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244-AR VAULT INFORMATION MANUAL

Compiled by

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Research and Engineering Department

April 15, 1968

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244-AR VAULT INFORMATION MANUALI. INTRODUCTION

The Waste Management Program currently being incorporated by Atlantic Richfield Hanford Company provides for the removal and separation of the long-lived cesium and strontium from current and stored Purex high-level wastes⁽¹⁾. In support of Phase II of the project, the 244-AR Vault facilities^(2,3,4) were constructed under Project CAC-169. The vault facilities are designed to provide the capability of removing, treating and transferring Purex tank farm sludges to 221-B Plant for fission product removal, to provide interim storage for Purex Acid Waste (PAW) feed to 221-B Plant, and to receive and distribute the Neutralized High-level 221-B Plant Waste (NHW).

This manual is written to describe the facilities and equipment within the 244-AR Vault area. A general process description has been provided to acquaint the reader with the streams processed through the 244-AR Vault facilities.

II. PROCESS INFORMATION (See Figure II)A. Purex Acid Waste and Zirflex Acid Waste

High-level Purex Acid Wastes (PAW) and Zirflex Acid Waste (ZAW) are generated in the 202-A Plant during the separation of uranium and plutonium from irradiated aluminum-clad and Zircaloy II-clad nuclear reactor fuel elements. These acidic wastes contain significant quantities of the long-lived isotopes Cs-137 and Sr-90, as well as large quantities of various shorter-lived and stable isotopes. PAW or ZAW is transferred to the 221-B Plant through an encased stainless steel line via the 151-AX diverter station⁽⁵⁾ and the 244-AR Vault. Tank 001 in the 244-AR Vault serves as interim storage for the PAW or ZAW. PAW or ZAW is cooled in Tank 001 and is pumped upon demand to Tank 11-2 in B-Plant. From Tank 11-2, the PAW or ZAW undergoes feed preparation steps prior to waste fractionization by solvent extraction⁽⁶⁾.

B. Neutralized High-Level Waste

Neutralized High-level Waste (NHW) is generated during the 221-B Plant waste fractionization of PAW or ZAW by solvent extraction. The NHW is segregated into cerium-rare earth and cesium-bearing waste streams which are neutralized in TK-25-1 and TK-25-2, respectively. The segregated NHW wastes are periodically transferred to the Purex boiling waste tank farms 241-A and 241-AX through an encased transfer line via the 244-AR Vault and the 151-AX diverter station. Tank 244-AR-003 in the vault receives the NHW for interim storage and possible neutralization prior to distribution to the desired A or AX tank farm.

C. Removal and Processing of Stored Purex High-Level Wastes

The high-level acid wastes generated in Purex over the past eleven years have been neutralized to a pH of approximately 10 and routed through the 151-AX diverter station to underground storage in the 241-A and 241-AX farms. These alkaline wastes, containing 10 - 15 percent solids, have large quantities of both short-lived and long-lived radioisotopes. After several years of storage, the shorter-lived isotopes decay leaving the two longer-lived isotopes Sr-90 and Cs-137 and some intermediate-lived isotopes such as Ce-144. During the storage period, the solids which contain nearly 100 percent of both the strontium and the rare earth isotopes have settled out and formed a sludge layer on the bottom of the storage tanks^(8,9,10). The supernatant solution above the sludge layer contains nearly all of the cesium-137⁽¹¹⁾. Phase III of the Waste Management Program provides for the removal and separation of the cesium and strontium from the stored Purex high-level wastes to permit storage by in-tank solidification⁽¹²⁾. Tanks 002 and 004 in the 244-AR Vault, plus adequate routing system and sludge removal (sluicing) system, provide the capability for removing and transferring the stored Purex high-level waste to 221-B Plant for waste fractionization processing. The following is a general description of this function of the 244-AR Vault facilities.

1. 241-A Tank Farm Supernatant Solution Removal and Transfer

The supernatant solution (PSN) above the sludge layer in the Purex high-level waste tank farm 241-A contains the majority of the cesium to be removed during the B-Plant waste fractionization by ion exchange processing⁽⁶⁾. The PSN is removed from the underground storage tanks in 241-A farm by pumping to the 244-AR Vault 002 Tank and jetting through the 151-C diversion box to the 241-C-105 interim storage tank (a jumper has been provided so that the 002 vessel may be bypassed), or by pumping to TK-241-C-105 via the 151-C diversion box and the V-109 and A-032 lines. (See Section IV for the detailed routing system available.)

2. 241-A Tank Farm Sludge Removal

The sludge layer in the underground storage tanks of the 241-A tank farm is available for either sludge conditioning or sluicing upon the removal of the PSN solution.

a. Sludge Conditioning⁽¹³⁾

If the sludge is to be preconditioned within the sluice tank, raw water will be added to the tank and allowed to leach the soluble ions from the solids. This leaching operation will facilitate the subsequent sluicing operations. Prior to sluicing, the leach solution will be transferred to TK-241-C-105 to be processed by ion exchange in B-Plant.

b. Purex Sludge Waste Removal [Sluicing] (14,15)

The removal of the aged sludge wastes from the 241-A and AX tank farms is accomplished by the use of the 244-AR Vault sluicing facilities. These facilities consist of the 244-AR-002 slurry receiving tank with sluice pump, the 153-A transfer box, a sluice assembly located in either or both of the two sluice pits of the sluice tank, and a waste recovery pump located in the sluice tank pump pit. Sludge is removed from the sluice tank by using a high pressure sluice nozzle to produce a slurry. The slurry is pumped at approximately 660 gpm from the sluice tank by the waste recovery pump to the 244-AR-002 slurry receiving tank. The solids are settled from the slurry and the sluice pump returns the solution at approximately 600 gpm to the sluice nozzle. Recycling of the sluicing solution is continued until the desired quantity of sludge has been collected in the slurry receiving tank. At this time, the sluice pump is turned off and the remaining solution in the sluice tank is returned to the slurry receiving tank. The solids are settled and the solution (Purex Sludge Supernatant [PSS]) is decanted to TK-241-C-105. Rinse water is added to the slurry receiving tank to re-slurry the solids. The solids are settled and a portion of the rinse solution is returned to the sluice tank.

