VA08	#2 Off Gas HEPA Filter DP Indicator	Off Gas Header	Dwyer	2004	0-4" H_2O	N/A	I
CN-DPSL/DPI-VA09	Intermediate Sample Box DP Indicator/Switch	Intermediate Sample Box shell	Dwyer	30001	0-1" H^2O	N/A	I
CN-DPAL-VA09	Intermediate Sample Box DP Low Alarm	Annunciator Panel #1	Ronan	X2-1003	0.25" H_2O	N/A	A
CN-DPSL/DPI-VA10	Beta Monitor Containment DP Low Alarm	Beta Monitor Manifold	Dwyer	3001	0-1" H_2O	0.25" H_2O	A,I
CN-DPAL-VA10	Beta Monitor Containment DP Low Alarm	Annunciator Panel #1	Ronan	X2-1003	N/A	0.25" H_2O	A
CN-DPSL/DPI-VA11	High Rad Feed Sample Box DP Indicator/Switch	High Rad Feed Sample Box	Dwyer	3001	0-1" H_2O	0.25" H_2O	A,I
CN-DPAL-VA11	High Rad Feed Sample Box DP Low Alarm	Annunciator Panel #1	Ronan	X2-1003	N/A	0.25" H_2O	A

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-DPSL/ DPI-VA12	RCS Manifold Containment DP Indicator/Switch	RCS Manifold Containment	Dwyer	3001	0-1" H_2O	0.25" H_2O	A,I
CN-DPAL-VA12	RCS Manifold Containment DP Low Alarm	Annunciator Panel #1	Ronan	X15-1001S	N/A	0.25" H_2O	A,I
CN-LT-VA03	Off Gas Separator Tank Level Transmitter	"B" Fuel Pool Surge Tank Skid	Goulds	PD3000-400-12-11			I,C,A
CN-LC-VA03	Off Gas Separator Tank Level Controller	"B" Fuel Pool Surge Tank Skid	Moore Ind.	DCA/4-20MA/D XLX3/TX/117VAC			I,C
CN-LSH-VA03	Off Gas Separator Tank Level High Switch	"B" Fuel Pool Surge Tank Skid	Moore Ind.	DCA/4-20MA/S-X1/L/117VAC		90%	A
CN-LAH-VA03	Off Gas Separator Tank Level High Alarm	Annunciator Panel #1	Ronan	X2-1003		90%	A
CN-LI-VA03	Off Gas Separator Tank Level Indicator	"B" Fuel Pool Surge Tank Skid	Moore Ind.		0-100%		I
CN-LE-FL06	Filter Manifold Containment Sump Level Element	Filter Manifold	Warrick	3R1C2			C,A
CN-LS-FL06	Filter Manifold Containment Sump Level Switch	Filter Manifold	Warrick	2C1G12		2"	C,A
CN-LAH-FL06	Filter Manifold Containment Sump Level High Alarm	Filter Manifold	Ronan	X15-1001S		2"	A
CN-LE-SA07	High Rad Filter Sample Glove Box Sump Level Element	Inside Glove Box	Warrick	3R1C2			C,A
CN-LSH-SA07	High Rad Filter Sample Glove Box Sump Level Switch	On Glove Box	Warrick	2C1G12		2"	C,A
CN-LAH-SA07	High Rad Filter Sample Glove Box Sump Level Alarm	On Glove Box	Ronan	X15-1001S		2"	A
CN-LE-RC09	RCS Manifold Containment Sump Level Element	In RCS Manifold Containment	Warrick				
CN-LSH-RC09	RCS Manifold Containment Sump Level Switch	In RCS Manifold Containment	Warrick			2"	C,A
CN-LAH-RC09	RCS Manifold Containment Sump Level High Alarm	On RCS Manifold Containment	Ronan			2"	A
CN-LCL-IX10	Feed Pump Shutdown Level Control Low Pressure Switch	Tank Farm Level Indicator Rack	United Electric	JG-142	0-18 psig	Later	C

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
SDS-LAHL-1	SDS Monitor Tank T-1A Level High/Low	Annunciator Panel #1	Ronan	X2-1003	N/A		A
SDS-LAH-1A	SDS Monitor Tank T-1A Level High	Monitor tank Subsystem	Later	Later	Later	Later	A,C
SDS-LI-1	SDS Monitor Tank T-1A Level	LCP-1	Magnetics	1151VB420	4-20 MADC 0-400"	NA	I
SDS-LI-1A	SDS Monitor Tank T-1A Level	LCP-2	Magnetics	1151VB420	4-20 MADC 0-400"	NA	I
SDS-LSHL-1	SDS Monitor Tank T-1A Level High/Low	Monitor Tank Subsystem	Magnetics	63U-BT-OJER			
SDS-LT-1	SDS Monitor Tank T-1B Level High/Low	Monitor Tank Subsystem	Foxboro	E13DM-15AH1	0-400"	Later	A,I,C
SDS-LAHL-3	SDS Monitor Tank T-1B Level High/Low	Annunciator Panel #1	Ronan	V2-1003	N/A	Later	A
SDS-LAH-3A	SDS Monitor Tank T-1B Level High	Monitor Tank Subsystem	Later	Later	Later	Later	A,C
SDS-LI-3	SDS Monitor Tank T-1B Level	LCP-1	Magnetics	1151VB420	0-400"	N/A	I
SDS-LI-3A	SDS Monitor Tank T-1B Level	LCP-2	Magnetics	1151VB420	0-400"	N/A	I
SDS-LSHL-3	SDS Monitor Tank T-1B Level High/Low	Monitor Tank Subsystem	Magnetics	63U-BT-OJEB	Later	Later	A
SDS-LT-3	SDS Monitor Tank T-1B Level	Monitor Tank Subsystem	Foxboro	E13DM-15AH1	0-400"	Later	A,I,C
SDS-LE-11	SDS Monitor Tank T-1A Level	Monitor Tank Subsystem	Drexelbrook	Y700-2-57	Later	N/A	I
SDS-LSLL-11	SDS Monitor Tank T-1A Low Level Trip	Monitor Tank Subsystem	Drexelbrook	407-1000-E	Later	Later	A,C
SDS-LE-12	SDS Monitor Tank T-B Level	Monitor Tank Subsystem	Drexelbrook	Y700-2-57	Later	N/A	I
SDS-LSLL-12	SDS Monitor Tank T-1B Low Level Trip	Monitor Tank Subsystem	Drexelbrook	Y700-2-57	Later	Later	A,C
CH-RE-IX03	IX Manifold General Area Radiation Element	Top of RMP-1	Eberline	DAI-4	Later	N/A	A,I,C

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-RIT/RSH/RSHH-IX03	IX Manifold General Area Radiation Indication/Switch	RMP-1 Panel EE-GRMP-1	Eberline	ECI-1	1-10,000 mR/hr	Later	A,I,C
CN-RAH/RAHH-IX03	IX Manifold General Area High and High-High Alarm (Local Light)	RMP-1 Panel EE-GRMP-1	Eberline	RMS II-Ru	Later	5mR/hr.	A
CN-RE-IX04	IX Manifold Effluent in Line Radiation Element	Inside IX Manifold	TGM	N-210-BNC	Later	N/A	A,I,C
CN-RY-IX04	IX Manifold Effluent in Line Radiation Discriminator	RMP-1 Panel EE-GRMP-1	Aston	205	Later	N/A	A,I,C
CN-RIT-IX04	IX Manifold Effluent in Line Radiation Indicator/Transmitter	RMP-1 Panel EE-GRMP-1	Mechtronics	1254	$10-10^6$ cps	N/A	A,I,C
CN-RSH-IX04	IX Manifold Effluent in Line Radiation High Switch	RMP-1 Panel EE-GRMP-1	Mechtronics	1254	Later	6000 cps	A,C
CN-RE-LC05	Leakage Containment System Influent Radiation Element	Leakage Containment System Influent Piping	TGM	N-210-BNC	Later	N/A	A,I,C
CN-RY-LC05	Leakage Containment System Influent Radiation Discriminator	RMP-1 Panel EE-GRMP-1	Aston	205	Later	N/A	A,I,C
CN-RIT-LC05	Leakage Containment System Influent Radiation Indicator/Transmitter	RMP-1 Panel EE-GRMP-1	Mechtronics	1254	$10-10^6$ cps	N/A	A,I,C
CN-RSH-LC05	Leakage Containment System Influent Radiation High Switch	RMP-1 Panel EE-GRMP-1	Mechtronics	1254	Later	6000 cps	A,C
CN-RE-VA06	Off Gas Header Influent Radiation Element	Off Gas Header	Eberline	DAI-1	Later	N/A	A,I,
CN-RIT-VA06	Off Gas Header Influent Radiation Indicator/Transmitter	RMP-1 Panel EE-GRMP-1	Eberline	ECI-1	.01-100Mr/hr	N/A	A,I
CN-RSH-VA06	Off Gas Header Influent Radiation High Switch	RMP-1 Panel EE-GRMP-1	Eberline	ECI-1	Later	1.5mR/hr	A
CN-RE-PM07	"A" Zeolite Beds Effluent Radiation Element		TGM	N-210-BNC	Later	N/A	A,I
CN-RY-PM07	"A" Zeolite Beds Effluent Radiation Discriminator	RMP-1 Panel EE-GRMP-1	Aston	205	Later	N/A	A,I

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-RIT/RSH-PM07	"A" Zeolite Beds Effluent Radiation Indicator/Transmitter/switch	RMP-1 Panel EE-CRMP-1	Mechtronics	1254	10-10^6cps	9X10^5cps	A,I
CN-RE-PM08	"B" Zelite Beds Effluent Radiation Element		TGM	N-210-BNC	Later	N/A	A,I
CN-RY-PM08	"B" Zeolite Beds Effluent Radiation Discrimination	RMP-1 Panel EE-CRMP-1	Aston	205	Later	N/A	A,I
CN-RIT/RSH-PM08	"B" Zeolite Beds Effluent Radiation Indicator/Transmitter/switch	RMP-1 Panel EE-CRMP-1	Mechtronics	1254	10-10^6cps	9X10^5cps	A,I
CN-RE-PM09	"C" Zeolite Beds Effluent Radiation Element		TGM	N-210-BNC	Later	N/A	A,I
CN-RY-PM09	"C" Zeolite Beds Effluent Radiation Discriminator	RMP-1 Panel EE-CRMP-1	Aston	205	Later	Later	A,I
CN-RIT/RSH-PM09	"C" Zeolite Beds Effluent Radiation Indicator/Transmittal/switch	RMP-1 Panel EE-CRMP-1	Mechtronics	1254	10-10^6cps	9X10^3cps	A,I
CN-RE-PM10	Cation Beds Influent Radiation Element		TGM	N-210-BNC	Later	Later	A,I
CN-RY-PM10	Cation Beds Influent Radiation Discriminator	RMP-1 Panel EE-CRMP-1	Aston	205	Later	Later	A,I
CN-RIT/RSH-PM10	Cation Beds Influent Radiation Indicator/Transmitter/Switch	RMP-1 Panel EE-CRMP-1	Mechtronics	1254	10-10^6cps	9X10^2cps	A,I
CN-RE-PM11	Cation Beds Effluent Radiation Element		TGM	N-210-BNC	Later	Later	A,I
CN-RY-PM11	Cation Beds Effluent Radiation Discriminator	RMP-1 Panel EE-CRMP-1	Aston	205	Later	Later	A,I
CN-RIT/RSH-PM11	Cation Beds Effluent Radiation Indicator/Transmitter/switch	RMP-1 Panel EE-CRMP-1	Mechtronics	1254	10-10^6cps	9X10^2cps	A,I
CN-RE-VA12	Off Gas Particulate sample Radiation element		Eberline	PING1A	Later	Later	A,I
CN-RIT-VA12	Off Gas Particulate Sample Radiation Indicator/Transmitter	Packaged off Gas Sampler	Eberline	Later	Later	Later	A,I

Table 7.0
SDS INSTRUMENT INDEX (Cont'd)

TAG NO.	SERVICE	LOCATION	SUPPLIER	MODEL NO.	INPUT/SPAN OUTPUT/SCALE	SET POINT	REMARKS
CN-RSH-VA12	Off Gas Particulate Sample Radiation switch	Packaged off Gas Sampler	Eberline	Later	Later	Later	A
CN-RAH-VA12	Off Gas Particulate Sampler Radiation Alarm High	Packaged off Gas Sampler	Eberline	Later	Later	Later	A
CN-RR-VA12	Off Gas Particulate Sampler Radiation Recorder	Packaged off Gas Sampler	Eberline	Later	Later	Later	I
CN-RE-VA13	Off Gas Charcoal Sampler Radiation Element	Packaged off Gas Sampler	Eberline	Later	Later	Later	A,I
CN-RIT-VA13	Off Gas Charcoal Sampler Radiation Indicator/Transmitter	Packaged off Gas Sampler	Eberline	Later	Later	Later	A,I
CN-RSH-VA13	Off Gas Charcoal Sampler Radiation Switch High	Packaged off Gas Sampler	Eberline	Later	Later	Later	A
CN-RAH-VA13	Off Gas Charcoal Sampler Radiation Alarm High	Packaged off Gas Sampler	Eberline	Later	Later	Later	A
CN-RR-VA13	Off Gas Charcoal Sampler Radiation Recorder	Packaged off Gas Sampler	Eberline	Later	Later	Later	I
CN-RE-VA14	Off Gas Ion Chamber Sampler Radiation Element	Packaged off Gas Sampler	Eberline	Later	Later	Later	A,I
CN-RIT-VA14	Off Gas Ion Chamber Sampler Radiation Indicator/ Transmitter	Packaged off Gas Sampler	Eberline	Later	Later	Later	A,I
CN-RSH-VA14	Off Gas Ion Chamber Sampler Radiation Switch High	Packaged off Gas Sampler	Eberline	Later	Later	Later	A
CN-RAH-VA14	Off Gas Ion Chamber Sampler Radiation Alarm High	Packaged Off Gas Sampler	Eberline	PING-1A	Later	Later	A
CN-RR-VA14	Off Gas Ion chamber sampler Radiation Recorder	Packaged off Gas Sampler	Eberline	PING-1A	$10-10^6$	N/A	I
CN-RA-AS15	Common Alarm for RMP-1	Surge Tank skid adjacent to Annunciation Panel	Ronan	506W	Later	N/A	A
CN-RR-RR16	Radiation Recorder	RMP-1 Panel EE-GRMP-1	Westronics	M11E	Later	N/A	I

Appendix No. 8

to

Submerged Demineralizer System

System Design Description

Title

Radionuclides Concentration Chart

Appendix 8

Typical Results of Analysis from the Reactor Coolant System Water and the Containment Sump Water

Isotope	Radionuclide Concentrations uCi/ml Reactor Coolant System	Containment Sump
	(Sample Results February, 1981)	(Decayed to October, 1980)
H-3	0.066	0.97
Sr-89	0.25 (not analyzed 2-81)	0.18
Sr-90	23	2.64
Sb-125	1.6×10^{-3} (not analyzed 2-81)	0.0091
Cs-134	3.4	27.7
Cs-137	25	172
pH	7.6	8.6
Boron	3800 ppm	2000 ppm
Na	1240 ppm (not analyzed 2-81)	1100 ppm
Volume	88000 gallons	625000 gallons[1]

[1]The containment sump volume is increasing about 150 gallons/day due to leakage from the Reactor Coolant System.