c. Sludge Acidification (6)

The Purex Sludge Waste (PSW) which has been collected in the slurry receiving tank is re-slurried using the remainder of the rinse solution. Approximately 20 percent of the slurry is pumped at approximately 50 gpm into the acidification tank (TK-244-AR-004) which contains 57 weight percent nitric acid. The slurry is agitated and digested at 90 C for several hours during which time the acid concentration is adjusted to approximately 0.1M. The solids are settled from the Purex Acidified Sludge (PAS) solution. The PAS solution is transferred to Tank 244-CR-003 through the 151-AX diverter station via a decant jet and an encased stainless steel line. Tank 244-CR-003 is the interim storage tank for PAS solution prior to B-Plant processing for the removal of strontium. The remaining 80 percent of the PSW slurry in the slurry receiving tank is similarly acidified in TK-244-AR-004. The remaining undissolved solids in the acidification tank are re-slurried and neutralized with 50 weight percent sodium hydroxide solution. The neutralized solids are then jettied to the slurry receiving tank and are recycled during the next sluicing cycle.

III. 244-AR VAULT FACILITIES

The 244-AR Vault facilities are located north of the 202-A Plant in the 200 East Area of the Hanford reservation. The vault facilities include a canyon building, an instrument building, a crane control room, a change house, a filter building, nitric acid and sodium hydroxide storage tanks, a vessel vent stack and exhaust fan, a canyon ventilation stack, a sluicing system, and a routing system. Figure III-1 shows the general layout of the facilities.

A. Canyon Building (Above Deck Level)

The 244-AR Vault canyon building is located approximately 140 feet west of the 241-A tank farm perimeter. The canyon building is a reinforced concrete structure 97 feet long by 21 feet wide. The walls of the canyon building are 1.5 feet thick and the inside of the canyon building measures 94 feet long by 18 feet wide and is 36 feet in height above the process cell cover blocks (see Figures III-2 and III-3). There are two personnel access doors measuring 7 feet high by 3 feet wide and 1-3/4 inches thick. Each door has been provided with a concrete shielded air lock. Equipment access to the canyon is provided through a 14-foot high by 12-foot wide opening in the east end of the canyon building. Two 3-inch thick motor-driven hollow steel doors have been provided to seal the access. Additional equipment access door shielding is provided by 18-inch thick concrete slabs which slide on a steel monorail outside the canyon building. The above-deck level equipment within the canyon building includes four 1-ton and one 20-ton hoists located on a remotely controlled overhead bridge crane (see Section V-F), an industrial wall periscope (see Section V-E), a closed circuit television system (see Section V-D), radiation monitoring equipment (see Section V-H), ventilation air inlet and exhaust ports, a canyon lighting system and power receptacles.

Reference prints: H-2-61991, 2, 3, 4, 5
H-2-62001

1. Ventilation Ports

Two inlet ventilation air ports are located in the roof of the canyon building. The ventilation air enters the roof ports, circulates through the space above the process cell cover blocks, and exhausts into Cell 3 through two 2.5 feet square concrete ducts located on the west end of the canyon building. Section V-G describes the heating and ventilation equipment.

2. Canyon Lighting System and Power Receptacles

The lighting system for the 244-AR Vault canyon building consists of fluorescent fixtures spaced around the inside circumference of canyon, two emergency light units located on the south canyon wall, and three high intensity incandescent lamps located on the overhead bridge crane. The emergency lighting system is discussed in Section VI and details of the fluorescent lighting system can be found on drawing H-2-62014.

Twelve 15A, 120 VAC power receptacles have been provided within the canyon. All the receptacles have been placed above the deck level and are approximately equally spaced around the inside perimeter of the canyon. Location details of the receptacles may be found on drawing H-2-62014.

B. Canyon Building (Deck Level and Below)

The majority of the equipment contained within the 244-AR Vault canyon building is found in the three process cells and the failed equipment storage area below the canyon deck level. The upper portion of the vault is separated from the three process cells by interlocking, removable concrete shielding blocks (top elevation - 682 feet) of six different widths. Each of these blocks is 5 feet thick by 12 feet long. Cell 3 has ten shielding blocks. Three of the Cell 3 shielding blocks cover the vessel vent heater and filter assemblies and are separated from the remaining seven blocks by a reinforced concrete partition, 5 feet high with an average width of 2 feet. Cells 1 and 2 each have seven blocks which cover the 002 slurry receiver tank and the 001 Purex acid waste storage tank. The failed equipment storage area is located next to Cell 1 on the east end of the canyon building and is covered by three 5-foot square concrete cover blocks, each of which is 2 feet thick. All the cover blocks are designed with recessed lifting bails so that they may be removed by the crane and stacked upon one another to provide access to the process cells. Each of the three process cells contains an 18-inch deep sump and an inter-cell sump overflow.

1. Cell 1

Cell 1 is located between Cell 2 and the failed equipment storage area at the east end of the vault. Cell 1 is 21 feet square by 32.75 feet deep (measured from the bottom of the cover blocks to the top of the tank pad). The 001 tank is centered within the cell and is supported by a reinforced concrete foundation 2.75 feet thick. Each of the cell walls is 2 feet thick. The west cell wall between Cells 1 and 2 contains a ventilation port which is 3.25 feet high by 5 feet wide. The ventilation port is horizontally centered in the cell wall and its top edge is located 8 feet below the bottom of the cell cover blocks. The ventilation air exhausts from the process area to the 291-AR filter building through a 2.7 feet high by 3 feet wide exhaust duct located 8 feet below Cell 1 cover blocks and 3 feet west of the east cell wall. Cell 1 contains:

- a. TK-244-AR-001 (see Section V-B-1)
- b. Sump Jet (see Section V-A-3)
- c. Wall Nozzles (see Section V-A-1)
- d. Permanent Piping (see Section V-A-2)
- e. Instrumentation (see Section V-A-5)
- f. Cell Spray System (see Section V-A-4)
- g. Radiation Monitoring Equipment (see Section V-H)

2. Cell 2

Cell 2 is located between Cells 1 and 3 of the 244-AR Vault canyon building and is 21 feet square by 32.75 feet deep (measured from the bottom of the cover blocks to the top of the tank pad). The 002 tank is centered within the cell and is supported by a reinforced concrete foundation 2.75 feet thick (tank pad elevation - 644 feet 3 inches). Each of the cell walls is 2 feet thick. The cell walls dividing Cell 2 from Cells 1 and 3 each have a ventilation air port which is 3.25 feet high by 5 feet wide. The top edges of the ventilation ports are located 8 feet below the bottom of the cell cover blocks and the ports are horizontally centered in the walls. Cell 2 contains:

- a. TK-244-AR-002 (See Section V-B-2)
- b. Sump Jet (See Section V-A-3)
- c. Wall Nozzles (See Section V-A-1)
- d. Permanent Piping (See Section V-A-2)
- e. Instrumentation (See Section V-A-5)
- f. Cell Spray System (See Section V-A-4)
- g. Radiation Monitoring Equipment (See Section V-H)

3. Cell 3

Cell 3 is located on the west end of the 244-AR Vault canyon building and has the inside dimension of 12 feet wide by approximately 32 feet long by 21 feet deep (measured from the bottom of the cover blocks to the top of the tank pad). The bottom of the cell is sloped to a low point (elevation - 655 feet 11-1/2 inches) located between the 003 and 004 tanks. The cell walls are constructed of reinforced concrete and are 2 feet thick. Two ventilation air inlet ducts exhaust in Cell 3 from the above-deck area. These ducts are located on the west wall of Cell 3 and are 2.5 feet square. The ventilation air exits Cell 3 through a ventilation hole 3.25 feet high by 5 feet wide located 8 feet below the cover blocks in the concrete wall between Cells 2 and 3. Cell 3 contains:

- a. TK-244-AR-003 (See Section V-B-3)
- b. TK-244-AR-004 (See Section V-B-4)
- c. Vessel Vent Equipment (See Section V-C)
- d. Sump Jet (See Section V-A-3)
- e. Wall Nozzles (See Section V-A-1)
- f. Permanent Piping (see Section V-A-2)
- g. Instrumentation (See Section V-A-5)
- h. Cell Spray System (See Section V-A-4)
- i. Radiation Monitoring Equipment (See Section V-H)

4. Failed Equipment Storage

The failed equipment storage area is located next to Cell 1 in the east end of the canyon building. There are three 4.5 foot diameter, 12-gauge, corrugated, galvanized pipes which extend 35 feet below the failed equipment cover blocks. Each of the storage tubes has been provided with a drain and a vent. The storage tube drains are constructed of 1/2" pipe and discharge to the Cell 1 floor. The storage tubes are vented to Cell 1 through 6" vent pipes located 22 feet above the storage tube bottom.

C. Service Building

The 244-AR Vault service building is located at the west end and attached to the south wall of the canyon building. The service building is 46.5 feet long by 22.5 feet wide by 15 feet high (see Figures III-2 and III-3). The building is constructed of steel framing with a sloped concrete roof and 3-inch thick insulated sheet metal siding. The service building contains a control room, a sample room, and a lavatory. The canyon and service area heating and ventilation supply system is located on the roof of the service building and is described in Section V-G.

1. Control Room

A 34 feet long by 22.5 feet wide control room is located in the west end of the service building. The control room is divided into the following localized equipment areas:

a. Jet Gang Valves (JGV)

The JGV stations are located along the north wall of the control room (canyon south wall) and are numbered 1 through 9 starting from the east end of the control room (see Figure III-3). The operation of the JGV station is explained in Section V-K.

b. Raw Water Control Station

The raw water for the process vessel cooling coils is controlled from the raw water control station located a few feet south of the JGV station in the control room (see Figure III-3). The raw water control valves within this station are manual valves with the exception of the TK-003 control valve DOV-003-1. The use of these valves is explained in the process vessel coil section for each vessel.

c. Steam Control Station

The steam control station is located in the northwest corner of the control room (see Figure III-3). The steam control station contains the PRV's, manual valves and pressure indicators required for reducing the 225 psig steam supply to 100 psig and 20 psig process steam for use in the 244-AR Vault operations. The process steam control station is described in Section V-N.

d. HVAC Instrument Panel, Transmitter and Converter Racks, and Process Instrument Panels

The heating and ventilation instrument panels, transmitter and converter racks, and the process instrument panels are centrally located in the control room a few feet south of the raw water control station (see Figure III-3). The west HVAC control panel contains the heating and ventilation instrumentation for the vault service building, crane control room, canyon building, and 291-AR filter building. The HVAC equipment and instrumentation

is described in Section V-G. The process, vessel vent, and HVAC transmitters and converters are located on racks between the HVAC control panels and the process instrument panels. The process instrument panels contain the controllers and indicators for the process and vessel vent equipment. The instruments located on these panels are described under each individual equipment piece section of this manual.

e. Instrument Air Dryer

The instrument air dryer is located at the west end of the HVAC instrument panels. The dryer is described in Section V-N.

f. Hydrogen Purge Air Control Station

The hydrogen purge air control station is located adjacent to the west wall of the control room. The station consists of four purge air rotameters with associated piping and valves for the control of the air flow rate to the four process vessels within the process cells. The flow ranges and valvings are given in Section V under each process vessel section.

g. Switch Gear and Motor Control Centers

The switch gear and motor control centers are located adjacent to the south wall of the control room. The motor control centers are numbered east to west and are referenced in Section V-N-1 along with the switch gear.

h. TK-A-30 Chemical Makeup

The chemical makeup tank (A-30) with associated piping, control, and monitoring instrumentation is located adjacent to the east wall of the control room. The aqueous makeup system is described in Section V-J.

2. Sample Room

The 12.25 feet long by 9.25 feet wide sample room is located at the northeast corner of the control room. The sample room has been equipped with 8-inch concrete shielding and an air lock to prevent the spread of contamination to other portions of the service building. The sample room contains the following equipment:

a. Sample Pits (See Figure III-4)

There are four process vessel sampler pits located in the floor along the north wall of the sample room. These pits are arranged east to west to provide sampling capability for the 001, 002, 003, and 004 process vessels, respectively. The pits are 2 feet 9-1/2

inches wide by 2 feet 7 inches long by 2 feet 9 inches deep (measured from the inside bottom to the top of the cover block) and are raised 1.25 feet above the sample room floor. Pits 2 and 4 have 2-1/4 inch thick lead shielding blocks, and Pits 1 and 3 have 5-1/2 inch thick shielding blocks. Each pit contains a drain with a 4-inch trap. The pit drain lines are connected to a common drain along with laboratory sink and sample room floor drain. The sample room floor drain is vented to the 002 sample pit. The common drain line discharges to the Cell 3 sump. Each pit contains a water spray system consisting of one 1/2-inch, G-35W-Fulljet spray nozzle and raw water control piping. All the sampler supply piping is located on the north wall above the pits. Details of the sampling equipment may be found in Section V-I.