Appendix No. 9

to

Submerged Demineralizer System

System Design Description

Title

S.D.S. Drawing List

S.D.S. DRAWING LIST

DRAWING NO.	TITLE
2R-950-21-001	P & ID Composite Submerged Demineralizer System
527D-A-5001	CNSI-TMI Supply Manifold Submerged Ion Exchangers P & ID
527D-A-5002	CNSI-TMI P & ID Contaminated Feed Water System
527D-A-5004	CNSI-TMI P & ID Off-Gas and Liquid Separation System
527D-A-5006	CNSI-TMI 527-A-D3/Intermediate Sampling System
527D-A-5009	CNSI-TMI 527A-D2 P & ID Beta Monitoring Manifold
527C-A-5011	CNSI-TMI Dewatering Station P & ID
527D-A-5013	P & ID RCS Clean Up Manifold
2E-950-02-001	Plan View Submerged Deminerelizer System
527D-A-5010	Ion Exchanger Support Assembly Drawing
527D-D-5002	Pre Filter 125 Micron
527D-D-5003	Final Filter 10 Micron
527D-D-5006	Ion Exchanger & Final Filter (with Agitator)
527D-D-5007	Off-Gas Separator Item No. 527D-01
527D-D-5008	Off-Gas Pump Stend Pipe
2D-950-29-001	Submerged Demineralizer System - Demineralizer Drawing
527D-J-5003	Radiation Monitor Panel RMP-1 Arrangement
527D-L-5001	Filter Manifold Piping Plan & Elevations
527D-L-5002	Ion-Exchanger Support Rack Piping
527D-L-5003	Ion-Exchanger Support Rack Piping
527D-L-5004	Filter & Leakage Containment Exchanger Rack Piping
527D-L-5005	Intermediate Level Sampling Glove Box Layout and Details 527A-03
527D-L-5006	Feed Manifold Piping Plan and Elevation
527D-L-5008	Unit (I) Support Rack & Exchanger Piping Manifold Interconnecting Piping Plan & Section "A-A"
527D-L-5009	Unit (I) Support Rack & Exchanger Piping Manifold Interconnecting Piping Plao & Section "B-B"
527D-L-5010	Unit (I) Support Rack & Exchanger Piping Manifold Interconnecting Piping Plan & Section "C-C"

DRAWING NO.	TITLE
527D-L-5011	Piping Plan and Elevation Exchanger Manifold
527D-L-5012	Piping Sections Exchanger Manifold
527D-L-5013	Feed Pump Discharge Piping Plan, Elevation & Details
527D-L-5014	Filter Manifold & Filter Rack Interconnect Piping
527D-L-5015	Filter Manifold & Filter Rack Interconnect Piping
527D-L-5016	Piping Arrangement Surge Chamber Area
527D-L-5017	Piping Section Surge Chamber Area
527D-L-5018	Piping Section Surge Chamber Area
527D-L-5021	Piping Arrangement - Plan Off-Gas System
527D-L-5022	Filter Manifold & Hi-Rad Filter Box (527-A-01) Interconnect Piping
527D-L-5023	Piping Arrangement - 527A-02 Beta Monitoring Manifold
527D-L-5026	Utility Piping Arrangement Plan - Unit II - "B" Fuel Pool
527D-L-5027	Utility Piping Arrangement Details - unit II - "B" Fuel Pool
527D-L-5028	Piping Arrangement - Sections Off-Gas System
527D-L-5029	Piping Arrangement - Dewatering Station
527D-L-5030	Piping Arrangement RCS Clean-Up Manifold
527D-L-5031	Composite Piping Arrangement Ion Exchanger, Polish Manifold, Filter Manifold & RCS Clean-Up Manifold
527D-L-5032	Composite Piping Elevation Ion Exchanger, Polish Manifold, Filter Manifold & RCS Clean-Up Manifold
527D-L-5033	Composite Piping Arrangement Surge Chamber Area Plan Column AM to AP
527D-L-5034	Composite Piping Arrangement Surge Chamber Area Elevations
527D-M-5003	Filter Manifold Assembly Plan & Elevation
527D-M-5004	Filter Manifold Assembly Sections
527D-M-5005	Filter Manifold Assembly Details
527D-M-5006	Filter Manifold Assembly Details
527D-M-5007	CNSI-TMI Ion Exchanger Support Unit Ia

DRAWING NO.	TITLE
527D-M-5008	CNSI-TMI Ion Exchanger Support Units Ib, Id and Ie
527D-M-5009	CNSI-TMI Ion Exchanger Support Unit Ic
527D-M-5010	CNSI-TMI Ion Exchanger Support Unit II
527D-M-5011	CNSI-TMI Ion Exchanger Support Unit III
527D-M-5012	Ion Exchanger Support Details
527D-M-5013	Off-Gas Separator & Stand Pipe - Skid Detail
527D-M-5014	Feed Manifold Plan, Elevation and Details
527D-M-5015	Cask Support Platform Plan, Section and Detail
527D-M-5016	Surge Chamber Cover Plan and Details
527D-M-5017	Exchanger Manifold Plans and Sections
527D-M-5018	Exchanger Manifold Sections and Details
527D-M-5019	Cask Support Platform Filter Manifold Shielding Details
527D-M-5020	Ion Exchanger Lifting Yoke Guide Details
527D-M-5021	Spent Ion Exchanger Storage Rack
527D-M-5022	Beta Monitoring Manifold Plans and Sections
527D-M-5023	1-13C Shipping Cask Support Platform
527D-M-5024	Yoke Hanger Detail
527D-M-5025	Plans and Details Dewatering Station
527D-M-5026	Pipe Containment and Restraint Details
527D-M-5027	Moveable Spent Ion Exchanger Storage Rack
527D-M-5030	RCS Clean-Up Manifold Assembly, Plan, Elevation & Details
527D-M-5033	Shielded Pipe Chase for RCS Clean-Up Manifold Arrangement Assembly & Details
527D-M-5034	Radiation Shielding Between RCS Clean-Up Manifold & Pipe Chase Assembly & Details
527D-T-5002	Intermediate Level Sampling Glove Box 527A-03
527D-T-5008	Hi-Rad Feed Sample Glove Box 527A-04
527D-T-5012	Hi-Rad Filter Sample Glove Box 527A-01

DRAWING NO.	TITLE
527D-T-5026	Shielded Pipe Chase 527A-01-C for Hi-Rad Filter Glove Box 527A-01 Arrangement, Assembly and Details
DD-527C-J-5002	Installation Design Detail Level Control Panel Off-Gas Separator
DD-517C-J-5017	Installation Design Detail Mounting Support for Annunciator Panel #1 & High Rad. Alarm
DD-527A-J-5001 Sht. 1 of 3	Installation Design Detail Material List
DD-527A-J-5001 Sht. 2 of 3	Installation Design Detail Material List
DD-527A-J-5001 Sht. 3 of 3	General Notes for Fabrication & Installation of Instruments & Supports
DD-527A-J-5004	Installation Design Detail Flow Indicator/Totalizer and Liquid Vortex Flow Element
DD-527A-J-5007	Installation Design Detail Flow Indicating U-Tube manometer & Orifice
DD-527A-J-5008	Installation Design Detail Flow Indicating Manometers Orientation - Ion/Cation Exch. Sys.
DD-527A-J-5013	Installation Design Detail Pressure Differential Indicator/Switch
DD-527A-J-5016	Installation Design Detail Feed Temp. Indicator TI-527-07 & TI-527-41
DD-527A-J-5018	Installation Design Detail Electronic Level Switch LC & LSH-527-04
DD-527A-J-5019	Installation Design Detail Electronic Level Switch LC/LSH-527-03 & LC/LSH-527-43
DD-527A-J-5020	Installation Design Detail High Rad. Alarm RAH-527-11
DD-527A-J-5021	Installation Design Detail High Rad. Alarm RAH-527-01
DD-527A-J-5022	Installation Design Detail Underwater Gamma Radiation Monitors
DD-527A-J-5024	Installation Design Detail Mounting Support for Relay Panel RP-1
DD-527A-J-5025	Installation Design Detail Support Stand for Filter Radiation Monitors
DD-527D-J-5023	Installation Design Detail Sample System Piping Off-Gas Radiation Monitor
527C-J-5002	BETA Monitor Mounting Detail for L527-65 RE527-13
527C-P-5003	CNSI/TMI - Electrical Wiring Diagrams 120 Volt Sump Pumps
527C-P-501D	Loop Diagram LC/LSH-527-03, LC-527-04, LSH-527-04 LC/LSH-527-43
527C-R-1003	Unit IIB Structural Bracing for Rigging
527C-R-1004	Unit IIA Structural Bracing for Rigging
527C-R-1005	Unit IIIA Structural Bracing for Rigging
527C-R-1006	Unit IIIB Structural Bracing for Rigging

DRAWING NO.	TITLE
527C-R-1007	Load Transfer Triangle & Spreader Bar Details
527C-R-1010	Arrangement for Mating Unit IIIE to IIIA
527C-R-1013	Arrangement for Mating Unit IIB to IIA
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527D-P-5007	Loop Diagram FI/FQI - 527-07, -09, -10 LI-527-01
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527D-R-1018	Unit 1A Rigging
527D-R-1020	Alignment and Compression Rigging Assemblies for Unit 1A, 1B, 1C, 1D, 1E
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527D-R-1030	Hi-Rad Filter Sample Box and Support Rigging Details
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527D-T-5001	Assembly & Details Remote Disconnect for Hansen Coupler
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527D-T-5027	Assembly and Details Remote Disconnect for Hansen Coupler @ Dewatering Station
527D-T-5028	Dewatering Station Remote Disconnect Guide and Supports
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RW3501-002-07	Filter Manifold Assembly Box and Details
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RW3501-005-01	Intermediate Level Sample Glove Box
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RW3501-010-04 Sht. 1 of 2	Off-Gas Separator & Standpipe, Piping Rack
RW3501-010-04 Sht. 2 of 2	Off-Gas Separator & Standpipe, Piping Rack
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RW3501-012A-08-01	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-02	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-03	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-04	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-05	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-06	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-07	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
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RW3501-012A-08-09	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-10	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
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RW3501-012A-08-13	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-14	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-15	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-16	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-17	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail

DRAWING NO.	TITLE
RW3501-012A-08-18	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-08-19	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Piping Detail
RW3501-012A-09	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Section "B-B"
RW3501-012A-10	Unit (1) Support Rack & Exchanger Piping Manifold Interconnecting Piping - Section "C-C"
RW3501-012B-13	Feed Pump Discharge Piping Plan, Elevation & Details
RW3501-012B-13-01	Feed Pump Discharge Piping Detail
RW3501-012B-13-02	Feed Pump Discharge Piping Detail
RW3501-012B-13-03	Feed Pump Discharge Piping Detail
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RW3501-012B-13-07	Feed Pump Discharge Piping Detail
RW3501-012B-13-08	Feed Pump Discharge Stand Piping Details
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RW3501-012B-13A	Stand Pipe Cover FLG's for Feed Pump Disch. Piping
RW3501-012C-14	Filter Manifold & Filter Rack Interconnect Piping
RW3501-012C-14-01	Filter Manifold & Filter Rack Interconnect Piping - Piping Detail
RW3501-012C-14-02	Filter Manifold & Filter Rack Interconnect Piping - Piping Detail
RW3501-012C-14-03	Filter Manifold & Filter Rack Interconnect Piping - Piping Detail
RW3501-012C-14-04	Filter Manifold & Filter Rack Interconnect Piping - Piping Detail
RW3501-012C-14-05	Filter Manifold & Filter Rack Interconnect Piping - Piping Detail
RW3501-012C-14-06	Filter Manifold & Filter Rack Interconnect Piping - Piping Detail
RW3501-012C-14-07	Filter Manifold & Filter Rack Interconnect Piping - Piping Detail
RW3501-012C-15	Filter Manifold & Filter Rack Interconnect Piping
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DRAWING NO.	TITLE
RW3501-012E-16	Piping Arrangement Surge Chamber Area
RW3501-012E-16-01	Surge Chamber Area Piping Detail
RW3501-012E-16-02	Surge Chamber Area Piping Detail
RW3501-012E-16-03	Surge Chamber Area Piping Detail
RW3501-012E-16-04	Surge Chamber Area Piping Detail
RW3501-012E-16-05	Surge Chamber Area Piping Detail
RW3501-012E-16-06	Surge Chamber Area Piping Detail
RW3501-012E-16-07	Surge Chamber Area Piping Detail
RW3501-012E-16-08	Surge Chamber Area Piping Detail
RW3501-012E-16-09	Surge Chamber Area Piping Detail
RW3501-012E-16-10	Surge Chamber Area Piping Detail
RW3501-012E-16-11	Surge Chamber Area Piping Detail
RW3501-012E-16-12	Surge Chamber Area Piping Detail
RW3501-012E-16-13	Surge Chamber Area Piping Detail
RW3501-012E-16-14	Surge Chamber Area Piping Detail
RW3501-012E-16-15	Surge Chamber Area Piping Detail
RW3501-012E-16A	Off-Gas Separator and Standpipe Skid Piping Arrangement
RW3501-012E-17	Piping Sections Surge Chamber Area
RW3501-012E-18	Piping Sections Surge Chamber Area
RW3501-012F-ML-1 Sht. 1 of 2	Bill of Material
RW3501-012F-ML-1 Sht. 2 of 2	Bill of Material
RW3501-012F-26	Utility Piping and Polish Manifold Piping Piece Mark Dwgs.
RW3501-012F-27	Utility Piping Arrangement Details Unit NO. 2 - "B" Fuel Pool
RW3501-012L-31	Composite Piping Arrangement Ion Exchanger, Polish Manifold, Filter Manifold and RCS Clean-up Manifold
RW-3501-012L-32	Composite Piping Arrangement Ion Exchanger, Polish Manifold, Filter Manifold and RCS Clean-up Manifold

DRAWING NO.	TITLE
RW3501-012L-33	Composite Piping Arrangement Surge Chamber Area Plan - Column AM to AP
RW3501-012L-34	Composite Piping Arrangement Surge Chamber Area Elevations
RW3501-012N-21-01	Off-Gas System Piping
RW3501-012N-21-02	Off-Gas System BETA Manifold Piping
RW3501-012N-21-03	Off-Gas System Hi-Rad Feed Sample Glove Box Piping Connection
RW3501-012N-21-04	Off-Gas System Piping from High Rad Filter Sample Glove Box
RW3501-012N-21-05	Off-Gas System Exchanger Manifold Exhaust Piping
RW3501-012N-21-06	Off-Gas System Piping
RW3501-012N-21-07	Off-Gas System Piping
RW3501-012N-21-08	Off-Gas System Piping
RW3501-012N-21-09	Off-Gas System Piping
RW3501-012N-21-10	Off-Gas System Piping
RW3501-012Q-1	Plate Layout for Pipe Supports 527-PS-1-49
RW3501-015-B1	RCS Clean-Up Manifold Pipe Bend
RW3501-015-1 Sht. 1 of 7	RCS Clean-Up Manifold Assembly
RW3501-015-1 Sht. 2 of 7	RCS Clean-Up Manifold Assembly
RW3501-015-1 Sht. 3 of 7	RCS Clean-Up Manifold Assembly
RW3501-015-1 Sht. 4 of 7	RCS Clean-Up Manifold Assembly
RW3501-015-1 Sht. 5 of 7	RCS Clean-Up Manifold Assembly
RW3501-015-1 Sht. 6 of 7	RCS Clean-Up Manifold Assembly
RW3501-015-1 Sht. 7 of 7	RCS Clean-Up Manifold Assembly
RW3501-015-2	RCS Clean-Up Manifold Brick Placement Layout
RW3501-015-30	Piping Arrangement RCS Clean-Up Manifold
RW3501-015-30-01	RCS Clean-Up Manifold Piping
RW3501-015-30-02	RCS Clean-Up Manifold Piping
RW3501-015-30-03	RCS Clean-Up Manifold Piping

DRAWING NO.	TITLE
RW-3501-031-08-B Sht. 2 of 2	CNSI-TMI Ion Exchanger Support Unit 1B
RW3501-031- 8-D-1	CNSI-TMI Ion Exchanger Support Unit 1D
RW3501-031- 8-D-2	CNSI-TMI Ion Exchanger Support Unit 1D
RW3501-031- 8-E-1	CNSI-TMI Ion Exchanger Support Unit 1E
RW3501-031- 8-E-2	CNSI-TMI Ion Exchanger Support Unit 1E
RW3501-031-09 Sht. 1 of 7	CNSI-TMI Ion Exchanger Support Unit 1C
RW3501-031-09 Sht. 2 of 7	CNSI-TMI Ion Exchanger Support Unit 1C
RW3501-031-09 Sht. 3 of 7	CNSI-TMI Ion Exchanger Support Unit 1C
RW3501-031-09 Sht. 4 of 7	CNSI-TMI Ion Exchanger Support Unit 1C
RW3501-031-09 Sht. 5 of 7	CNSI-TMI Ion Exchanger Support Unit 1C
RW3501-031-09 Sht. 6 of 7	CNSI-TMI Ion Exchanger Support Unit 1C
RW3501-031-09 Sht. 7 of 7	CNSI-TMI Ion Exchanger Support Unit 1C
RW3501-031-10A Sht. 1 of 2	CNSI-TMI Ion Exchanger Support Unit 11 A
RW3501-031-10A Sht. 2 of 2	CNSI-TMI Ion Exchanger Support Unit 11 A
RW3501-031-10C Sht. 1 of 3	CNSI-TMI Ion Exchanger Support Unit II B
RW3501-031-10C Sht. 2 of 3	CNSI-TMI Ion Exchanger Support Unit II B
RW3501-031-10C Sht. 3 of 3	CNSI-TMI Ion Exchanger Support Unit II B
RW3501-031-11A Sht. 1 of 2	CNSI-TMI Ion Exchanger Support Unit III A
RW3501-031-11A Sht. 2 of 2	CNSI-TMI Ion Exchanger Support Unit III A
RW3501-031-11B Sht. 1 of 3	CNSI-TMI Ion Exchanger Support Unit III B
RW3501-031-11B Sht. 2 of 3	CNSI-TMI Ion Exchanger Support Unit III B
RW3501-031-11B Sht. 3 of 3	CNSI-TMI Ion Exchanger Support Unit III B
RW3501-031-12	Ion Exchanger Support Details Moveable Personnel Bridge
RW3501-031-12A	Inn Exchanger Supports Details Moveable Personnel Bridge II
RW3501-031-13	Ion Exchanger Support Details Cross Bracing
RW3501-031-14	Ion Exchanger Remote Valve Operators