Reference prints: H-2-62006, H-2-62069

b. Laboratory Sink

The laboratory sink is located on the south wall of the sample room. The sink is supplied with cold raw water and drains to the Cell 3 sump.

c. Floor Drain

The sample room concrete floor is sloped to drain into the centrally located 3-inch floor drain. The floor drain size is reduced to a 1-inch drain line which drains to the Cell 3 sump.

3. Radiation Monitoring Instrument Panel

The radiation monitoring (RM) instrument panel is located adjacent to the sample room air lock at the east end of the service building. The RM equipment pieces and their locations through the vault are given in Section V-H.

D. Crane Control Room

The crane control room is adjacent to the east end of the service building and is 7 feet from the canyon building (see Figures III-2 and III-3). The reinforced concrete room has inside dimensions of 10.5 feet wide by 8 feet long by 10 feet high. The east and west walls are each 1.25 feet thick, and the north and south walls are 1.5 and 0.75 feet thick, respectively. The roof is constructed of concrete and is sloped toward the south for drainage. Access to the room is through a 2 feet 9 inch wide by 7 feet high solid steel door 2 inches thick on the south side of the room. Ventilation air is supplied to the crane control room through a 10-inch by 6-inch duct from the control building. The ventilation air exhausts to the atmosphere through a 1-foot square duct located 1 foot from the floor on the east side of the south wall (see Section V-G - Ventilation Systems).

The crane control room contains an industrial wall periscope for remote viewing of operations within the canyon, a closed circuit television system also for remote viewing of canyon operations, a crane control console, lighting, and communication and power receptacles.

Reference prints: H-2-61994, H-2-62007, H-2-62030

1. Closed Circuit Television (See Section V-D)
2. Industrial Wall Periscope (See Section V-E)
3. Lighting, Communication, and Power Receptacles

The crane control room has four 100-watt fluorescent light fixtures with the control switch located next to the door on the south wall. An emergency flood light has been mounted in the west wall near the northwest corner of the room. A 6-inch single stroke gong alarm is mounted on the south wall and has been connected to the fire alarm circuit. A telephone has been provided and its junction box is located on the west wall. One 15A, 120 vac power receptacle has been placed on the south wall near the southwest corner of the control room.

Reference prints: H-2-62014

E. 244-AR Addition

The 244-AR addition is located 6 feet south of the 244-AR Vault service building. The addition (see Figure III-5) is a prefabricated self-framing structure 36 feet long by 12 feet wide by 10 feet high. The walls of the structure are constructed of 24 GA. by 3-inch deep interlocking sculptured panels having a green colored enamel exterior finish. The roof is constructed of 24 GA. by 3-inch deep interlocking panels having a white factory enameled finish on both sides. The roof of the addition extends to the service building and crane control room walls. The ceiling panels are constructed of 24 GA. by 3-inch deep interlocking flat surface panels which have been galvanized, bonderized, and factory primed. The ceiling insulation is of the 3-inch glass-fiber blanket type having a heat transfer coefficient of not less than 0.10 Btu/hr/ft²/°F. The interior metal liner is constructed of 26 GA. by 1-inch deep lock-in type panel with 1-inch foamed insulation having a U-value of not less than 0.20 Btu/hr/ft²/°F. The interior metal liner panels have been galvanized, bonderized, and factory primed. The interior of the addition has been primed and painted light green.

The addition contains a lunchroom and a change room. The lunchroom is 12 feet wide by 13 feet long and contains one access door at the west end of the room. The lunchroom has been provided with a sink, an electric range, a 4 kw wall heater, an exhaust fan (K-1-4-1), an evaporative

cooler (K-1-3-1), four 20A, 120 vac power receptacles, two fluorescent light fixtures, and tables and chairs. The change room is 12 feet wide by 23 feet long and contains an access door on the north and south sides of the room. The change room has been provided with a 66-gallon 8 kw water heater, a shower, two 4 kw wall heaters, four fluorescent light fixtures, three 20A, 120 vac power receptacles, a floor drain, lockers, clothes hampers, and benches. Details of the ventilation equipment may be found in Section V-G.

Reference prints: H-2-62948, H-2-62949, H-2-62950

F. 291-AR Filter Building and Ventilation Stack

The 291-AR filter building is located north of the east end of the 244-AR Vault canyon building (see Figure III-1). The reinforced concrete filter building is 30 feet 10 inches long by 20 feet 10 inches wide by 9 feet 11 inches deep and has been buried to a depth of 6 inches above grade (see Figure III-6). The east and west walls, the ceiling above the filters, the floor and the south wall are 1 foot thick. The north wall and the ceiling on the north end of the building are 10 inches and 8 inches thick, respectively. The first filter bank (K-3-3-1, see Section V-G) is located on a 4-inch concrete curb 7 feet from the south wall. The second filter bank (K-3-3-2) is located on a 4-inch curb 7 feet from the first filter bank. The north end of the filter building is separated from the filter banks by a 1-foot 4-inch thick overhanging partition which extends to within 3 feet of the concrete floor. Two concrete exhaust ducts, each 11 feet 4 inches wide by 6 feet 4 inches deep, are located on the east and west corners of the ceiling at the north end of the filter building. These exhaust ducts extend 10 feet above the ceiling and are connected to the canyon exhaust ventilation fans (K-3-9-1 and K-3-9-2) located between the exhaust ducts. The exhaust ventilation fans have been mounted on 3-inch thick concrete pads. These fans draw the ventilation air from the canyon through the filters and exhaust to the canyon ventilation stack located 28.5 feet north of the 291-AR building. The ventilation stack is constructed of concrete and extends to 61 feet above grade. The stack has a 3-foot inside diameter and is mounted on a buried concrete stand. The ventilation stack has been equipped with galvanized steel ladder rungs, a type 304L stainless steel breech, a cleanout access, two monitoring holes constructed of 3-inch and 8-inch schedule 40 stainless steel pipe at an elevation of 695 feet (11 feet above grade), and spray rings located at elevations of 714 feet and 744 feet. The inlet duct to the filter from Cell 1 in the canyon building is constructed of concrete and is 3 feet wide by 2 feet 8 inches deep. The inlet duct branches prior to entering the filter building. The branch terminates at the west wall of the filter building and has been provided with a concrete gate. The inlet duct penetrates the 291-AR filter building south wall 3 feet above the floor and is horizontally centered. The equipment provided for the filter building includes

instrumentation, two floor drains with remote manual valves and dry-wells, flow dampers, and electric power supply system (see Section V-G).

Reference prints: H-2-61963, H-2-62008, H-2-62009

Specification: (for ventilation stack) HWS-7539

G. Miscellaneous Equipment and Outdoor Lighting

1. Diesel Powered Emergency Generator

The emergency power supply for the canyon exhaust ventilation fan is located at the west end of the 244-AR Vault service building. The emergency power supply system is described in Section V-N.

2. Air Compressor

The air compressor supplying process and instrument air for the 244-AR Vault is located at the west end of the 244-AR Vault canyon building. The air compressor and the process and instrument air supply systems are described in Section V-N.

3. Storage Tanks

The A-10 (Nitric Acid Storage) and A-20 (Sodium Hydroxide Storage) vessels are located a few feet in front of the west end of the 244-AR Vault service building. These vessels are described in Section V-J.

4. Vessel Vent Backup Filter and Vessel Vent Stack

The vessel vent backup filter and vessel vent stack are located a few feet northwest of the canyon building. The vessel vent equipment is described in Section V-C.

5. Outdoor Lighting

Outdoor lighting in the area of the 244-AR Vault is provided by seven outdoor housing assembly units for three, 150-watt, par 38 incandescent flood lights and eight wall-mounted fixtures for single 150-watt outdoor incandescent lamps. The locations of these units are listed below.

Three Lamp Unit - Locations

<u>Wall</u>	<u>Position</u>	<u>Height Above Finished Floor (ft.)</u>
East	North end	15
East	South end	15
North	Center	15
West	North end	15
West	Center	15
West	South end	15
South	East end of operating building	15

One Lamp Unit - Locations

<u>Wall</u>	<u>Position</u>	<u>Height Above Finished Floor (ft.)</u>
West	Canyon door,	8
	South of Tank A-10	11
South	Operating area, west door	8
South	Operating area, east door	8
South	Crane Control Room door	8
South	Canyon door, main canyon exhaust fan, auxiliary canyon exhaust fan	8

H. 241-A Tank Farm

The sludge removal facilities within the 241-A tank farm include the 153-A transfer box, two sluice pits and one pump pit on each underground storage tank, three sluicer assemblies for movement throughout the tank farm, a waste recovery pump (EPN-244-AR-P-100), and various waste transfer lines. The routing systems and the waste transfer lines are described in Section IV - Waste Transfer Routings.

1. 153-A Transfer Box (See Figure III-7)

The 153-A transfer box is located at the western edge of the 241-A tank farm. It contains 12 lower nozzles at an elevation of 681.48 feet and 6 upper nozzles at an elevation of 684.40 feet. In addition, it contains 2 floor nozzles at elevations of 678.20 feet

(nozzle A) and 681.2 feet (nozzle B). The lower nozzles are located on a semi-circle with a radius of 3 feet 10-1/8 inches centered about nozzle A. The upper nozzles are located on a semi-circle with a radius of 6 feet 2-5/8 inches centered about nozzle B. All nozzles are 4-inch stainless steel. A list of the 153-A diversion box nozzles and their associated lines is given in Table III-1. All lines discussed in this table are 6-inch carbon steel.

The over-all dimensions of the transfer box are 6.5 feet by 14 feet by 11.5 feet deep. The top of the box is at ground level and is covered with 24-inch thick concrete cover blocks. The diversion box has 6 spray nozzles and is drained into Tank 105-A via a 4-inch floor drain.

TABLE III-1153-A TRANSFER BOX

<u>Nozzle</u>	<u>Line</u>	<u>Destination or Origin</u>
U-5	01-A(8051)	Pump Pit 01-A U-7
L-10	01-B	South Sluice Pit 01-B U-1
L-9	01-C	North Sluice Pit 01-C U-1
U-6	02-A(8052)	Pump Pit 02-A U-7
L-11	02-B	South Sluice Pit 02-B U-1
L-8	02-C	North Sluice Pit 02-C U-1
U-4	03-A(8053)	Pump Pit 03-A U-7
L-12	03-B	South Sluice Pit 03-B U-4
L-7	03-C	North Sluice Pit 03-C U-1
U-1	04-A(8054)	Pump Pit 04-A U-7
L-4	04-B	South Sluice Pit 04-B U-1
L-3	04-C	North Sluice Pit 04-C U-1
L-6	05-B	South Sluice Pit 05-B U-1
U-2	05-C(8055)	Pump Pit 05-C Nozzle B
L-2	05-D	North Sluice Pit 05-D U-1
U-3	06-A(8056)	Pump Pit 06-A U-7
L-5	06-B	South Sluice Pit U-1
L-1	06-C	North Sluice Pit U-1
A	801	From 244-AR Vault, Cell 2
B	805	To 244-AR Vault, Cell 2

2. Sluice Pits and Pump Pits

Each tank in the 241-A tank farm has two sluice pits and one pump pit. (TK-241-A-105 has two pump pits due to a bulge in the bottom liner.) The concrete sluice pits are 6 feet square by 8.5 feet deep and are covered by two 24-inch thick concrete cover blocks. The sluice pits in A-Farm, except the south TK-241-A-103 sluice pit, are identical in content and construction, but differ in orientation above each tank. The TK-241-A-103 south sluice pit was adapted from an existing pit that is somewhat larger and contains some additional nozzles. Each sluice pit contains a 12-inch flanged riser, a 3-inch floor drain back to the tank through the sluice riser, a 4-inch nozzle connected to the 153-A transfer box, and four water spray nozzles. Each pit receives high pressure sluicing water from the 244-AR Vault via the 153-A transfer box. The routings of the lines supplying the sluice pits from the 153-A transfer box may be found in Table III-2 and drawing H-2-61984, Sheets 1, 2, and 3.