DRAWING NO.	TITLE
RW3501-031-15 Sht. 1 of 2	Ion Exchanger Piping Rack Details
RW3501-031-15 Sht. 2 of 2	Ion Exchanger Piping Rack Details
RW3501-031-16	Cask Support Connection Unit 111A
RW3501-031-17	Pipe Containment Stand
RW3501-031-18	Load Transfer Triangle and Spreader Bar Details
RW3501-031-19	Unit 11 A Structural Bracing for Rigging
RW3501-031-20	Unit II B Structural Bracing for Rigging
RW3501-031-21	Unit III A Structural Bracing for Rigging
RW3501-031-22	Unit III B Structural Bracing for Rigging
RW3501-031-23	Pipe Chase for Unit I
RW3501-031-24	Restraints for Unit 1 and Unit 2
RW3501-031-25	Strut Rod Orientation Assembly and Details
RW3501-031-28	Load Transfer Triangle and Adjustable Spreader Bar
RW3501-031-29	Compression Rigging Lug Detailx
RW3501-031-30	Unit 1A Rigging
RW3501-031-31	Unit 1C Rigging
RW3501-031-32	Remote Valve Operator (Diaphram Valve)
RW3501-032-01	Assembly and Details - Remote Disconnect for Hansen Coupler
RW3501-032-02	Remote Disconnect Guide and Supports
RW3501-032K-31 Sht. 1 of 2	Hansen Coupler Remote Connector Assembly and Details for Prefilter Nozzle "A"
RW3501-032K-31 Sht. 2 of 2	Hansen Coupler Remote Conn. Bill of Material for Prefilter Nozzle "A"
RW3501-033-01	Cask Support Platform Plan, Sections and Details
RW3501-033-06	Shielded Pipe Chase RCS Clean-Up Manifold Arrangement and Assembly
RW3501-033-07	Shielded Pipe Chase RCS Clean-Up Manifold
RW3501-033-08	Radiation Shielding Between RCS Clean-Up Manifold and Pipe Chase Assembly and Details
RW3501-033-09	Field Fabrication Details

DRAWING NO.	TITLE
RW3501-034-1 Sht. 1 of 3	Metal Forms for Surge Chamber Cover
RW3501-034-1 Sht. 2 of 3	Metal Forms for Surge Chamber Cover Details
RW3501-034-1 Sht. 3 of 3	Surge Chamber Cover Plan and Details - 1A
RW3501-034-2 Sht. 1 of 3	Metal Forms for Surge Chamber Cover
RW3501-034-2 Sht. 2 of 3	Metal Forms for Surge Chamber Cover Details
RW3501-034-2 Sht. 3 of 3	Surge Chamber Cover Plant and Details - 2A
RW3501-034-3 Sht. 1 of 3	Metal Forms for Surge Chamber Cover
RW3501-034-3 Sht. 2 of 3	Metals Forms for Surge Chamber Cover Details
RW3501-034-3 Sht. 3 of 3	Surge Chambar Cover Plan and Details - 3A
RW3501-034-4 Sht. 1 of 3	Metal Forms for Surge Chamber Cover
RW3501-034-4 Sht. 2 of 3	Metal Forms for Surge Chamber Cover Details
RW3501-034-4 Sht. 3 of 3	Surge Chamber Cover Plan and Details - 4A
RW3501-034-6	Surge Chamber Cover Brick
RW3501-035-1 Sht. 1 of 2	Spent Ion Exchanger Storage Rack Unit 1
RW3501-035-1 Sht. 2 of 2	Spent Ion Exchanger Storage Rack Unit 1
RW3501-035-2 Sht. 1 of 2	Moveable Spent Ion Exchanger Storage Rack
RW3501-035-2 Sht. 2 of 2	Moveable Spent Ion Exchanger Storage Rack
RW3501-035-3	Spent Ion Exchanger Storage Rack - Unit 3
RW3501-035-4a	Spent Ion Exchanger Storage Rack - Unit 4a
RW3501-035-4b	Spent Ion Exchanger Storage Rack - Unit 4b
RW3501-037-1 Sht. 1 of 2	Cask Support Platform
RW3501-037-1 Sht. 2 of 2	Cask Support Platform
RW3501-038-01	Assembly and Details - Remote Disconnect for Hansen Coupler at Dewatering Station
RW3501-038-1 Sht. 1 of 2	Plans and Details Dewatering Station
RW3501-038-1 Sht. 2 of 2	Plans and Details Dewatering Station
RW3501-038-2	Dewatering Station Remote Disconnect Guide and Support

DRAWING NO.	TITLE
RW3501-038-3	Dewatering Station and Ion Exchanger Station Lanyards
RW3501-038-4	Dewatering Station Structural Bracing Required for Rigging
RW3501-038-05	Lead Shielding for Dewatering Station Piping
RW3501-038B-29	Piping Arrangement Dewatering Station
RW3501-038B-29-A1	Dewatering Station Pipe Bend Details
RW3501-038B-29-A2	Dewatering System Pipe Bending Detail
RW3501-038B-29-A3	Dewatering Station Pipe Bending Details
RW3501-038B-29-01	Dewatering Station Ion Exchanger Vessels - Air/N_2/Emergency Demineralized Water Supply
RW3501-038B-29-02	Dewatering Station Air/N_2/ Emergency Demineralized Water Inlet
RW3501-038B-29-03	Dewatering Station Filter Vessels Air/N_2/ Emergency Demineralized Water Supply
RW3501-038B-29-04	Dewatering Station Demineralized Water From Ion Exchanger Vessels to Off-Gas Separator
RW3501-038B-29-05	Dewatering Station Filter Vessel Outlet
RW3501-038B-29-06	Dewatering Station Demineralized Water Supply
RW3501-038B-29-07	Dewatering Station Remote Disconnect Tool Pipe Extensions
RW3501-038B-29-08	Dewatering Station Remote Disconnect Tool Pipe Extensions
RW3501-051-5 Sht. 1 of 3	Prefilter 125 Micron Assembly
RW3501-051-5 Sht. 2 of 3	Prefilter 125 Micron, Filter Cylinder Details
RW3501-051-5 Sht. 3 of 3	Prefilter 125 Micron, Head Details
RW3501-051-6 Sht. 1 of 3	Final Filter, 10 Micron
RW3501-051-6 Sht. 2 of 3	Final Filter, 10 Micron, Misc. Details
RW3501-051-6 Sht. 3 of 3	Final Filter, Filter Subassembly and Misc. Details
RW3501-058-02	Shielding Cylinder for Feed Pump Removal and for Gas Pump Removal
RW3501-059-01	Personnel Crane Basket Assembly
RW3501-081-01	Valve Extension 1" Rising Stem Diaph. Valve
RW3501-081-02	Valve Stem Extensions 1/2", 3/4", 1" and 1 1/2" ITT Grinnel Ball Valves
RW3501-081-03	Valve Stem Extensions 1/4" Ball, 1/4" Needle and 3/8" Ball Whitey Series 43, 44 and 1RS 4 Resp.

DRAWING NO.	TITLE
RW3501-081-04	Valve Stem Extension Pneumatic Operator
RW3501-081-5	Valve Stem Extensions 1" ITT Grinnell Ball Valves
RW3501-081-6	Valve Strm Extensions 1" Rising Stem Diaph. Valve
RW3501-082-02	Rack IIA Wiring Diagram
RW3501-082-02-2	Ion Exchanger Rack IIA Electrical (Instrumentation) Plan and Elevations
RW3501-082-03	Rack IA Wiring Diagram
RW3501-082-03-1	Rack IA Elementary
RW3501-082-03-2	Ion/Cation Exchanger Rack I Electrical (Instrumentation) Plan and Elevations
RW3501-082-04	Filter Manifold Wiring Diagram
RW3501-082-04-1	Filter Manifold Elementary
RW3501-082-04-2	Filter Manifold Electrical (Instrumentation) Plan and Elevations
RW3501-082-05	Exchanger Manifold Wiring Diagram
RW3501-082-05-1	Exchanger Manifold Elementary
RW3501-082-05-2	Exchanger Manifold Electrical (Instrumentation) Plan and Elevations
RW3501-082-06	Feed Pump Manifold Wiring Diagram
RW3501-082-06-1	Feed Pump Manifold Wiring Elementary
RW3501-082-06-2	Feed Pump Manifold Electrical (Instrumentation) Plan and Elevations
RW3501-082-07	Intermediate Level Sampling Glove Box
RW3501-082-07-02	Intermediate Level Sample Glove Box (Electrical Instrumentation) Plan and Elevations
RW3501-082-08	RCS Clean-Up Manifold Wiring Diagram
RW3501-082-08-1	RCS Clean-Up Manifold Elementary
RW3501-082-08-2	RCS Manifold Electrical (Instrumentation) Plan and Elevation
RW3501-082-09	Hi-Rad Filter Glove Box Wiring Diagram
RW3501-082-09-1	Hi-Rad Filter Glove Box Elementary
RW3501-082-09-2	Hi-Rad Filter Sample Glove Box Electrical (Instrumentation) Plan and Elevations
RW3501-082-10	Hi-Rad Feed Sample Glove Box Wiring Diagram

DRAWING NO.	TITLE
RW3501-082-10-2	High Rad Feed Sample Glove Box Electrical (Instrumentation) Plan and Elevations
RW3501-082-11	BETA Monitor Manifold Wiring Diagram
RW3501-082-11-2	BETA Monitoring Manifold Electrical (Instrumentation) Plan and Elevations
RW3501-082-11-3	BETA Monitor Manifold Megohmmeter Readings
RW3501-082-12	Dewatering Station Wiring Diagram
RW3501-084-01 Sht. 1 of 2	Shielded Pipe Chase Assembly 527A-01-C
RW3501-084-01 Sht. 2 of 2	Shielded Pipe Chase Details
RW3501-IDX-01	Filter Manifold Index
RW3501-IDX-02	Filter Rack Piping Index
FSK-1743-3060	Off-Gas Air Filtration System Arrangement (MSA Drawing)
P1-35675	Mine Safety Appliance Contactor Panel (Chromalox Dwg.)
106-057080-999	Duct Heater (Chromalox Dwg.)
3475-E019	480V motor control center aux. one line diagram
3475-E031	480V unit sub sta. one line diag.
3475-E032	Misc. PWR PNL schedules for Submerged Demineralizer System
3475-E119	Fuel Handling Bldg. ele. 347'6" conduit plan for SDS (SH 1)
3475-E125	FHB ele. 347'6" conduit plan for SDS (SH 2)
3475-E796	Block diag. 480V USS 2-32
3475-E798	Ext. conn. for 480V USS 2-32
3475-E799	Int. and ext. conn. for MCC 2-32B (section 5 rear)
3475-E800	Int. conn. for USS 2-32 Unit 12
3475-E804	Block diag. misc. SDS
3475-E805	Block diag. misc. SDS
3475-E806	Block diag. misc. SDS
3475-E807	Block diag. misc. SDS
3475-E808	Block diag. misc. SDS

DRAWING NO.	TITLE
3475-E809	Inter. and ext. conn. for 2-32B (section 1 front)
3475-E810	Conn. diag. for ann. PNL No. 1
3475-E811	Conn. diag. Hi Rad Filter Sample Glove Box 527-A-01
3475-E812	Conn. diag. Hi Rad Filter Sample Glove Box 527-A-01
3475-E813	Conn. diag. Off Gas Separator LVL inst. rack
3475-E814	Conn. diag. for Unit 3A of SDS
3475-E815	Conn. diag. for Unit II A of SDS
3475-E816	Conn. diag. for Unit 1 A of SDS
3475-E817	Conn. diag. for Filter Manifold of SDS
3475-E818	Conn. diag. for Feed Pump Manifold (inst. and alarm)
3475-E819	Conn. diag. for local starter CN52 for Feed Pump 527 GM-01
3475-E820	Conn. diag. for local starter CN 60 for leakage containment pump 527 GM-05
3475-E821	Conn. diag. for local starter CN 58 for Off Gas Blower pump 527 GM-04
3475-E822	Conn. diag. for local starter CN 55 for Off Gas Bottoms Pump 527 GM-02
3475-E823	Conn. diag. Hi Rad Feed Sample Glove Box 527-A-04
3475-E824	Conn. diag. Ion Exchanger Manifold
3475-E825	Conn. diag. int. lvl. Sample Glove Box 527-A-03
3475-E826	Conn. diag. Beta Monitor Manifold 527-A02
3475-E827	Conn. diag. "Off Gas HDR" Term. Box CN 70 and PI/PSH/PSHH-527-18 and RE-527-18
3475-E828	Elem. diag. SDS 480V. Feed Pump 527 GM-01
3475-E829	Elem. diag. SDS 480V. Off Gas Blower and Leak Cont. pump
3475-E830	Elem. diag. SDS Off Gas Bottom pump 527 GM-02
3475-E831	Elem. diag. SDS 480V Off Gas HTR 527-E-01
3475-E832	Conn. diag. HTR cont. PNL for Off Gas HTR 527-E-01
3475-E833	Conn. diag. rad. mon. PNL RMP.1 (Sh. 1 of 3)
3475-E834	Conn. diag. rad. mon. PNL RMP.1 (Sh. 2 of 3)

DRAWING NO.	TITLE
3475-E835	Conn. diag. rad. mon. PNL RMP.1 (Sh. 3 of 3)
3475-E836	Conn. diag. for RCS clean Up Manifold
3475-E837	Block diag. misc. SDS
3475-E838	Conn. diag. dewatering station
3475-E839	Elem. diag. Rad. Montior PNL RMP-1 control and alarm
3475-E840	Conn. diag. for RE-527-11, 12 and 13 and RAH-527-11
3475-E852	Elem. diag. R.B. Waste Pump WG-P-1
3475-E853	Elem. diag. sol. vlv AV-01 AV-02 and SV-13
3475-E886	Block diag. SDS misc. Rad Monitor
3475-E887	Conn. diag. Filter Containment Rad det. inst. rack
3475-E891	Block diag. misc. Fuel Pool Waste Storage System
3475-E892	Int. and ext. conn. for LCL cont. PNL WMG 149
3475-E893	Elem. diag. alarms - cont. PNL CN-PNL-1
3475-E894	Int. and ext. conn. for cont. PNL CN-PNL-1 (Sh 1 of 2)
3475-E895	Int. and ext. conn. for cont PNL CN-PNL-1 (Sh 2 of 2)
3475-E896	Loop diag. upper Waste Storage Tanks Levol
3475-E903	Conn. diag. for hoist 527-T-04
3475-BM-E819	Bill of material fcr local starter CN 52
3475-BM-E820	Bill of material for local starter CN 60
3475-BM-E821	Bill of material for local starter CN 58
3475-BM-E822	Bill of material for local starter CN 55
2-M74-SDS01	Piping and Instrument Diagram, SDS Feed and Monitor Tank System
2-M74-DW01	Piping and Instrument Diagram, Demineralized Service Water
2-M74-PW01	Piping and Instrument Diagram, Processed Water Storage and Recycle System
2-POA-6201	General Arrangement, SDS Monitor Tanks, Fuel Handling Building, El. 305'0"
2-COC-6201	FHB, El. 305'0", SDS Equipment, Foundations and Misc. Support Steel

DRAWING NO.	TITLE
2-COR-6201	FHB, El. 305'0", SDS Equipment, Foundations Reinforcing Details
2-C21-008	Civil Structural Standards, Anchor Bolt Schedule and Details
2-C8R-6201	FHB, SDS Equipment Foundations Reinforcing Bar List
2-E21-005	One Line Diagram SDS Admin. Building
2-E38-SDS01	Connection Diagram, Local Control Panel SDS-LCP1
2-E38-SDS02	Connection Diagram, Local Control Panel SDS-LCP2
2-E38-SDS03	Connection Diagram, SDS Monitor Tank Transfer Pump Local Starters
2-E38-SDS04	Connection Diagram, SDS Misc. Devices
2-E38-SDS05	Connection Diagram, SDS Misc. Term Boxes
2-E76-SDS01	Schematic Diagram, SDS Monitoring Tank Transfer Pump (P1A)
2-E76-SDS02	Schematic Diagram, SDS Monitoring Tank Transfer Pump (P1B)
2-E76-SDS03	Schematic Diagram, SDS Monitor Tank Inlet Valves
2-E76-SDS04	Schematic Diagram, SDS Misc. Instrumentation and Alarms
2-E80-SDS01	Bill of Materials, Local Conrol Panel, SDS-LCP-1
2-E80-SDS02	Bill of Materials, Local Control Panel, SDS-LCP-2
2-E81-SDS01	SDS Pull Slips
2-J23-001	Instrument Piping Class Specification
2-J25-002	Installation Details
2-J25-003	Installation Details
2-J25-005	Installation Details
2-J25-007	Installation Details
2-J71-SDS01	Instrument Rack Layout, Instrument Rack SDS-R-1
2-J71-SDS02	Instrument Rack Layout, Instrument RAck SDS-R-2
2-J73-SDS01	Panel Drawing, SDS Feed and Monitor Tank, Panel SDS-LCP-1
2-J73-SDS02	Panel Drawing, SDS Feed and Monitor Tank, Panel SDS-LCP-2
2-J74-SDS01	Instrument Installation Detail, SDS Monitor Tank Transfer Pump P-1A Discharge
2-J74-SDS02	Instrument Installation Detail, SDS Monitor Tank Transfer Pump P-1B Discharge

DRAWING NO.	TITLE
2-J74-SDS03	Instrument Installation Detail, SDS Monitor Tank T-1A
2-J74-SDS04	Instrument Installation Detail, SDS Monitor Tank T-1B
2-J75-SDS01	Loop Diagram, SDS Monitor Tank T-1A Level
2-J75-SDS02	Loop Diagram, SDS Monitor Tank T-1B Level
2-J75-SDS03	Loop Diagram, SDS Monitor Tank, P-1A Discharge
2-J75-SDS04	Loop Diagram, SDS Monitor Tank, P-1B Discharge
2-J75-SDS05	Loop Diagram, SDS Monitor Tank T-1A, Low Level Trip
2-J75-SDS06	Loop Diagram, SDS Monitor Tank, T-1B, Low Level Trip
2-J77-SDS01	Logic Diagram, SDS Feed and Monitor Tank Transfer Pumps
2-J77-SDS02	Logic Diagram, SDS Feed and Monitor Tank Inlet Valves
2-J77-SDS03	Logic Diagram, SDS Feed and Monitor Tank Alarms
2-J78-SDS01	Level Setting Diagram, SDS Monitor Tank, T-1A
2-J78-SDS02	Level Setting Diagram, SDS Monitor Tank, T-1B
2-POH-001	HVAC, Partial Plans
2-P15-001	Wall and Floor Penetration Schedule
2-P15-002	Wall and Floor Penetration Schedule
2-P60-DW01	Piping Isometric, Demineralized Water System, FHB, Unit 1/Unit 2 Corridor
2-P60-SDS01	Piping Isometric, SDS, Aux and Fuel Handling Building
2-P60-SDS02	Piping Isometric, SDS, Aux and Fuel Handling Building
2-P60-SDS03	Piping Isometric, SDS, Aux and Fuel Handling Building
2-P64-DW01	Hanger Details, Demineralized Water System, FHB, Unit 1/Unit 2 Corridor
2-P64-SDS01	Hanger Details, SDS Feed and Monitor Tank System, Aux and Fuel Handling Bldg.
2-P64-SDS02	Hanger Details, SDS Feed and Monitor Tank System, Aux and Fuel Handling Bldg.
2-P64-SDS03	Hanger Details, SDS Feed and Monitor Tank System, Aux and Fuel Handling Bldg.
2-E21-SDS01	SDS-One Line Digram
2-M100A-00001-D1	Two 12,000 Gallon, 96" O.D. x 32'0", Straight Shell Water Storage Tanks, Buffalo Tank
2-EOR-6201	Grounding and Raceway, Submerged Demineralizer System

Appendix No. 10

to

Submerged Demineralizer System

System Design Description

Title

S.D.S Valve List

FILTRATION SUBSYSTEM (FL)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-FL-1		1 1/2"	Ball	Filter Manifold Inf. Stop
CN-V-FL-2	V-527-6	1 1/2"	Check	Filter Supply Check
CN-V-FL-3	V-527-9	1 1/2"	Ball	Filter Inlet
CN-V-FL-4	V-527-11	3/4"	Ball	Filter Manifold Flushing Stop
CN-V-FL-5	V-527-13	1 1/2"	Diaphragm	Prefilter Inlet Isol.
CN-V-FL-6	V-527-14	1 1/2"	Ball	Filter Outlet
CN-V-FL-7		1 1/2"	Q.D.	Prefilter Vent
CN-V-FL-8		1 1/2"	Q.D.	Prefilter Outlet
CN-V-FL-9		1 1/2"	Q.D.	Prefilter Inlet
CN-V-FL-10	V-527-18	3/4"	Ball	Final Filter Vent
CN-V-FL-11	V-527-19	3/4"	Ball	Prefilter Vent
CN-V-FL-12	V-527-20	3/4"	Check	Filter Flush Line Check
CN-V-FL-13		1 1/2"	Q.D.	Final Filter Vent
CN-V-FL-14		1 1/2"	Q.D.	Final Filter Outlet
CN-V-FL-15		1 1/2"	Q.D.	Final Filter Inlet
CN-V-FL-16	V-527-24	3/4"	Ball	Filter Flushing Connection Isol.
CN-V-FL-17		1/2"	Ball	Prefilter Outlet Pressure Inst. Isol.
CN-V-FL-18	Reserved			
CN-V-FL-19	Reserved			

SDS ION EXCHANGE SUBSYSTEM (IX)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-IX-20	V-527-1	1"	Diaphram	Feed Pump Discharge
CN-V-IX-21	V-527-2	3/4"	Ball	Feed Pump Recirc. Isol.
CN-V-IX-22	V-527-3	1"	Check	Feed Manifold Flush Line Check
CN-V-IX-23	V-527-4	1"	Ball	Feed Manifold Flush Connection Isol.
CN-V-IX-24	V-527-21	1"	Ball	IX Manifold Supply Line Auto. Isol.
CN-V-IX-25	V-527-22	1"	Diaphram	Train # 1 Ion Exchangers Inlet Isol.
CN-V-IX-26	V-527-23	1"	Diaphram	Train # 2 Ion Exchangers Inlet Isol.
CN-V-IX-27	V-527-25	1"	Ball	Train # 1 Ion Exchangers Outlet Isol.
CN-V-IX-28	V-527-28	1"	Ball	Train # 2 Ion Exchangers Outlet Isol.
CN-V-IX-29	V-527-29	1"	Ball	Cation Exchanger "A" Inlet Isol.
CN-V-IX-30	V-527-30	1"	Ball	Cation Exchanger "A" Outlet Isol.
CN-V-IX-31	V-527-31	1"	Ball	Cation Exchanger "B" Inlet Isol.
CN-V-IX-32	V-527-32	1"	Ball	Cation Exchanger "B" Outlet Isol.
CN-V-IX-33		1"	Check	Train # 1 IX Flush Line Check
CN-V-IX-34	V-527-49	1"	Ball	Train # 1 IX Flush Line Isol.
CN-V-IX-35		1"	Check	Train # 2 IX Flush Line Check
CN-V-IX-36	V-527-50	1"	Ball	Train # 2 IX Flush Line Isol.
CN-V-IX-37		1"	Check	Cation "A" Flush Line Check
CN-V-IX-38	V-527-51	1"	Ball	Cation "A" Flush Line Isol.
CN-V-IX-39		1"	Check	Cation "B" Flush Line Check
CN-V-IX-40	V-527-52	1"	Ball	Cation "B" Flush Line Isol.
CN-V-IX-41		1 1/2"	Q.D.	Train # 1 IX "A" Inlet
CN-V-IX-42		1 1/2"	Q.D.	Train # 1 IX "A" Outlet
CN-V-IX-43		1 1/2"	Q.D.	Train # 1 IX "B" Inlet
CN-V-IX-44		1 1/2"	Q.D.	Train # 1 IX "B" Outlet

SDS ION EXCHANGE SUBSYSTEM (IX) (Cont'd)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-IX-45		1 1/2"	Q.D.	Train # 1 IX "C" Inlet
CN-V-IX-46		1 1/2"	Q.D.	Train # 1 IX "C" Outlet
CN-V-IX-47		1 1/2"	Q.D.	Train # 2 IX "A" Inlet
CN-V-IX-48		1 1/2"	Q.D.	Train # 2 IX "A" Outlet
CN-V-IX-49		1 1/2"	Q.D.	Train # 2 IX "B" Inlet
CN-V-IX-50		1 1/2"	Q.D.	Train # 2 IX "B" Outlet
CN-V-IX-51		1 1/2"	Q.D.	Train # 2 IX "C" Inlet
CN-V-IX-52		1 1/2"	Q.D.	Train # 2 IX "C" Outlet
CN-V-IX-53		1 1/2"	Q.D.	Cation IX "A" Inlet
CN-V-IX-54		1 1/2"	Q.D.	Cation IX "A" Outlet
CN-V-IX-55		1 1/2"	Q.D.	Cation IX "B" Inlet
CN-V-IX-56		1 1/2"	Q.D.	Cation IX "B" Outlet
CN-V-IX-57	RESERVED			
CN-V-IX-58	V-527-213	1 1/2"	Ball	Cation Effluent Isolation to Utility Piping
CN-V-IX-59	RESERVED			
CN-V-IX-60	RESERVED			
CN-V-IX-102		2"	Ball	First Isolation to MWHT
CN-V-IX-103		2"	Ball	Second Isolation to MWHT
CN-V-IX-104		2"	Ball	First Isolation to RCBT
CN-V-IX-105		2"	Ball	Second Isolation to RCBT

LEAKOFF CONTAINMENT

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-LC-106	V-527-204	1/2"	Ball	Containment Pump Disch. Press. Inst. Isol
CN-V-LC-107	V-527-26	1"	Diaphragm	Final Filter Leakoff Isol.
CN-V-LC-108	V-527-27	1"	Diaphragm	Prefilter Leakoff Isol.
CN-V-LC-109	V-527-65	1"	Diaphragm	Train # 1 IX "A" Leakoff Isol.
CN-V-LC-110	V-527-66	1"	Diaphragm	Train # 1 IX "B" Leakoff Isol.
CN-V-LC-111	V-527-67	1"	Diaphragm	Train # 1 IX "C" Leakoff Isol.
CN-V-LC-112	V-527-68	1"	Diaphragm	Train # 2 IX "A" Leakoff Isol.
CN-V-LC-113	V-527-69	1"	Diaphragm	Train # 2 IX "B" Leakoff Isol.
CN-V-LC-114	V-527-70	1"	Diaphragm	Train # 2 IX "C" Leakoff Isol.
CN-V-LC-115	V-527-71	1"	Diaphragm	Cation IX "A" Leakoff Isol.
CN-V-LC-116	V-527-72	1"	Diaphragm	Cation IX "B" Leakoff Isol.
CN-V-LC-117	V-527-57	1 1/2"	Ball	Leakoff IX "A" Inlet Isol.
CN-V-LC-118	V-527-58	1 1/2"	Ball	Leakoff IX "B" Inlet Isol.
CN-V-LC-119	V-527-59	1 1/2"	Ball	Leakoff IX "A" Outlet Isol.
CN-V-LC-120	V-527-60	1 1/2"	Ball	Leakoff IX "B" Outlet Isol.
CN-V-LC-121	V-527-63	1"	Ball	Leakoff IX "A" Flushline Isol.
CN-V-LC-122	V-527-64	1"	Ball	Leakoff IX "B" Flushline Isol.
CN-V-LC-123		1 1/2"	Q.D.	Leakoff IX "A" Inlet
CN-V-LC-124		1 1/2"	Q.D.	Leakoff IX "A" Outlet
CN-V-LC-125		1 1/2"	Q.D.	Leakoff IX "B" Inlet
CN-V-LC-126		1 1/2"	Q.D.	Leakoff IX "B" Outlet
CN-V-LC-127	V-527-85	3"	Check Valve	Leakoff Containment Pump Suctionline Check Valve
CN-V-LC-128		1 1/2"	Q.D.	Leakoff IX "A" Vent
CN-V-LC-129		1 1/2"	Q.D.	Leakoff IX "B" Vent

LEAKOFF CONTAINMENT (Cont'd)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-LC-213	V-527-61	3/4"	Ball	Leakoff IX "A" Vent
CN-V-LC-214	V-527-62	3/4"	Ball	Leakoff IX "B" Vent Isol.
CN-V-LC-130		1/2"	Ball	LCIX A Effluent Pressure Gage Isol.
CN-V-LC-291		1/2"	Ball	LCIX B Effluent Pressure Gage Isol.

PROCESS MONITORING SUBSYSTEM (PM)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-PM-166	V-527-42	3/4"	Ball	Train # 1 IX "A" Outlet Sample Isol.
CN-V-PM-167	V-527-43	3/4"	Ball	Train # 1 IX "B" Outlet Sample Isol.
CN-V-PM-168	V-527-44	3/4"	Ball	Train # 1 IX "C" Outlet Sample Isol.
CN-V-PM-169	V-527-45	3/4"	Ball	Train # 2 IX "A" Outlet Sample Isol.
CN-V-PM-170	V-527-46	3/4"	Ball	Train # 2 IX "B" Outlet Sample Isol.
CN-V-PM-171	V-527-47	3/4"	Ball	Train # 2 IX "C" Outlet Sample Isol.
CN-V-PM-172		3/4"	Ball	Cation Exchangers Outlet Sample Isol.
CN-V-PM-173	V-527-114	1/4"	3-Way Ball	Train # 1 IX "A" Outlet Flow Diversion
CN-V-PM-174	V-527-115	1/4"	3-Way Ball	Train # 2 IX "A" Outlet Flow Diversion
CN-V-PM-175	V-527-116	1/4"	3-Way Ball	Train # 1 IX "B" Outlet Flow Diversion
CN-V-PM-176	V-527-117	1/4"	3-Way Ball	Train # 2 IX "B" Outlet Flow Diversion
CN-V-PM-177	V-527-118	1/4"	3-Way Ball	Train # 1 IX "C" Outlet Flow Diversion
CN-V-PM-178	V-527-119	1/4"	3-Way Ball	Train # 2 IX "C" Outlet Flow Diversion
CN-V-PM-179	V-527-120	1/4"	3-Way Ball	Cation Exchangers Influent Flow Diversion
CN-V-PM-180	V-527-121	1/4"	3-Way Ball	Cation Exchangers Effluent Flow Diversion
CN-V-PM-181	V-527-88	3/4"	Ball	Cation Exchangers Influent Sample Isol.
CN-V-PM-183	V-527-96	1/4"	Needle	Train # 1 - IX "A" EFF Sample Throttle
CN-V-PM-184	V-527-95	1/4"	Needle	Train # 1 - IX "B" EFF Sample Throttle
CN-V-PM-185	V-527-93	1/4"	Needle	Train # 1 - IX "C" EFF Sample Throttle
CN-V-PM-186	V-527-94	1/4"	Needle	Train # 2 - IX "A" EFF Sample Throttle
CN-V-PM-187	V-527-92	1/4"	Needle	Train # 2 - IX "B" EFF Sample Throttle
CN-V-PM-188	V-527-91	1/4"	Needle	Train # 2 - IX "C" EFF Sample Throttle
CN-V-PM-189	V-527-89	1/4"	Needle	Cation Exchangers Influent Sample Throttle

PROCESS MONITORING SUBSYSTEM (PM) (Cont'd)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-PM-190	V-527-90	1/4"	Needle	Cation Exchangers Influent Sample Throttle
CN-V-PM-191	V-527-150	1/4"	Ball	Train # 1 & 2 IX's "A" Beta Monitor Flush Stop
CN-V-PM-192	V-527-149	1/4"	Ball	Train # 1 & 2 IX's "B" Beta Monitor Flush Stop
CN-V-PM-193	V-527-148	1/4"	Ball	Train # 1 & 2 IX's "C" Beta Monitor Flush Stop
CN-V-PM-194	V-527-147	1/4"	Ball	Cation Exchangers Influent Beta Monitor Flush Stop
CN-V-PM-195	V-527-146	1/4"	Ball	Cation Exchangers Effluent Beta Monitor Flush Stop
CN-V-PM-196	V-527-143	1/4"	Ball	Beta Monitor Flush Header Isol.
CN-V-PM-197	V-527-144	1/4"	Check	Beta Monitor Flush Header Check
CN-V-PM-198	V-527-200	1/4"	Check	Train # 1 & 2 IX's "A" Beta Monitor Flushline Check
CN-V-PM-199	V-527-199	1/4"	Check	Train # 1 & 2 IX's "B" Beta Monitor Flushline Check
CN-V-PM-200	V-527-198	1/4"	Check	Train # 1 & 2 IX's "C" Beta Monitor Flushline Check
CN-V-PM-229	V-527-197	1/4"	Check	Cation Exchangers Influent Beta Monitor Flushline Check
CN-V-PM-230	V-527-196	1/4"	Check	Cation Exchangers Effluent Beta Monitor Flushline Check

VENT AND DRAIN SUBSYSTEM (VA)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-VA-201	V-527-33	3/4"	ball	train #1 IX "A" vent isol.
CN-V-VA-202	V-527-34	3/4"	ball	train #1 IX "B" vent isol.
CN-V-VA-203	V-527-35	3/4"	ball	train #1 IX "C" vent isol.
CN-V-VA-204	V-527-36	3/4"	ball	train #2 IX "A" vent isol.
CN-V-VA-205	V-527-37	3/4"	ball	train #2 IX "B" vent isol.
CN-V-VA-206	V-527-38	3/4"	ball	train #2 IX "C" vent isol.
CN-V-VA-207	V-527-39	3/4"	ball	cation IX "A" vent isol.
CN-V-VA-208	V-527-40	3/4"	ball	cation IX "B" vent isol.
CN-V-VA-209	V-527-53	1"	ball	train #1 ion exchangers piping vent
CN-V-VA-210	V-527-54	1"	ball	train #2 ion exchangers piping vent
CN-V-VA-211	V-527-55	1"	ball	cation IX "A" piping vent
CN-V-VA-212	V-527-56	1"	ball	cation IX "B" piping vent
CN-V-VA-215		1 1/2"	Q.D.	train #1 IX "A" vent connection
CN-V-VA-216		1 1/2"	Q.D.	train #1 IX "B" vent connection
CN-V-VA-217		1 1/2"	Q.D.	train #1 IX "C" vent connection
CN-V-VA-218		1 1/2"	Q.D.	train #2 IX "A" vent connection
CN-V-VA-219		1 1/2"	Q.D.	train #2 IX "B" vent connection
CN-V-VA-220		1 1/2"	Q.D.	train #2 IX "C" vent connection
CN-V-VA-221		1 1/2"	Q.D.	cation "A" vent connection
CN-V-VA-222		1 1/2"	Q.D.	cation "B" vent connection
CN-V-VA-225		2"	ball	tank farm vent isol.
CN-V-VA-226	RESERVED			
CN-V-VA-227	RESERVED			
CN-V-VA-228		10"	butterfly	exhaust header inlet isol.