The existing A-Farm pump pits were modified for use in conjunction with the sludge removal. All pump pits except the 105-A pump pit are of the same general type. They have inside dimensions of 12 feet by 11 feet by 7.5 feet deep. All are covered with 2-1/2-foot cover blocks and are located over the center of the tank. Equipment in the pits to be used during the sluicing operations are a 42-inch pump riser, a 3-inch floor drain, and a 4-inch nozzle. The particular nozzle used and the routing to 153-A diversion box may be found on drawing H-2-61983 and in Table III-1. The TK-241-A-105 pump pit used in connection with sluicing has the same equipment but is somewhat smaller and is located over the northwest quadrant of Tank 105-A.

3. Sluicer Assembly (See Section V-L)

4. Waste Recovery Pump EPN-244-AR-P-100 (See Section V-M)

I. Service Roads

Access to the AR Vault is provided from the road running past the 202-A Plant on North 40845.0. An 18-foot wide gravel road runs north from this road on West 47965.0. This road turns west on a 50-foot radius at North 41307.0 to give access to the canyon area. A 12-foot graveled branch running west on North 41210.0 gives access to the caustic and nitric storage tanks, to the change house, and to the service building.

TABLE III-2
241-A TANK FARM SLUICE PITS AND PUMP PITS

<u>Tank</u>	<u>Pump Pit Riser Flange</u>		<u>Sluice Pit Designation</u>	<u>Sluice Pit Riser Flange</u>		
	<u>Elevation</u>	<u>Distance to Tank Bottom</u>		<u>Elevation</u>	<u>Distance to Tank Bottom</u>	<u>Coordinated from Center of Tank</u>
						<u>Distance from Tank Center, ft.</u>
101	683.86	47.25	B	682.61	46.00	17'6" N, 23'1-1/2" W
			C	682.61	46.00	15'0" S, 24'9-3/4" E
102	681.79	47.25	B	681.61	47.07	17'6" N, 23'1-1/2" W
			C	681.61	47.07	15'0" S, 23'9-3/4" E
103	680.77	47.25	B	680.61	47.09	23'0" N, 0'0" W
			C	680.61	47.09	15'0" S, 24'9-3/4" E
104	682.93	47.25	B	681.61	45.93	15'0" N, 24'9-3/4" W
			C	681.61	45.93	15'0" S, 24'9-3/4" E
105	681.88	47.25	B	680.61	45.98	23'6" N, 3'0" W
			C	680.61	45.98	23'6" S, 4'9" W
106	680.89	47.25	B	679.61	45.97	15'0" N, 24'9-3/4" W
			C	679.61	45.97	15'0" S, 24'9-3/4" E

IV. WASTE TRANSFER ROUTINGS

The 244-AR Vault facilities are used in conjunction with transfer of PAW or ZAW from the 202-A Plant to the 221-B Plant, of Purex boiling waste tank farm sludges and supernatant solutions to the 221-B Plant, and of NHW from the 221-B Plant to the Purex boiling waste tank farm.

The details of the routings available for the above mentioned streams may be obtained from Tables III-1 and IV-1, and Figure IV-1. The 153-AX transfer box and its associated piping in the 241-AX tank farm, as shown on drawings III-1 and III-7, are to be installed at a future date. Lines 802 and 806 from Cell 2 of the 244-AR Vault to the future 153-AX transfer box are blanked at the AX tank farm perimeter. Lines V-032 and V-109 shown in Figure IV-1 are used to provide additional flexibility for supernatant solution removal.

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TABLE IV-1

WASTE ROUTINGS

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<u>Material</u>	<u>Origin</u>	<u>Destination</u>	<u>Line Number</u>	<u>Pipe Size & Material</u>
PAW	Purex	151-AX Diverter*		
	Cell R-8	Tank G*	4004	3" SS
	Tank G-8	Tank G*	4004	3" SS
	Tank F-16	Tank E*	4002	3" SS
	Tank F-18	Tank F*	4003	3" SS
	Tank E-3	Tank E*	4002	3" SS
	Tank E-1	Tank D*	4001	3" SS
	151-AX Diverter	TK-244-AR-001*	4015	3" SS
	Tanks E, D, & F		814	
	TK-244-AR-001	B-Plant Cell 11*	809	3" SS
			8618	
			V833	
			21	
PSW	A Farm	153-A Transfer Box+		
	153-A Transfer Box	TK-244-AR-002+	805	6" CS
	TK-244-AR-002	TK-244-AR-004+	811	2" SS
PAS	TK-244-AR-004	151-AX Diverter+	4005	3" SS
		Tank D	810	
	151-AX Diverter	TK-244-CR-003*	8656	3" SS
	Tank D			
	TK-244-CR-003	B-Plant Cell 31**	8901	3" SS
			8653	
			108	
			V837	
			96	
PSN	TK-241-A-101	151-C Diversion Box U-2	V109	2" SS
	151-C Diversion Box L-5	Tank 241-C-105	103	3" SS
	Tank 241-C-105	152-C Diversion Box L-8	122	
	152-C Diversion Box U-4	154-B Diversion Box L-8	V130	
	154-B Diversion Box U-2	B-Plant Cell 19	V330	
	Cell 19	TK-17-2		

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TABLE IV-1 - Continued

Material	Origin	Destination	Line Number	Pipe Size & Material
PSN	241 A	153-A Transfer Box+		
	153-A Transfer Box	Cell 2 244-AR+ T-13	805	6" CS
	Cell 2 244-AR T-13	Cell 2 244-AR T-9		
	Cell 2 244-AR T-9	151-C Diversion Box U-1+	812 103	3" CS
	Same Routing as described for PSN from 151-C Diversion Box L-5 to B-Plant.			
PSS	TK-244-AR-002	151-C Diversion Box U-1	812 108	3" CS
	Same Routing as described for PSN from 151-C Diversion Box L-5 to B-Plant.			
NHW	B-Plant Cell 25	TK-244-AR-003*	160 834 8653 818	3" SS
	TK-244-AR-003	151-AX Diverter Tank F*	4019 817	3" SS
	151-AX Diverter Tank F	241-A or AX		