VENT AND DRAIN SUBSYSTEM (VA) (Cont'd.)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-VA-231		6"	diaphragm activated butterfly	pressure control valve
CN-V-VA-232	RESERVED			
CN-V-VA-233		2"	ball	Spare
CN-V-VA-234	RESERVED			
CN-V-VA-235	RESERVED			
CN-V-VA-236	RESERVED			
CN-V-VA-237	V-527-123	2"	ball	beta monitoring manifold vent exhaust
CN-V-VA-238	V-527-122	2"	ball	beta monitoring manifold vent intake
CN-V-VA-239	V-527-83	2"	ball	IX manifold vent exhaust
CN-V-VA-240	V-527-206	2"	globe	IX manifold vent intake
CN-V-VA-241	V-527-108	3/8"	check	hi rad filter sample box pump discharge check to waste vent isol.
CN-V-VA-242	V-527-189	2"	ball	inter. sample box vent exhaust isol.
CN-V-VA-243	V-527-188	2"	ball	inter. sample box vent inelt isol.
CN-V-VA-244	V-527-203	2"	ball	hi rad feed sample box vent intake line isol.
CN-V-VA-246	V-527-151	2"	ball	hi rad feed sample box vent exhaust isol.
CN-V-VA-247	V-527-260		ball	off-gas bottoms pump fush conn. isol.
CN-V-VA-248	V-527-207	2"	ball	hi rad filter sample box vent intake
CN-V-VA-249	V-527-208	2"	ball	hi rad filter sample box vent exhaust
CN-V-VA-223	V-527-193	2"	ball	feed manifold vent intake
CN-V-VA-224	V-527-195	2"	ball	filter manifold vent intake

VENT AND DRAIN SUBSYSTEM (VA) (Cont'd.)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-VA-250	V-527-77	2"	ball	filter manifold vent exhaust isolation
CN-V-VA-251	V-527-194	2"	ball	feed manifold vent exhaust isolation
CN-V-VA-252		1"	ball check	off gas bottoms pump flush connection check valve
CN-V-VA-253	RESERVED			
CN-V-VA-336	V-527-192	3/8"	check	filter manifold sump pump discharge check
CN-V-VA-337	V-527-218	3/8"	check	filter manifold drain line check
CN-V-VA-245	V-527-261	1"	check	off gas bottom pump discharge isol.
CN-V-VA-295	V-527-242	2"	ball	RCS manifold vent intake
CN-V-VA-296	V-527-243	2"	ball	RCS manifold vent exhaust
CN-V-VA-335	V-527-252	3/8"	check	RCS sump pump discharge check

SAMPLING SUBSYSTEM (S

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION	
CN-V-SA-255	V-527-7	3/4"	ball	filter influent sample inlet isolation	
CN-V-SA-256	V-527-8	3/4"	ball	filter influent sample outlet isolation	
CN-V-SA-257	V-527-10	3/4"	ball	filter effluent sample inlet isolation	
CN-V-SA-258	V-527-12	3/4"	ball	filter effluent sample outlet isolation	
CN-V-SA-259	V-527-164	1/4"	ball	sample flask inlet stop	Cation Ion Exchanger Effluent
CN-V-SA-260	V-527-156	1/4"	ball	sample flask flush	
CN-V-SA-261	V-527-172	1/4"	ball	sample flask outlet stop.	
CN-V-SA-262	V-527-180	1/4"	ball	sample flask SPIGOT isol	
CN-V-SA-263	V-527-165	1/4"	ball	sample flask inlet stop	Train No. 2 Exchanger "C" Effluent
CN-V-SA-264	V-527-157	1/4"	ball	sample flask flush	
CN-V-SA-265	V-527-173	1/4"	ball	sample flask outlet stop	
CN-V-SA-266	V-527-181	1/4"	ball	sample flask SPIGOT isol.	
CN-V-SA-267	V-527-166	1/4"	ball	sample flask inlet stop	Train No. 1 Ion Exchanger "A" Effluent
CN-V-SA-268	V-527-158	1/4"	ball	sample flask flush	
CN-V-SA-269	V-527-174	1/4"	ball	sample flask outlet stop	
CN-V-SA-270	V-527-182	1/4"	ball	sample flask SPIGOT isol.	
CN-V-SA-271	V-527-167	1/4"	ball	sample flask inlet stop	Train No. 1 Ion Exchanger "B" Effluent
CN-V-SA-272	V-527-159	1/4"	ball	sample flask flush	
CN-V-SA-273	V-527-175	1/4"	ball	sample flask outlet stop	
CN-V-SA-274	V-527-183	1/4"	ball	sample flask SPIGOT isol.	
CN-V-SA-275	V-527-168	1/4"	ball	sample flask inlet stop	Train No. 2 Ion Exchanger "A" Effluent
CN-V-SA-276	V-527-160	1/4"	ball	sample flask flush	
CN-V-SA-277	V-527-176	1/4"	ball	sample flask outlet stop	
CN-V-SA-278	V-527-184	1/4"	ball	sample flask SPIGOT isol.	

SAMPLING SUBSYSTEM (SA) (Cont'd.)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION	
CN-V-SA-279	V-527-169	1/4"	ball	sample flask inlet stop	Train No. 2 Ion Exchanger "B" Effluent
CN-V-SA-280	V-527-161	1/4"	ball	sample flask flush	
CN-V-SA-281	V-527-177	1/4"	ball	sample flask outlet stop	
CN-V-SA-282	V-527-185	1/4"	ball	sample flask SPIGOT isol.	
CN-V-SA-283	V-527-170	1/4"	ball	sample flask inlet stop	Train No. 1 Ion Exchanger "C" Effluent
CN-V-SA-284	V-527-162	1/4"	ball	sample flask flush	
CN-V-SA-285	V-527-178	1/4"	ball	sample flask outlet stop	
CN-V-SA-286	V-527-186	1/4"	ball	sample flask SPIGOT isol.	
CN-V-SA-287	V-527-155	1/4"	ball	removable sample cylinder inlet isol.	
CN-V-SA-288		1/4"	ball	removable sample cylinder inlet stop	
CN-V-SA-289		1/4"	ball	removable sample cylinder outlet stop	
CN-V-SA-290	V-527-190	1/4"	ball	removable sample cylinder outlet isol.	
CN-V-SA-292	V-527-154	1/4"	ball	sample flask flushing header stop.	
CN-V-SA-293	V-527-153	1/4"	ball	sample flask flushing header	
CN-V-SA-294	V-527-152	1/4"	ball	sample flask flushing connection isol.	
CN-V-SA-303	V-527-41	3/4"	ball	IX train influent sample isol.	
CN-V-SA-304	V-527-98	3/8"	ball	filter influent sample outlet stop	
CN-V-SA-305	V-527-99	3/8"	ball	filter influent sample inlet stop	
CN-V-SA-306	V-527-104	3/8"	ball	filter effluent sample inlet stop	
CN-V-SA-307	V-527-103	3/8"	ball	filter effluent sample outlet stop	
CN-V-SA-308	V-527-86	1/2"	ball	leakoff IX'ers inf. sample spigot	
CN-V-SA-309	V-527-87	1/2"	ball	leakoff IX'ers eff. sample spigot	
CN-V-SA-310	V-527-110	3/8"	ball	Hi rad feed inf. sample stop	
CN-V-SA-311	V-527-109	3/8"	ball	Hi rad feed eff. sample stop	
CN-V-SA-312	V-527-111	3/8"	ball	Hi rad feed sample spigot	

SAMPLING SUBSYSTEM (SA) (Cont'd.)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-SA-313		3/4"	ball	off-gas sample system infl. isol.
CN-V-SA-314		3/4"	ball	off-gas sample system effl. isol.
CN-V-SA-315		3/8"	ball	off-gas sample perticulate filter bypass
CN-V-SA-316		3/8"	ball	off-gas sample charcoal filter bypass
CN-V-SA-317		3/8"	ball	off-gas sample ion chamber bypass
CN-V-SA-318	V-527-171	1/4"	ball	cation IX'ers influent sample flask inlet stop
CN-V-SA-319	V-527-163	1/4"	ball	cation IX'ers influent sample flask flush stop
CN-V-SA-320	V-527-179	1/4"	ball	cation IX'ers influent sample flask outlet sto
CN-V-SA-321	V-527-187	1/4"	ball	cation IX'ers influent sample flask spigot isol.
CN-V-SA-325	V-527-101	3/8"	ball	filter influent sample manifold vent isol.
CN-V-SA-326	V-527-106	3/8"	ball	filter effluent sample manifold vent isol.
CN-V-SA-327	V-527-201	3/8"	globe	off-gas sampler air supply stop
CN-V-SA-328	V-527-102	3/8"	check	filter influent sample, sample line vent check
CN-V-SA-329	V-527-107	3/8"	check	filter effluent sample, sample line vent check
CN-V-SA-330	V-527-100	3/8"	ball	filter influent sample spigot
CN-V-SA-331	V-527-105	3/8"	ball	filter effluent sample spigot
CN-V-SA-332	V-527-112	3/8"	ball	Hi rad feed sample manifold vent isol.
CN-V-SA-333	V-527-113	3/8"	check	Hi rad feed sample manifold vent check
CN-V-SA-323	RESERVED			
CN-V-SA-324	RESERVED			
CN-V-SA-322	RESERVED			

DEWATERING SUBSYSTEM (DW)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-DW-338	V-527-227	1/2"	globe	flush line inlet isol.
CN-V-DW-339		1/2"	solonoid	flush line inlet auto isol.
CN-V-DW-340	V-527-231		ball	flush line inlet press inst. isol.
CN-V-DW-341	V-527-228	1/2"	ball	flush line inlet stop
CN-V-DW-342	V-527-229	1/2"	check	flush line inlet check
CN-V-DW-343	V-527-31	1/2"	globe	dewatering air control valve
CN-V-DW-344	V-527-230		ball	dewatering air pressure inst. isol.
CN-V-DW-345	V-527-221	1/2"	ball	dewatering air stop valve
CN-V-DW-346	V-527-222	1/2"	check	dewatering air check
CN-V-DW-347	V-527-223	1/2"	ball	IX dewatering air inlet stop
CN-V-DW-348	V-527-225	3/4"	ball	IX dewatering outlet stop
CN-V-DW-349	V-527-224	1/2"	ball	filter vessel dewatering air inlet stop
CN-V-DW-350	V-527-226	3/4"	ball	filter vessel dewatering outlet stop
CN-V-DW-351		1 1/2"	QD	IX vessel inlet quick disconnect
CN-V-DW-352		1 1/2"	QD	IX vessel outlet quick disconnect
CN-V-DW-353		1 1/2"	QD	filter vessel inlet quick disconnect
CN-V-DW-354		1 1/2"	QD	filter vessel outlet quick disconnect
CN-V-DW-355		1"	globe	Demin water supply (SS)
CN-V-DW-356		3/4"	globe	Service air supply (CS)
CN-V-DW-357		1"	check	Demin. water supply (SS)
CN-V-DW-358		1"	globe	Demin. water utility piping isolation
CN-V-DW-359	V-527-239	3/4"	ball	Demin. water utility station #1 isol.
CN-V-DW-360	V-527-241	3/4"	ball	Demin. water utility station #2 isol.
CN-V-DW-361	V-527-238	1"	ball	Demin. water utility station #3 isol.
CN-V-DW-362	V-527-212	2"	ball	Demin. water utility piping isol.
CN-V-DW-363	V-527-240	3/4"	ball	Demin. water utility piping isol.

REACTOR SUBSYSTEM (RC)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-RC-360	V-527-262	1"	ball	RCS Manifold Influent Isolation
CN-V-RC-361	V-527-251	1"	check	RCS Manifold Influent Check
CN-V-RC-362	V-527-263	1"	ball	Dual flow operation isolation
CN-V-RC-363	V-527-247	1"	ball	Filter Manifold RCS Supply Stop
CN-V-RC-364	V-527-244	1"	ball	RCS Manifold Influent "Tie-In" Connection Isolation
CN-V-RC-365	V-527-253	1"	check	RCS Manifold Influent "Tie-In" Connection Check
CN-V-RC-366	V-527-264	1"	ball	Filter bypass line isolation
CN-V-RC-367	V-527-265	1"	ball	RCS return from filter manifold
CN-V-RC-368	V-527-250	1"	check	RCS return from filter manifold
CN-V-RC-369	V-527-245	1"	Diaphragm	Ion exchange manifold RCS influent throttle
CN-V-RC-370	V-527-249	1"	ball	RCS manifold effluent isolation
CN-V-RC-371	V-527-255	1"	check	RCS manifold effluent check
CN-V-RC-372	V-527-248	1"	ball	RCS manifold ion exchange return stop
CN-V-RC-373	V-527-254	1"	check	RCS manifold filter return "Tie-In' flange check
CN-V-RC-374	V-527-246	1"	ball	RCS manifold filter return "Tie-In' flange isolation
CN-V-RC-375	V-527-269	1"	check	RCS manifold I.X. return "Tie-In' flange check
CN-V-RC-376	V-527-268	1"	ball	RCS Manifold I.X. Return "Tie-In" flange isolation

POST FILTER SUBSYSTEM (PF)

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
CN-V-PF-61		1 1/2"	Ball	Post Filter Inlet Isolation.
CN-V-PF-62		1 1/2"	Ball	Post Filter Outlet First Isol. to Monitor Tank.
CN-V-PF-63		3/4"	Globe	Post Filter DP Instrument Isol.
CN-V-PF-64		3/4"	Globe	Post Filter DP Instrument Isol.
CN-V-PF-65		3/4"	Ball	Post Filter Process Drain Isol.
CN-V-PF-66		3/4"	Ball	Post Filter Vent First Isol.
CN-V-PF-67		3/4"	Ball	Post Filter Vent Second Isol.
CN-V-PF-68	V-527-270	1 1/2"	Ball	Post Filter Outlet Second Isol. to Monitor Tank

MONITOR TANK SUBSYSTEM VALVES

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
SDS-V-002A		1 1/2"	Ball	Monitor Tank A Isolation Valve
SDS-V-002B		1 1/2	Ball	Monitor Tank B Isolation Valve
SDS-V-003		2"	Ball	Monitor Tanks Outlet Cross Connect Valve
SDS-V-004A		2"	Ball	Monitor Pump 1A Suction
SDS-V-004B		2"	Ball	Monitor Pump 1B Suction
SDS-V-005A		3/4"	Ball	Monitor Pump 1A Suction Instrument Isolation
SDS-V-005B		3/4"	Ball	Monitor Pump 1B Suction Instrument Isolation
SDS-V-006A		3/4"	Ball	Monitor Pump 1A Discharge Instrument Isolation
SDS-V-006B		3/4"	Ball	Monitor Pump 1B Discharge Instrument Isolation
SDS-V-007A		2"	Check	Monitor Pump 1A Discharge Check Valve
SDS-V-007B		2"	Check	Monitor Pump 1B Discharge Check Valve
SDS-V-008A		2"	Ball	Monitor Pump 1A Discharge Valve
SDS-V-008B		2"	Ball	Monitor Pump 1B Discharge Valve
SDS-V-009A		1"	Ball	Monitor Pump 1A Sample Isolation Valve
SDS-V-009B		1"	Ball	Monitor Pump 1B Sample Isolation Valve
SDS-V-010A		3/4"	Globe	Monitor Pump 1A Sample Valve
SDS-V-010B		3/4"	Globe	Monitor Pump 1B Sample Valve
SDS-V-011		1 1/2"	Ball	Monitor Tanks Discharge Cross Connect
SDS-V-012A		1 1/2"	Check	Monitor Tank A Recirc Check Valve
SDS-V-012B		1 1/2"	Check	Monitor Tank B Recirc Check Valve
SDS-V-013A		1 1/2"	Ball	Monitor Tank A Recirc
SDS-V-013B		1 1/2"	Ball	Monitor Tank B Recirc

MONITOR TANK SUBSYSTEM VALVES

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
SDS-V-014		2"	Ball	Monitor Pump Discharge to EPICOR
SDS-V-018		2"	Ball	Monitor Pump Discharge to PWST, Second Isolation Valve
SDS-V-023A		3/4"	Ball	Monitor Tank A, Level Indication Valve
SDS-V-023B		3/4"	Ball	Monitor Tank B, Level Indication Valve
SDS-V-024A		1 1/2"	Ball	Monitor Tank A, Drain First Isolation Valve
SDS-V-024B		1 1/2"	Ball	Monitor Tank B Drain, First Isolation Valve
SDS-V-025A		1 1/2"	Ball	Monitor Tank A Inlet
SDS-V-025B		1 1/2"	Ball	Monitor Tank B Inlet
SDS-V-026A		2"	Ball	Monitor Tank A Outlet
SDS-V-026B		2"	Ball	Monitor Tank B Outlet
SDS-V-028		2"	Check	Monitor Pump Discharge to Epicor Check Valve
SDS-V-031		2"	Check	Monitor Pump Discharge to PWST Check Valve
SDS-V-032		2"	Ball	Monitor Tank Demin. Water Isolation
SDS-V-033		2"	Check	Monitor Tank Demin Water Supply Check Valve
SDS-V-034A		1 1/2"	Ball	Monitor Tank A Drain, Second Isolation Valve
SDS-V-034B		1 1/2"	Ball	Monitor Tank B Drain, Second Isolation Valve
SDS-V-036		3/4"	Globe	Monitor Pump Discharge Header Vent
SDS-V-037		3/4"	Globe	Monitor Pump Discharge Header Vent
SDS-V-038		1"	Globe	Monitor Pump Discharge Header Drain
SDS-V-039		2"	Ball	Monitor Pump Discharge to PWST, First Isolation Valve
SDS-V-050	V-527-209	2"	Check	Monitor Pump Diacharge to Feed Standpipe Check Valve.