+ Direct Buried

* Encased

** Not encased from 003-CR to encasement west of 151-CR
Diversion Box

V. 244-AR VAULT PIPING, EQUIPMENT, AND UTILITIESA. Process Cells

The following piping and equipment are found in the process cells of the 244-AR Vault:

1. Wall Nozzles*a. Cell 1

The following wall nozzles have been provided in Cell 1 of the 244-AR Vault:**

<u>Designation</u>	<u>Size (inches)</u>	<u>Service</u>
G-1	2	Steam to sump jet
G-2	2" - 3-way	WF/SpG - sump
G-4	XY-0011-7PT	Power to pump (P-001)
G-5	2" - 3-way	Instrument spare
G-6	XY-0012-7PT	Solution Temp and Cell MK
G-7	3	Piping spare
G-8	2" - 3-way	Sampler
G-10	XY-0010-7PT	Power to agitator (A-001)
G-12	-	Sludge temperatures
G-13	2" - 3-way	WF/SpG tank
G-14	2	Steam to transfer jet (J-001)
T-1	3	PAW-814 from Purex
T-4	4	Spare to Cells 2 and 3
T-5	3	PAW-919 to 003-AR
T-16	3	PAW-809 to 221-B Plant
W-1	3	Spare

* 'G' numbers denote "cold" piping and 'T' numbers denote "hot" piping.

** Nozzle elevations are given on drawing H-2-62055.

b. Cell 2

The following wall nozzles have been provided in Cell 2 of the 244-AR Vault:*

<u>Designation</u>	<u>Size (inches)</u>	<u>Service</u>
G-2	XY-0023-13PT	Power to P-002-1
G-3	2" - 3-way	Instrument spare
G-4	2	Steam to J-002-1
G-5	3	Piping spare
G-6	2" - 3-way	Sampler
G-8	XY-0024-7PT	Power to A-002
G-10	-	Electrical spare
G-11	2" - 3-way	WF/SpG tank
G-12	XY-0021-7PT	Solution Temp and Cell MK
G-16	XY-0022-7PT	Power to P-002-2
G-18	XY-0020-7PT	Electrical to FT-002
G-19	2" - 3-way	Loading signal to DOV-002-1
G-20	2	Steam to sump jet
G-21	2" - 3-way	WF/SpG - sump
T-1	4	Spare to Cell 1 (T-4) and Cell 3 (T-8)
T-2	4	PSW-803 spare
T-4	4	PSW-802 to 153-AX transfer box (future)
T-6	4	PSW-801 to 153-A transfer box (nozzle A)
T-8	4	PSW-804 spare
T-9	4	PSN-812 to TK-241-C-105
T-10	4	PSW-807 spare
T-11	4	PSW-806 from 153-AX transfer box (future)
T-13	4	PSW-805 from 153-A transfer box (nozzle B)
T-14	4	PSW-808 spare
T-15	2	PSW-811 to TK-004-AR
T-16	3	Alternate from P-002-2

* Nozzle elevations are given on drawing H-2-62056.

c. Cell 3

The following wall nozzles have been provided in Cell 3 of the 244-AR Vault:*

<u>Designation</u>	<u>Size (inches)</u>	<u>Service</u>
G-1	(3) 1/2	Vessel vent filter differential
G-2	XY-0050-7PT	Heater inlet-outlet temp
G-3	2	Steam to vessel vent heater
G-4	(3) 1/2	WF/SpG - TK-004-AR
G-5	2	Steam to J-004-1
G-6	XY-0041-6PT	Solution Temp and MK-004
G-8	3	Piping spare
G-10	-	Electrical spare
G-12	2	Instrument spare - 3-way
G-14	XY-0040-6PT	Power to A-004
G-15	(1) 1/2; (2) 1/4	Sampler 004-AR
G-16	2	Steam to J-004-2
G-17	(3) 1/2	WF/SpG - sump
G-18	2	Steam to sump jet
G-19	2	Steam to J-003-2
G-20	XY-0031-6PT	Solution Temp and MK-003
G-22	3	Piping spare
G-24	-	Electrical spare
G-26	(3) 1/2	Instrument spare - 3-way
G-28	XY-0030-6PT	Power to A-003
G-29	(1) 1/2; (2) 1/4	Sampler 003-AR
G-30	(3) 1/2	WF/SpG - TK-003-AR
G-31	2	Steam to J-003-1
T-1**	8	Vessel vent header outlet
T-2**	8	Vessel vent header inlet
T-3	2	Vessel vent steam condensate
T-4	3	CSW-813 to TK-002-AR
T-8	3	Spare - line SP-837
T-9	3	PAS-810 to TK-003-CR
T-10	3	NHW-818 from 221-B Plant
T-15	3	NHW-817 to 241-AX-151

* Elevations are given on drawing H-2-62058.

** Remote wedge connectors

2. Permanent Piping*a. Cell 1

The following permanent stainless steel piping has been provided in Cell 1 of the 244-AR Vault:**

<u>Designation</u>	<u>Size (inches)</u>	<u>Service</u>
G-3	2	Raw water to spray ring (P-001)
G-9	2	Purge air to TK-001-AR
G-11	2	Raw water to spray ring (A-001)
G-15	4	Lower coil inlet
G-16	4	Upper coil inlet
G-17	1-1/2	Chemical addition
T-2	4	Upper coil outlet
T-3	4	Lower coil outlet
T-6	6	Vessel vent
RW-84935***	2	Raw water to cell spray

b. Cell 2

The following permanent stainless steel piping has been provided in Cell 2 of the 244-AR Vault:+

<u>Designation</u>	<u>Size (inches)</u>	<u>Service</u>
G-1	2	Raw water to spray ring (P-002-1)
G-7	2	Purge air to TK-002-AR
G-9	2	Raw water to spray ring (A-002)
G-11A	1	Jet gang valves vent
G-13	3	Raw water to TK-002-AR (and chem.add)
G-14	2	Raw water to spray ring (P-002-2)
G-15	4	Lower coil inlet
G-17	4	Upper coil inlet
T-3	4	Upper coil outlet

* 'G' numbers denote "cold" piping and 'T' numbers denote "hot" piping.