MONITOR TANK SUBSYSTEM VALVES

VALVE NUMBER	PRINT NUMBER	SIZE	TYPE	DESCRIPTION
SDS-V-051	V-527-214	1"	Ball	Monitor Pump Discharge to Feed Standpipe First Isolation Valve.
SDS-V-052		1"	Ball	Monitor Pump Discharge to Feed Standpipe Second Isolation Valve.

APPENDIX 11

to

Submerged Demineralizer System

System Design Description

SDD #527-A

Revision 2

2104-8.0	Feed Tank Filling System Operation
2104-8.1	Submerged Ion Exchangers System Operation
2104-8.2	Leakage Containment Subsystem Operation
2104-8.3	Vent and Drain Subsystem Operation
2104-8.4	Monitor Tanks Subsystem Operation
2104-8.5	Filter Vessel Replacement Operation
2104-8.6	Cation Ion Exchanger Vessel Replacement Operation
2104-8.7	Zeolite Exchanger Vessel Replacement Operation
2104-8.8	Leakage Ion Exchanger Vessel Replacement Operation
2104-8.9	SDS Electrical
2104-8.10	195 Cask Handling Operation - Deleted
2104-8.11	1-13-C Cask Handling Operation
2104-8.12	Spent Vessel Dewatering Operation
2104-8.13	SDS Sampling Operation
2104-8.14	10 Cuft Zeolite Loading Procedure
2202-8.0	General Emergency
2202-8.1	Leakage in Filtration
2202-8.2	Leakage in IX System
2202-8.3	Fire in Charcoal Filter - Deleted
2202-8.4	Loss of Vent & Drain
2202-8.5	Cask Handling Accident

Appendix No. 11

to

Submerged Demineralizer System

System Design Description

Title

S.D.S. Operating, Emergency

and Response Procedure List

APPENDIX 11

to

Submerged Demineralizer System

System Design Description

SDD #527-A

Revision 2

2104-8.0	Feed Tank Filling System Operation
2104-8.1	Submerged Ion Exchangers System Operation
2104-8.2	Leakage Containment Subsystem Operation
2104-8.3	Vent and Drain Subsystem Operation
2104-8.4	Monitor Tanks Subsystem Operation
2104-8.5	Filter Vessel Replacement Operation
2104-8.6	Cation Ion Exchanger Vessel Replacement Operation
2104-8.7	Zeolite Exchanger Vessel Replacement Operation
2104-8.8	Leakage Ion Exchanger Vessel Replacement Operation
2104-8.9	SDS Electrical
2104-8.10	195 Cask Handling Operation - Deleted
2104-8.11	1-13-C Cask Handling Operation
2104-8.12	Spent Vessel Dewatering Operation
2104-8.13	SDS Sampling Operation
2104-8.14	10 Cuft Zeolite Loading Procedure
2202-8.0	General Emergency
2202-8.1	Leakage in Filtration
2202-8.2	Leakage in IX System
2202-8.3	Fire in Charcoal Filter - Deleted
2202-8.4	Loss of Vent & Drain
2202-8.5	Cask Handling Accident

Appendix No. 12

to

Submerged Demineralizer System

System Design Description

Title

Surface Suction System

System Design Description

DIVISION II

SYSTEM DESIGN DESCRIPTION

OF THE

SURFACE WATER SUCTION FEED TANKAGE FILL SYSTEM (SUMP SUCKER)

Description No. 527-B

Recovery Support Engineering

File No. 10.18.3

Word Processing File No. 0113v

TABLE OF CONTENTS

1.0 DESIGN DESCRIPTION

1.1 Summary.

This system is designed to draw water from the basement of the Containment Building and deliver it to the RCS clean-up manifold of the Submerged Demineralizer System (SDS). Within the SDS the water will normally be routed via the prefilter and final filter to four 15,000 gallon SDS feed tanks located in the "A" Spent Fuel Pool. Alternately, the water can bypass the filters and be pumped directly to the feed tanks.

1.2 References.

1.2.1 S-ECM-818; Surface Suction Scheme Penetration Piping

1.2.2 S-ECM-817; 1-1/2" ϕ Line from Pen 1551 to Tank Farm

1.2.3 OP Procedure 2104-8.0 Feed Tank Filling by Surface Suction

1.2.4 Burns and Roe Calculation WG-61-02; WG-61 1-1/2" Line Rupture in F.H. Building (SWS-P-1)

1.3 Detailed System Description

1.3.1 A P and ID of the Surface Water Suction System, drawing RSE-027, is attached. The pump which is a commercially available high capacity well pump is attached to a float assembly. The float serves to always keep the pump suction near the surface of the water in the Containment. This will allow the water with the least solids to be drawn off and processed first. A 1" I.D. rubber hose with leak tight "quick disconnect" fittings is coupled to the pump discharge at one end and to containment penetration 626 at the other. From just inside the containment penetration to the tie-in with the SDS piping, the system is hard piped with 1-1/2" Schedule 40 stainless steel pipe. The pipe is shielded with a minimum of 2 1/2 inches of lead except around the flushing station near Pen 1551 where it is surrounded by a minimum of 20 1/2 inches of concrete block. These shielding requirements reduce area dose rates to < 1 mrem/hr. System piping design conforms to Regulatory Guide 1.143 and as such all piping outside the Containment is per ANSI B31.1, non-seismic with commercial grade QA. Within the containment there are no valves or other devices to prevent flow in either direction. Double isolation is provided just outside the Reactor Building in the Fuel Handling Building. A 1" ø line located near the top of the system piping and just inside the Fuel Handling Building serves as a vacuum breaker and flush connection. Flush water will be plant demineralized water or processed water. This is a plant operations option. Flush water will be supplied via rubber hose to the flush connection. Electricity to the pump is fed through a 4 conductor no. 9 power cord which parallels the pump discharge hose up through the Containment and Fuel Handling Building penetrations. Inside the Fuel Handling Building the power cord is routed to a motor control center located on the east wall at the operating floor elevation.

1.3.2 Pump

Type: Verticle 3 stg. High Capacity Well Pump; Goulds Model UJ64HM32

Motor: 230V, 3 ø 3600 rpm, 3 hp.

Head: Per Figure 1

Mechanical Design Life: 2 yrs. Continuous Duty

1.3.3 System Capacity

25 gpm clean filters

17 gpm dirty filters

33 gpm Filters Bypassed

1.3.4 Discharge Hose

154 feet long, 1" I.D. Water Hose; 300 psi design working pressure, Buna - N tube with polyester reinforcement, neoprene cover; Design life: approx. 1 yr. in contact with sump water. Fittings: 1" ø Hansen type 8-ST quick disconnects; straight thru design

1.3.5 Piping

1-1/2" sched. 40 Austenitic Stainless Steel

Design Code: B31.1 (non-seismic)

Design Pressure: 100 psig.

Design Temperature: Ambient

1.3.6 Float

Dimensions: 60" X 6.5" X 18" (max. width)

Material: Fiberglass Encased, closed pore, polystyrene foam; < 5.0 lb/ft^3

Volume: approximately 1.5 ft.^{3}

Weight (including pump and fixtures): approximately 60 lbs.

1.4 System Performance Characteristics

The surface suction pump was chosen based on two basic parameters. These parameters are (1) the design flowrate range of approximately 15-30 gpm to the tank farm from the RB sump and (2) the weight of the pump and, hence, its portability for manual installation. The pump has hydraulic characteristics shown on Figure 1. The pump, float and float-attached equipment weigh approximately 60 pounds, while the attached electrical cord weighs an additional (approximate) 50 pounds.

In tests conducted April 25 and 26, 1981 using System hardware and Piping, the pumping resistance characteristics were confirmed. The results of those tests are reflected in the system curves on Figure 1.

1.5 System Arrangement

The pump will float freely in the containment water in the area immediately east of stairwell no. 1 (the "open" stairwell) with sufficient hose, power cable, and tether slack to allow it to pump all but approximately the last 2-1/2 inches of water above the 282'6" floor elevation. The discharge hose and power cable slack will initially float on the RB sump water next to the pump. The remainder of the discharge hose and power cable is routed up the open stairwell to elevation 305', northward across the 305' elevation floor to column R-9, up through the 347' elevation seismic gap (west of the incore instrumentation termination plate), and then northeastward to meet the hard piping and electrical connection extending into the containment through penetration R-626. The hose is anchored at the 347' elevation seismic gap, column R-9 above the 305' elevation floor, and the curbing on the north side of the open stairwell on the 305' elevation. The hard piping is routed through containment penetration R-626 and Fuel Handling Building penetration 1551, east along the south wall of the Fuel Handling Building to the east side of the fuel pool area, and then northward to the SDS tie-in between valves CN-V-FL-1 and WG-V-71. Exact routing is documented in references 1.2.1 and 1.2.2.

1.6 Instrumentation and Control

The pump control will be via on/off buttons with indicator lights showing power to the panel and pump. Controls and indication will be located on panel CN-PNL-1 near the SDS feed tank level indication and high level alarm. Though the system is designed to be started and run in the valves wide open mode, system flow may be decreased by throttling any of the process line valves.

1.7 System Interfaces

The Surface Suction Pump discharges through flexible hoses to hard pipe in containment Penetration R-626 and Fuel Handling Building

Penetration No. 1551. Inside the Fuel Handling building the fluid from the Surface Suction Pump interfaces with 2" and 1-1/2" schedule 40 stainless steel piping belonging to the Feed Tank Fill System.

The Surface Suction Pump interfaces electrically with 480V, 3ø, 60 cycle power from circuit 7 of the 480V distribution panel PDP-2B located on the 328' Elevation of the Auxiliary Building. The 480 Volts is stepped down through a 15KVA transformer to 240V 3ø 60Hz, to a motor starter box on the east wall of 347' elevation of the Fuel Handling Building. Each phase of the 240V circuit is protected by a 15 AMP fuse.

Pump control will eventually be from a start/stop motor control center on the Cask Support Platform at the South end of B Fuel Pool, Panel CN-PNL-1.

2.0 SYSTEM LIMITATIONS

2.1 If the pump is to be shut down for an extended period (i.e. longer than approximately 3 hours) the discharge hose must be vented. This will keep the high vacuum which will form as water attempts to flow back to the RB Sump from unduly stressing the hose.

2.2 If debris clogs the pump suction screen, cavitation induced damage to the pump could occur. Therefore, if flow to the tanks is un-accountably low, or if pressure delivered to the SDS is lower than anticipated, the pump should be stopped and the line back-flushed to clear the pump inlet.

2.3 If the pump has been run since the last Reactor Building entry, the pump must be shutdown and back flushed with at least 12 gallons of non-radioactive water at least 24 hours prior to any subsequent containment entry.

3.0 OPERATION

System operation shall be per operating procedure 2104-8.0 Feed Tank Filling by Surface Suction; reference 1.2.3.

4.0 CASUALTY EVENTS AND RECOVERY PROCEDURES

4.1 Casualty Events

The only significant casualty event possible in this system is a breech of pressure boundary experienced during pumping of Reactor Building sump water to the SDS Feed Tanks. The result of this scenario would be a release of containment sump water to either the Reactor Building elevations 305' or 347' or to the 347' elevation of the Fuel Handling Building.

4.2 Design Features to Mitigate Effects of Casualty Events

During the transfer of Reactor Building sump water to the Fuel Pool Waste Storage System the operator controlling the on/off switch for SWS-P-1 will monitor the pump discharge pressure CN-PI-FL-01 (ref. 2.3) located on the SDS prefilter inlet. It can then be concluded that a hose or pipe leak will result in a loss of pres- sure as indicated on CN-PI-FL-01 and will be secured immediately by de-energizing SWS-P-1. However, an undetected leak located in the Reactor Building will result in increased surface contamination in the area of the leak but no off-site exposure. The resulting exposure to on-site personnel is minimized by (1) no pumping operations within 24 hours prior to personnel entry into the containment, (2) RB atmosphere purges during all containment RB entries and, (3) back flushing of all process lines after pumping. Standing water will be redirected to the containment sump via the floor drains.

Unchecked leakage of containment sump water on to the Fuel Handling Building 347' elevation floor will be directed to the Auxiliary Building waste collection system via the floor drains. A process pipe leak in the Fuel Handling Building (resulting from a 5 minute undetected guillotined rupture of a 1-1/2" transfer pipe resulting in a 371 gallon spill, ref. 1.2.4) results in a worst case off-site exposure of approximately 2200 times smaller magnitude than that resulting from the rupture of a Waste Gas Decay Tank as analyzed in the TMI-2 FSAR. (See also SDS Technical Evaluation Report Section 7.2)

5.0 SURVEILLANCE

Pump Surveillance will be by occasional non-routine visual observation on containment entries subsequent to entry no. 9. (April 30, 1981). Portions of the Surface Suction Pumps' discharge hose and power (electrical) cable may be observed from closed circuit TV cameras located inside the Reactor Building.

6.0 ACCEPTANCE TESTING

The Surface Suction Pump was given a continuous duty test run between 1400 4/25/81 and 1210 4/26/81. Between the hours of 0730 and 1200 on 4/26/81 the pump, discharge hose, Feed Tank Fill Piping, and SDS Filter Manifold Piping were flow tested.

The first test, from the Surface Suction pump sitting in a 6 X 6 Epicor liner, water level at EL 340', delivered 40.7 gpm to a 55 gallon drum located at EL 350', thus confirming the unrecoverable head loss in the hose and fittings of 152 ft. at 40.7 gpm. The second test, from the Surface Suction Pump sitting in the 6 X 6 Epicor liner, water level at EL 340', delivered 28 gpm to a 55 gallon drum located at EL 345', thus confirming the unrecoverable head loss in the hose, fittings, hard piping, SDS Filter Manifold, etc of 192 ft. at 28 gpm. Subsequent tests through the system piping to the SDS Feed Tanks were conducted with varying positions of SDS Valve FL-5 (pre-filter inlet) to create data indicative of operation with both filters clogged (i.e., 20 psid across each filter).

Extrapolation of this data to correct sump level and tank farm inlet piping yields flow rates from 27 gpm (clean filters) to 17 gpm (dirty filters), 33 gpm filters bypassed.

SURFACE SUCTION SCHEME

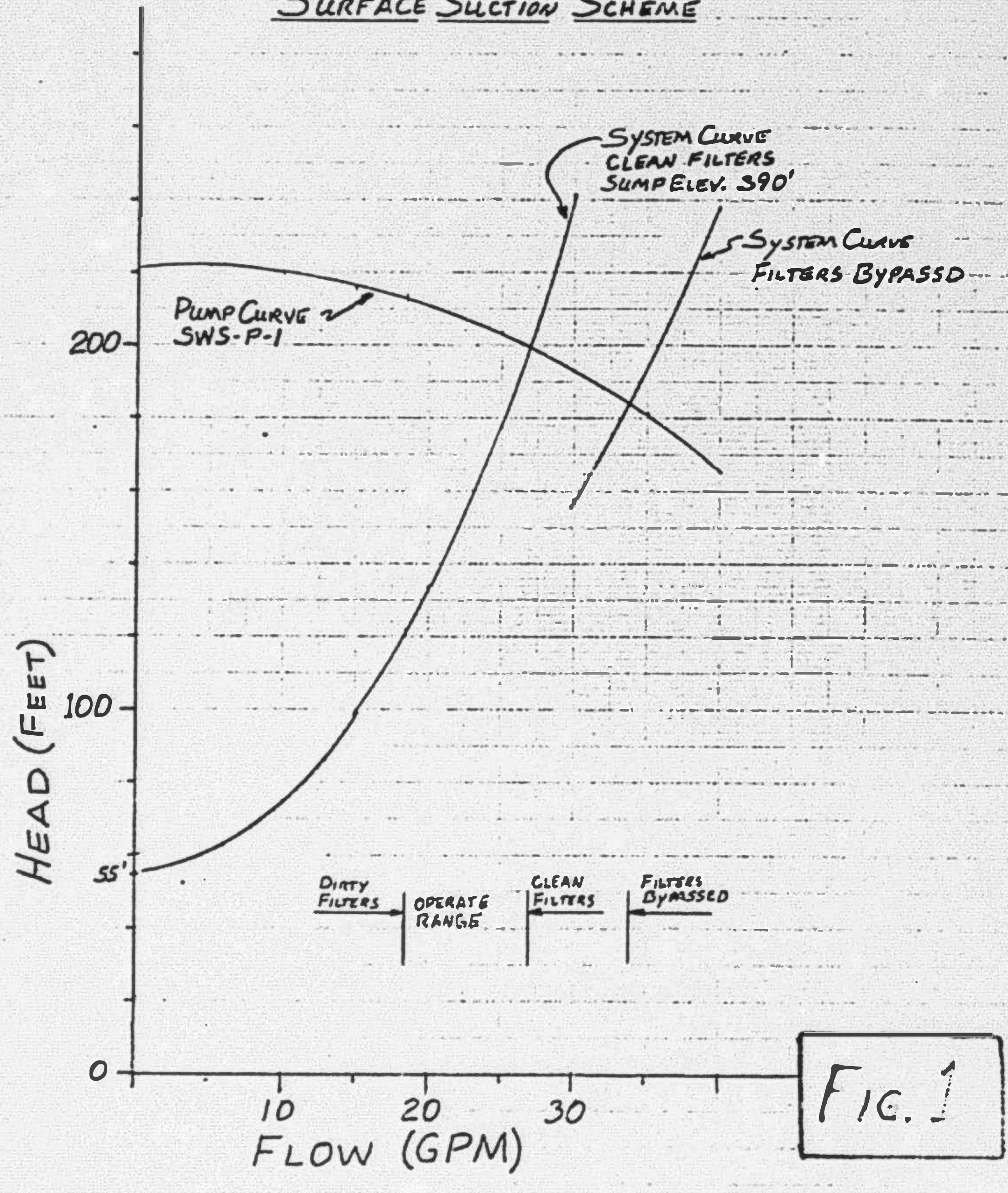
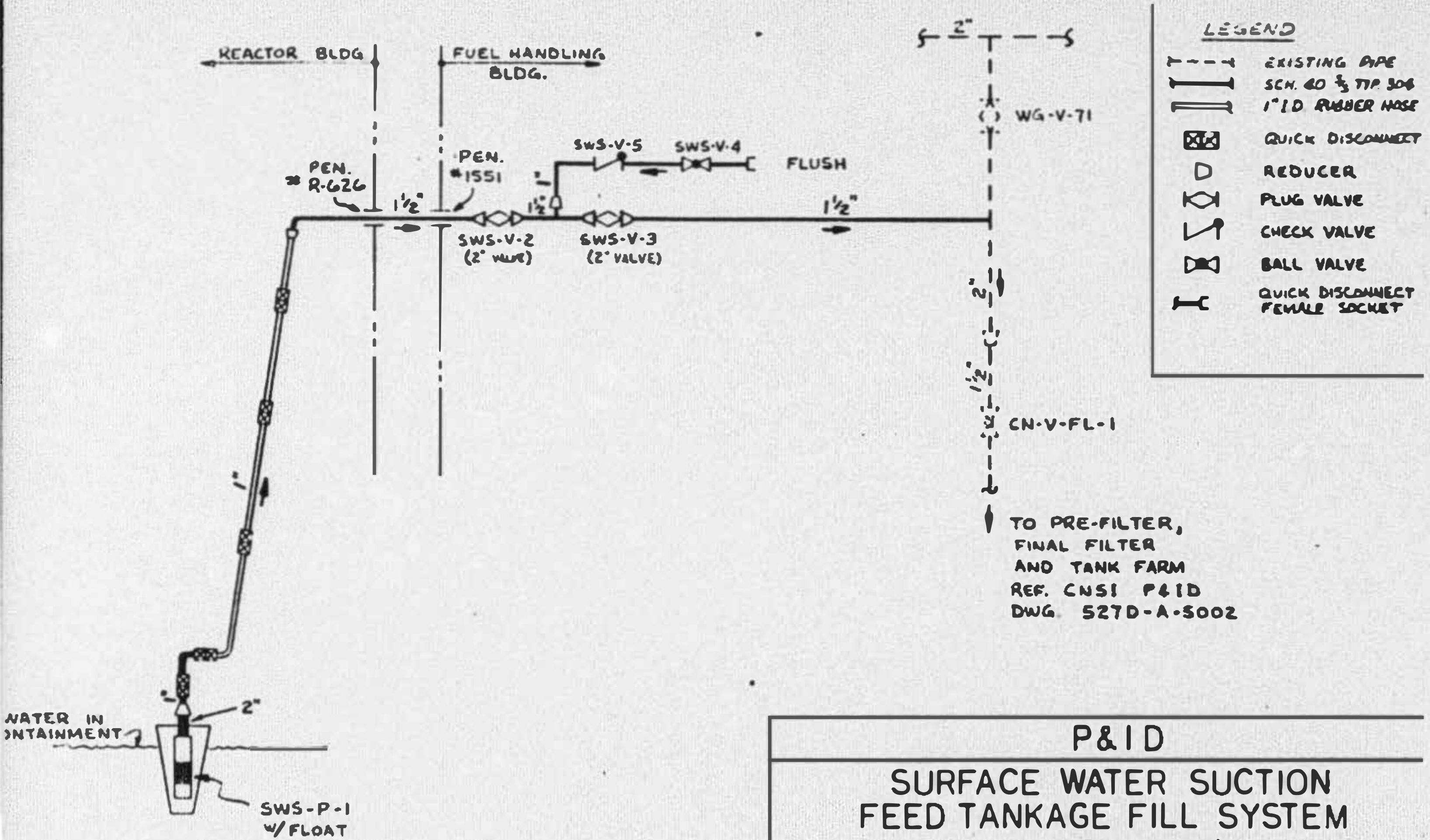


FIG. 1

30 APRIL 1981
Hal Beite



P&ID

SURFACE WATER SUCTION FEED TANKAGE FILL SYSTEM (SUMP SUCKER)

REV. 2			REV. 1			REV. 0			DWG NUMBER	REV
BY	CSE	CPE	BY	CSE	CPE	BY	CSC	CPE	RSE-027	0
						JHA				

Appendix No. 13

to

Submerged Demineralizer System

System Design Description

Title

Process Control Program

Limiting Parameters

SUBMERGED DEMINERALIZER SYSTEM

Summary of Process Control Program

Parameter	Basis	Limit
Pre Filter D.P.	Mechanical Performance	* $\underline{20}$ psi
Final Filter D.P.	Mechanical Perforamance	* $\underline{20}$ psi
Tank Farm Liquid Level	90% Capacity (Admin. Limit)	$\leq$54,000 gallons
SDS Flow Rate	Residence Time	$\leq$5 gpm
Liner #1 Curie Deposition	Admin. limit based on DOE Task Force	60,000 Ci Cs 2,000 Ci Sr
Liner #2 Curie Deposition	Admin. limit based on DOE Task Force	60,000 Ci Cs 2,000 Ci Sr
Liner #3 Curie Deposition	Admin. limit based on DOE Task Force	60,000 Ci Cs 2,000 Ci Sr
Liner #4 Curie Deposition	Admin. limit based on DOE Task Force	60,000 Ci Cs 2,000 Ci Sr
SDS Post Filter D.P.	Mech. Performance	25 PSID
SDS Post Filter Radiation Level	Rad. Levels	*200 mr/hr on filter housing
RCBT Volume	90% Capacity (Admin. Limit)	* 72,000 gallons
SDS Effluent to EPICOR II	Assures < luc/cc of primary long-lived isotopes to permit dewatered burial	$<2.85 \times 10^2$uc/ml (Cs + Sr)
	or	
	Deposits < 13.6 Ci Sr^{90} to ensure 6 x 6 will not to be Type "B" shipment	$<1.4 \times 10^{-1}$uc/ml Sr^{90}
	and	
	Deposits <20ci γ emitters to permit bare handling of 6 x 6 at <20R/hr	$<2 \times 10^{-1}$uc/ml γ - emitters
SDS Effluent Recycle	Minimize curved loading in Epicor II	*>0.2uc/ml
PWST	Per PEIS, as long as PWST radiation levels are acceptable	* $\frac{Ai}{MPCi} \leq 6.4 \times 10^6$

*Tentative, not firm

Parameter	Basis	Limit
EPICOR II Batch Size	minimize Na^+ breakthrough	25,000 gallons
Fuel Pool Cleanup IX Ci Deposition	1 uCi/gm Curies with t1/2 5 yrs. to permit dewatered shallow land burial	.18 Ci/liner
Fuel Pool Quality: - pH	Corosion	8.5 - 10.0
- boron Conc.	Solubility	3,500ppm B, max.
- Na Grade	Minimize Cl^-	Reactor Coolant Grade Na OH
- Cl^-	Corrosion	5.0 ppm, max.
- F^-	Corrosion	5.0 ppm, max.
- Suspended Solids	Pool Clarity	1.0 ppm, max.
- Turbidity	Pool Clarity	1 NTU, max.
- Gross B γ	Allow use of process water and small leaks from SDS operation, and minimize Pool Water recontamination and surface dose rates.	1×10^{-5} uCi/ml max. excl. H_3

* Tentative, not firm

Appendix No. 14

to

Submerged Demineralizer System

System Design Description

Title

Monitor Tank

System Design Description

DIVISION II

SYSTEM DESI N DESCRIPTION

OF THE

SUBMERGED DEMINERALIZER

SYSTEM FEED AND MONITOR TANK

SYSTEM

(Bechtel Dwg. No. 2-M74-SDS01)

N

NO.	DATE	REVISIONS	BY	CH'K	ENG'R	PROJ ENGR	APPR
3	1-20-81	Issued for GPUSC Review and Comment	ER	[illegible]	[illegible]	[illegible]	—
2	9-19-80	Issued for Chief Nuclear Review and Approval	ER	[illegible]	TMP	—	—
1	9-8-80	Issued for Project Review	ER	[illegible]	TMP	—	—

CHIEF ENGR —

ORIGIN			
ENC	BECHTEL	GENERAL PUBLIC UTILITY SERVICE COR ORATION THREE MILE ISLAND - UNIT 2	JOB NO 13587
			DOCUMENT NO. 2-M72-SDS01 — REV C
			SHEET 1 OF 15

SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.	SHEET	LATEST REV.
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13	C												
14	C												
15	C												

BECHTEL

REVISION STATUS SHEET

DOCUMENT TITLE: DIVISION II SYSTEM DESIGN DESCRIPTION OF THE SUBMERGED DEMINERALIZER SYSTEM FEED AND MONITOR TANK SYSTEM

JOB 13587	REV
DISCIPLINE Mechanical	C
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SYSTEM DESIGN DESCRIPTION

DIVISION II

1.0 DESIGN DESCRIPTION

1.1 SUMMARY

The Submerged Demineralizer System Feed and Monitor Tank System is a temporary system capable of collecting and monitoring decontaminated liquid effluent from the Submerged Demineralizer System (SDS) and transferring it to the Processed Water Storage and Recycle System (PW). The Submerged Demineralizer System processes, by filtration and demineralization, highly contaminated waste water from the containment sump, various liquid radwaste storage tanks, and the reactor coolant system.

The SDS Feed and Monitor Tank System components include the SDS Monitor Tanks, SDS Monitor Tank Transfer Pumps, and associated instrumentation, piping, and valves.

1.2 REFERENCES

1.2.1 Piping and Instrument Diagram, SDS Feed and Monitor Tank System, Drawing 2-M74-SDS01.

1.2.2 General Arrangement, SDS Monitor Tanks, Fuel Handling Building, EL. 305'-0", Drawing 2-POA-6201.

1.2.3 Piping Isometric, Submerged Demineralizer System, Aux. and Fuel Handling Bldg., Drawing 2-P60-SDS01.

1.2.4 Piping Isometric, Submerged Demineralizer System, Aux. and Fuel Handling Bldg., Drawing 2-P60-SDS02.

1.2.5 Piping Isometric, Submerged Demineralizer System, Aux. and Fuel Handling Bldg., Drawing 2-P60-SDS03.

1.2.6 Piping Line Index, Standard 13587-2-P-002.

1.2.7 (2) 12,000 Gallon, 96" O.D. x 32'-0" Straight Shell Water Storage Tanks, Buffalo Tank, Drawing 2-M100A-00001-01.

1.2.8 SDS One Line Diagram, Drawing 2-E21-SDS01.

1.2.9 Schematic Diagram, SDS Monitor Tank Transfer Pump P-1A, Drawing 2-E76-SDS01.

1.2.10 Schematic Diagram, SDS Monitor Tank Transfer Pump P-1B, Drawing 2-E76-SDS02.

1.2.11 Schematic Diagram, SDS Monitor Tank Inlet Valves, Drawing 2-E76-SDS03.

1.2.12 SDS Miscellaneous Instrumentation and Alarms, Drawing 2-E76-SDS04.

1.2.13 Loop Diagram, SDS Monitor Tank T-1A Level, Drawing 2-J75-SDS01.

1.2.14 Loop Diagram, SDS Monitor Tank T-1B Level, Drawing 2-J75-SDS02.

1.2.15 Loop Diagram, SDS Transfer Pump P-1A Discharge, Drawing 2-J75-SDS03.

1.2.16 Loop Diagram, SDS Transfer Pump P-1B Discharge, Drawing 2-J75-SDS04.

1.2.17 Loop Diagram, SDS Monitor Tank T-1A Low Level Trip, Drawing 2-J75-SDS05.

1.2.18 Loop Diagram, SDS Monitor Tank T-1B Low Level Trip, Drawing 2-J75-SDS06.

1.2.19 Logic Diagram, SDS Feed and Monitor Tank Transfer Pumps, Drawing 2-J77-SDS01.

1.2.20 Logic Diagram, SDS Feed and Monitor Tank Inlet Valves, Drawing 2-J77-SDS02.

1.2.21 Logic Diagram, SDS Feed and Monitor Tank Alarms, Drawing 2-J77-SDS03.

1.2.22 P&ID, Demineralized Service Water, Drawing 2-M74-DW01.

1.2.23 P&ID, Processed Water Storage and Recycle System, Drawing 2-M74-PW01.

1.2.24 HVAC, Partial Plans, Drawing 2-POH-001.

1.2.25 Burns & Roe Flow Diagram, Auxiliary Building Emergency Liquid Clean-Up System (EPICOR II), Recovery Drawing M006.

1.2.26 Instrument Rack Layout, Instrument Rack SDS-R-1, Drawing 2-J71-SDS01.

1.2.27 Instrument Rack Layout, Instrument Rack SDS-R-2, Drawing 2-J71-SDS02.

1.2.28 Panel Drawing, SDS Feed and Monitor Tank, Panel SDS-LCP-1, Drawing 2-J73-SDS01.

1.2.29 Panel Drawing, SDS Feed and Monitor Tank, Panel SDS-LCP-2, Drawing 2-J73-SDS02.

1.2.30 Instrument Installation Detail, SDS Monitor Tank Transfer Pump P-1A Discharge, Drawing 2-J74-SDS01.

1.2.31 Instrument Installation Detail, SDS Monitor Tank Transfer Pump P-1B Discharge, Drawing 2-J74-SDS02.

1.2.32 Instrument Installation Detail, SDS Monitor Tank T-1A, Drawing 2-J74-SDS03.

1.2.33 Instrument Installation Detail, SDS Monitor Tank T-1B, Drawing 2-J74-SDS04.

1.2.34 Level Setting Diagram, SDS Monitor Tank T-1A, Drawing 2-J78-SDS01.

1.2.35 Level Setting Diagram, SDS Monitor Tank T-1B, Drawing 2-J78-SDS02.

1.2.36 Raceway Drawing, SDS Grounding and Raceway, Drawing 2-EOR-6201.

1.2.37 Bill of Materials, Local Control Panel SDS-LCP-1, Drawing 2-EBO-SDS01.

1.2.38 Bill of Materials, Local Control Panel SDS-LCP-2, Drawing 2-EBO-SDS02.

1.2.39 Outline Drawing, SDS Monitor Tank Transfer Pumps, Drawing 2-M080A-00001-01.

1.2.40 Instruction Manual, SDS Monitor Tank Transfer Pumps, Drawing 2-M080A-00004-01.

1.3 DETAILED SYSTEM DESCRIPTION

1.3.1 Process System Flowpaths

The SDS Monitor Tanks, SDS-T-1A and SDS-T-1B, collect processed water from the SDS Polishing Ion Exchanger. The effluent is routed to the tanks via separate 1½-inch influent lines, allowing the capability for selection of either tank for filling operations. Each influent line contains a motor operated isolation valve. These valves, SDS-V002A and SDS-V002B, automatically isolate their respective tank when the level transmitter for the associated tank senses a high liquid level. These valves are interlocked so that both valves cannot be open at the same time. Hand switches associated with these valves are provided for remote manual operation.

Manually operated valves, SDS-V025A and SDS-V025B, provide redundant isolation when used in conjunction with the above noted valves, SDS-V002A and SDS-V002B.

Monitor tank overflow and drain line piping is routed to an existing floor drain in the Fuel Handling Building from where it is routed to the Auxiliary Building Sump via the existing Auxiliary Building Drainage System. Vents from the monitor tanks are routed to an exhaust duct in the Fuel Handling Building HVAC System.

Monitor tank transfer pumps, SDS-P-1A and SDS-P-1B, take suction directly from the monitor tanks. Transfer pump suction piping is 2-inch diameter and allows selection of either tank as the source of water. Isolation valves SDS-V026A, SDS-V026B, and SDS-V003 are provided on the crossover line of the pump suction piping to permit the correct monitor tank/transfer pump alignment to be selected. The crossover line is also equipped with a Demineralized Service Water System tie-in to provide the capability for flushing system piping. Each transfer pump suction line is equipped with a Wye-type strainer and a pressure test connection.

Transfer pump discharge piping is 2 inches in diameter and allows selection of either pump for water delivery functions. Discharge piping is equipped with a local pressure gauge and a pressure transmitter for remote indication. From the pumps, a 2-inch main discharge header is routed through the Fuel Handling Building and Auxiliary Building, into the Unit 1/Unit 2 Corridor and finally through the yard to the Processed Water Storage and Recycle System. The main discharge line contains a flow totalizer and tie-in connections to the Auxiliary Building Emergency Liquid Cleanup System (EPICOR II) and the Submerged Demineralizer System.

A 1½-inch recycle line is routed from each pump discharge to the monitor tanks. Correct valve lineup will allow selection of either pump to recycle to either tank. Sample lines are routed from each recycle line to a sample sink adjacent to the pumps. From the sample sink, the effluent is directed to an existing floor drain in the Fuel Handling Building.

1.3.2 Major System Components

1.3.2.1 Monitor Tanks

Processed water from the Submerged Demineralizer System is stored in two 12,000-gallon monitor tanks that are located at Elevation 305'-0" of the Fuel Handling Building, in an area known as the "model shop." The monitor tanks are 8 feet in diameter, have a straight shell height of 32 feet, are mounted vertically, and are manufactured of SA-240, Type 304L stainless steel. Tanks are designed and fabricated in accordance with the requirements of API-650. A structural restraint system is provided for the monitor tanks to prevent their complete collapse during a seismic event. The structural restraint system consists of steel framework for bracing the upper portion of the tanks, along with anchor bolts and hold-down lugs for supporting the base. Mixing of the liquid within the tanks is accomplished by pump recirculation. A mixing eductor system capable of recirculating the equivalent of three tank volumes in approximately 3 hours is used in each tank to provide representative sampling capability. The eductor system consists of a single 1½-inch Schutte and Koerting Co. Type 268 eductor and associated piping and supports.

1.3.2.2 Monitor Tank Transfer Pumps

Monitor Tank Transfer Pumps SDS-P-1A and SDS-P-1B take suction directly from the monitor tanks. The pumps are single-stage horizontal centrifugal type with mechanical seals and casing drains. Pump casings are manufactured of ASTM A296, Grade CF8M, stainless steel.

Pumps are driven by 5 hp motors which are powered from 480 volt local starters.

1.3.3 Process System Design

The system design temperature range is 40-120 F. Primary design pressure for the system piping, valves, and monitor tank transfer pumps is 150 psig. Design pressure for the monitor tanks is atmospheric.

System piping and valves are manufactured of stainless steel.

1.4 SYSTEM PERFORMANCE CHARACTERISTICS

The maximum flow rate of the influent to the monitor tanks from SDS is 15 gpm.

The monitor tank transfer pumps have a design capacity of 50 gpm at approximately 111 feet total dynamic head.

The normal operating pressure range (unthrottled) at the discharge of the transfer pumps is 25 to 60 psig. Since transfer pump discharge pressure varies with the water level in the monitor tanks, transfer pump shutoff may occur in the normal operating range.

1.5 SYSTEM ARRANGEMENT

The monitor tanks and monitor tank transfer pumps are located in the northwest corner of the Fuel Handling Building, at Elevation 305'-0" (as shown on Reference 1.2.2) in an area known as the "model shop."

Tanks are mounted vertically, and are located 11 feet apart centerline to centerline. A 20-inch manway is provided on the side of each tank as a means for personnel access, for surveillance, inspection, and maintenance purposes.

Space is provided around the tanks and pumps for future shielding if required.

Liquid retention curbing is also provided around the tanks and pumps to retain spills.

Controls for the monitor tank transfer pumps are provided at local control panel SDS-LCP-1, and at local starters SDS-STR-1 and SDS-STR-2, located, respectively, at Elevation 347'-6" and 305'-0" in the Fuel Handling Building. Controls for the monitor tank inlet motor operated isolation valves, SDS-V002A and SDS-V002B, are provided at local control panel SDS-LCP-1.

1.6 INSTRUMENTATION AND CONTROL

1.6.1 Local Control Panel

The primary control for the system is accomplished from local panel SDS-LCP-1, located at Elevation 347'-6" in the Fuel Handling Building. Devices mounted on this panel include the following:

a. Indicators for the liquid level in the monitor tanks and the discharge pressure of the transfer pumps.

b. Hand switches and indicator lights for the motor operated isolation valves.

c. Hand switches and indicator lights for the monitor tank transfer pumps.

d. Monitor tank/transfer pump selector switch.

Local control panel SDS-LCP-2, located at Elevation 305'-0" in the Fuel Handling Building, is equipped with level indicators for the monitor tanks.

1.6.2 Annunciator Panel

Alarms for high/low tank level are included on the CNSI Annunciator Panel, located at Elevation 347'-6" in the Fuel Handling Building.

1.6.3 Level Transmitters

Differential pressure transmitters (SDS-LT-1 and SDS-LT-3) are provided to measure the liquid level in the monitor tanks. Their output is transmitted to the level indicators described in Section 1.6.4 and the level switches described in Section 1.6.6. The output signal is 4-20 mA dc and a range of 0-400 inches H_2O.

1.6.4 Level Indicators

Monitor tank level indicators, SDS-LI-1A and SDS-LI-3A are provided on each of the local control panels described in Section 1.6.1. The input signal is 4-20 mA dc and the scale is 0-400 inches H_2O.

1.6.5 Selector Switch

Selector switch, SDS-KHS-11 is provided on local control panel, SDS-LCP-1 (described in Section 1.6.1), to ensure that the pump will trip on low tank level for each monitor tank/transfer pump combination.

1.6.6 High/Low Level Switches

A dual-setpoint electronic bistable is provided in each monitor tank level transmitter loop. The high setpoint (high level) will trip the associated monitor tank inlet motor operated valve (SDS-V002A or SDS-V002B) and actuate an alarm in the main control room panel, SPC-3. The low setpoint (low level) will activate an alarm on the CNSI annunciator panel. (This window is common for both the high and low level alarms.) The bistables are located in local control panel SDS-LCP-1.

1.6.7 Low-Low Level Switches

Level switches (capacitance type), SDS-LSLL-11 and SDS-LSLL-12, are provided to trip or lock out the aligned transfer pump when a monitor tank low-low liquid level condition exists.

1.6.8 Position Indicators

Position indicator lights, SDS-KL-1 and SDS-KL-3, are provided for the monitor tank inlet motor operated isolation valves (SDS-V002A and SDS-V002B) on control panel SDS-LCP-1.

1.6.9 Hand Switches

Hand switches (SDS-KHS-1 and SDS-KHS-3) and (SDS-KHS-5 and SDS-KHS-7) are provided, respectively, for the following components:

a. Monitor tank inlet motor operated isolation valves.

b. Monitor tank transfer pumps.

In addition to the hand switches indicated above, hand switch SDS-KHS-11, located on control panel SDS-LCP-1, is provided to choose the correct monitor tank/transfer pump alignment.

Local hand switches (SDS-KHS-5A and SDS-KHS-7A) are provided for the transfer pumps on their respective local starters that are located at Elevation 305'-0" in the Fuel Handling Building.

1.6.10 Pressure Test Connections

The suction line of each transfer pump is equipped with a pressure test connection to verify pump performance.

1.6.11 Pressure Transmitters

Pressure transmitters (SDS-PT-9 and SDS-PT-10) are provided on the discharge of the transfer pumps to sense pump discharge pressure. Their output is transmitted to the pressure indicators described in Section 1.6.12. The output signal is 4-20 mA dc and the range is 0-100 psig.

1.6.12 Pressure Indicators

Transfer pump pressure indicators, SDS-PI-9 and SDS-PI-10, are provided on local control panel SDS-LCP-1, described in Section 1.6.1. The input signal is 4-20 mA dc and the scale is 0-100 psig.

1.6.13 Pressure Gauges

The discharge lines of the transfer pumps are equipped with pressure gauges SDS-PI-6 and SDS-PI-8. Their range is 0-100 psig.

1.6.14 Flow Totalizer

The common transfer pump discharge header is equipped with flow totalizer, SDS-FM-13, to measure the quantity of liquid discharged from the system. Since the totalizer can be reset to zero, a batch may be discharged and the quantity recorded by the operator. The totalizer can then be rezeroed for the ensuing water transfer operation.

1.6.15 Instrument Racks

Instrument racks are provided for transfer pump discharge pressure instrumentation. The instrumentation for transfer pump SDS-P-1A is located on rack SDS-R-1 and the instrumentation for transfer pump SDS-P-1B is located on rack SDS-R-2. The instrument racks are located at Elevation 305'-0" in the Fuel Handling Building.

1.7 SYSTEM INTERFACES

The Submerged Demineralizer System Feed and Monitor Tank System interfaces with the following systems:

a. Submerged Demineralizer System

b. Processed Water Storage and Recycle System

c. Auxiliary Building Emergency Liquid Cleanup System (EPICOR II)

d. Demineralized Service Water System

e. Fuel Handling Building HVAC System

f. Auxiliary and Fuel Handling Building Floor Drainage System

The system is designed to provide a temporary recovery system capable of collecting and monitoring processed water from SDS. Sample points located downstream of the monitor tank transfer pumps provide the capability for monitoring the liquid effluent. If it is determined that the effluent is not suitable for discharge to the Processed Water Storage Tanks, additional cleanup may be achieved by transferring the effluent to either EPICOR II or recycling through SDS for further processing.

The Demineralized Service Water System tie-in provides the capability for flushing system piping.

Monitor tank vents are routed to the existing Fuel Handling Building HVAC System exhaust to control the release of airborne radioactivity to the "model shop."

The monitor tank overflow and drain lines are routed to an existing floor drain in the Fuel Handling Building to mitigate the effects of overfilling the tanks and to facilitate draining the tanks for maintenance purposes.

2.0 SYSTEM LIMITATIONS, SETPOINTS, AND PRECAUTIONS

The monitor tanks are provided with level transmitters (described in Section 1.6.3) to sense either a high or low liquid level. If a high liquid level condition exists, an alarm will annunciate on the main control room panel, SPC-3, and on the CNSI annunciator panel described in Section 1.6.2. If a low liquid level condition exists, an alarm will annunciate on the CNSI annunciator panel.

The high level setpoint and the low level setpoint are 364 inches and 16 inches, respectively, from the bottom of the tank.

The monitor tanks are also provided with a separate level switch (described in Section 1.6.7) that trips the pump in operation when a low-low liquid level condition exists. The low-low level setpoint associated with the level switch is located 6 inches from the bottom of the tank.

System operators should be aware of the liquid level in the tanks by observing the level indicators located on the control panels described in Section 1.6.1. Tank level indications are based on a zero reference (low level pump trip) of 6 inches above the actual tank low point.

Operators should also be aware of the monitor tank/transfer pump alignment during pumping operations and the position of motor operated isolation valves (SDS-V002A and SDS-V002B) located on the influent lines to the tanks.

3.0 OPERATIONS

3.1 INITIAL FILL

Prior to filling the preselected tank, the tank vent and drain system must be operable and the proper valve lineup selected. Interlocks to valves must also be verified.

Prior to initial transfer pump operation, the high point vents must be opened to enable air trapped in the system piping to escape.

To avoid contamination or fouling of the flow totalizer, SDS-FM-13, system piping must be thoroughly flushed prior to initial totalizer installation.

3.2 STARTUP

When the monitor tank filling process has been secured, the proper valve lineup must then be selected on the suction and discharge sides of the pumps. This includes the recirculation line associated with the pump selected.

Administrative controls must be used to verify the correct valve lineup prior to pumping operations and to ensure that valves are not inadvertently closed during water delivery operations.

3.3 NORMAL OPERATION

Normal operation is on a batch mode basis. The batch size is approximately 12,000 gallons and is determined by the capacity of the SDS ion exchanger beds.

After one monitor tank has received a batch, it is isolated and the contents recirculated, the associated sample line purged, and the effluent sampled.

Based on the results of the sample, the tank contents are either transferred to a processed water storage tank for storage and reuse, or routed to EPICOR II or back to SDS for reprocessing.

While one tank is being recirculated, sampled, and transferred, the second tank is available to receive SDS effluent.

Operation of the monitor tank transfer pumps shall be in accordance with Reference 1.2.40.

The system has the capability to recirculate batches to SDS if a maximum radiation limit of (by GPUSC) µCi/ml is exceeded.

Automatic control of the system is used where necessary for safe system operation, such as control of the liquid level in the monitor tanks. Other operations are accomplished by manual and remote manual control since operations of these types mainly involve intermittent batch-type operations.

3.4 SHUTDOWN

Flow to a monitor tank may be discontinued by shutting the associated manually operated valve, SDS-V025A or SDS-V025B, or the associated motor operated valve, SDS-V002A or SDS-V002B. The SDS Polishing Unit Dewatering Pump in operation must also be shut down.

3.5 DRAINING

The monitor tanks are equipped with an externally sloped bottom (¼ inch per foot) to provide the capability to drain the full contents of each tank to the existing drainage system.

Transfer pumps are equipped with casing drains.

The 2-inch process line to the Processed Water Storage Tanks contains a low point drain.

3.6 REFILLING

Prior to refilling the preselected tank, the tank vent and drain system must be operable and the proper valve lineup selected. Valve interlocks should also be verified.

3.7 INFREQUENT OPERATIONS

Redundant transfer pumps are provided. Therefore, with one pump out of service, the other transfer pump may be used for pumping operations. This operation requires that the monitor tank/transfer pump selector switch, SDS-KHS-11, be placed in the proper position and the isolation valves located on the transfer pump suction piping be properly aligned.

3.8 TRANSIENT OPERATIONS

If a loss of power transient were to occur, motor operated isolation valves SDS-V002A and SDS-V002B would fail as-is. Therefore, if a loss of power transient were to occur while a monitor tank is being filled, the motor operated isolation valve (SDS-V002A or SDS-V002B) associated with the tank being filled, would fail in the open position. This would increase the possibility of overflowing the tank being filled. However, loss of system power would cause the high level alarm in the main control room to actuate on loss of power to the monitor tank level loop. Also, to mitigate the effects of such a transient, tank overflow lines are provided and routed to an existing floor drain in the Fuel Handling Building.

During a loss of power transient, operator action should involve manual isolation of the monitor tanks. A loss of power transient would also interrupt monitor tank transfer pump operation.

4.0 CASUALTY EVENTS AND RECOVERY PROCEDURES

4.1 CASUALTY EVENTS

Possible system casualty events include the following:

a. System leakage and rupture

b. High radiation level

4.2 DESIGN FEATURE TO MITIGATE EFFECTS OF CASUALTY EVENTS

Liquid retention curbing is provided around the tanks and pumps to retain spills caused by localized system leakage, and floor drains are provided in the Fuel Handling Building to mitigate the effects of a localized system rupture.

The system has the capability to recirculate batches to SDS if the radiation zone limitations for the area are exceeded.

4.3 RECOVERY PROCEDURES

Recovery from a system leakage or rupture casualty event would involve isolation of the leak and/or rupture, and collection of the spill. Recovery from a high radiation casualty event would entail recirculation of off-spec batches to SDS.

5.0 MAINTENANCE

5.1 MAINTENANCE APPROACH

The Submerged Demineralizer System Feed and Monitor Tank System is a temporary recovery system and, therefore, no major maintenance program is required.

Redundant transfer pumps, and a Demineralized Service Water System tie-in for flushing system piping, are provided to facilitate maintenance.

5.2 CORRECTIVE MAINTENANCE

If repair welding is done to any part or component of the system it will be done in accordance with the procedures used for initial construction. The specific part or component shall be isolated, drained, repaired, and hydrotested for the required amount of time and pressure. After hydrotest procedures have been completed, the part or component shall receive final flushing with demineralized water.

Transfer pump corrective maintenance shall be in accordance with Reference 1.2.40.

5.3 PREVENTIVE MAINTENANCE

Transfer pump preventive maintenance shall be in accordance with Reference 1.2.40.

5.4 INSERVICE INSPECTION

The system has no formal inservice inspection program.

Manways are provided on each monitor tank to provide the capability for personnel access.

6.0 ACCEPTANCE TESTING

Monitor tanks are shop hydrostatically tested in accordance with the requirements of Reference 1.2.7.

System piping and valves are field hydrostatically tested in accordance with the requirements of Reference 1.2.6.

Acceptance testing shall be in accordance with GPUSC procedures.