** Elevations are given on drawing H-2-62055.

*** Painted carbon steel line.

+ Elevations are given on drawing H-2-62056.

<u>Designation</u>	<u>Size (inches)</u>	<u>Service</u>
T-5	4	Lower coil outlet
T-7	6	Vessel vent
T-12	3	CSW-813 from TK-004-AR
RW-84936*	2	Raw water to cell spray

c. Cell 3

The following permanent stainless steel piping has been provided in Cell 3 of the 244-AR Vault:**

<u>Designation</u>	<u>Size (inches)</u>	<u>Service</u>
G-7	1-1/2	Chemical addition TK-004-AR
G-9	2	Raw water to spray ring (A-004)
G-11	1	Purge air to TK-004-AR
G-13	3	TK-004-AR coil inlet
G-21	1-1/2	Chemical addition TK-003-AR
G-23	2	Raw water to spray ring (A-003)
G-25	1	Purge air to TK-003-AR
G-27	3	TK-003-AR coil inlet
T-5	2	PSW-811 from TK-002-AR
T-6	3	TK-004-AR coil outlet
T-7	4	Vessel vent
T-11	3	TK-003-AR coil outlet
T-12	4	Vessel vent
T-13	3	SP-837 spare
T-14	3	PAW-819 from TK-001-AR
RW-84973*	2	Raw water to cell spray

* Painted carbon steel line.

** Elevations are given on drawing H-2-62058.

3. Sump Jets

Each of the three process cells in the 244-AR Vault has been equipped with sump jets. The 2-inch, 75 gpm sump jets are constructed of type 304L stainless steel. The Group I siphon jet suction is spaced one inch from the bottom of each sump, and the jets discharge into Tanks 001-AR, 002-AR, and 003-AR through nozzle R, H, and S respectively. Steam is supplied to the jets through 2-inch steam lines supplied from the 100 psig, 6-inch steam header STM-848 through jet gang valves #2, #3, and #7 for Cells 1, 2, and 3 respectively. (See Figure V-1 and Table V-1.)

TABLE V-1 - Sump Jets

<u>Cell</u>	<u>Jet</u>	<u>Tank Nozzle</u>	<u>Wall Nozzle</u>	<u>Reference</u>
1	J-001-2	R	G-1	H-2-62111
2	J-002-2	H	G-20	H-2-62157
3	J-003-3	S	G-18	H-2-62158

CVI #: 16720

4. Cell Spray Systems

Each of the three process cells in the 244-AR Vault is equipped with a cell spray system. Cells 1 and 2 each have four 3/4-inch, type 316 stainless steel spray nozzles (Spraying Systems Co., Nozzle No. 3/4" HH6W) located 6 inches below the cover blocks. Cell 3 has six similar nozzles also located 6 inches below the cover blocks. The three separate spray systems are supplied by three 2-inch carbon steel raw water lines containing manual valves. For line numbers, system layout, and location of the control valves, see Figure V-2.

Reference prints: H-2-58745, H-2-62110

5. Instrumentation

The following cell instrumentation has been provided:

a. Sump Weight Factor and Specific Gravity (WF/SpG)

Each of the three process cells has been provided with sump weight factor and specific gravity instrumentation (see Figure V-3 and Table V-2). The dip tube assemblies are constructed of 1/2-inch, schedule 40 stainless steel pipe. The SpG dip tube spacing is 10 inches and the high pressure weight factor tube is designated A with B as the cell reference leg. The dip tube assemblies are connected to weight factor and specific gravity transmitters through the remote cell nozzles given in Table V-2.

The signals from the WF transmitters are transmitted to a weight factor recorder and to high weight factor alarm switches. Table V-2 contains the recorder point numbers, annunciators' numbers, and the jumper data.

TABLE V-2 - SUMP WF/SpG INSTRUMENTATION

<u>Cell</u>	<u>Jumper Identification</u>	<u>Wall Connector</u>	<u>Installation Drawing</u>	<u>Recorder & Point No.</u>	<u>ANN No.</u>
1	1-SUMP-G2	G-2	H-2-62058	WFR/SGR-3 #1 & 2	1
2	2-SUMP-G21	G-21	H-2-62058	WFR/SGR-3 #3 & 4	1
3	3-SUMP-G17	G-17	H-2-62-58	WFR/SGR-3 #5 & 6	1

Reference prints: H-2-62112

Specifications: HWS-5786 (Fabrication and Testing)
HWS-8241 (Welding)
HWS-7539 (Instrumentation)

b. Radiation Monitoring Equipment

See Section V-H.

B. Process Vessels

1. TK-244-AR-001 (Purex Acid Waste Storage)

The PAW storage tank (see Figure V-4) is located in Cell 1 of the 244-AR Vault and is constructed of 3/8-inch, type 304L stainless steel plate. The flat-bottomed (bottom elevation - 644'3") vessel is 20 feet in diameter by 19.75 feet in height and has an internal volume of 43,148 gallons. The tank is equipped with upper and lower cooling coils, a transfer pump, a transfer jet, an agitator, spray rings, a purge air system, a sampler, vessel vent and chemical addition lines, instrumentation, and three spare tank nozzles.

Reference prints: H-2-58745, H-2-58750, H-2-62055,
H-2-62057, H-2-62062, H-2-62090,
H-2-62091, sht 1 and 2

Specifications: HWS-7542

a. Tank Nozzles

The following tank nozzles have been provided. (All tank nozzles are approximately 20 feet from the bottom of the tank.)

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Jumper Print Reference</u>
3	PAW inlet	A	H-2-62119
4	Piping spare	C	-
3	WF/SpG tubes	J	H-2-62116
3	Sampler	M	H-2-62121
3	Piping spare	N	-
2	Solution temp	P	H-2-62114
3	Instrument spare	Q	-
3	Sump inlet	R	H-2-62111

b. Permanent Piping

The following permanent piping has been provided:

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Line No.</u>
4	Upper cooling coil outlet	B	CWD-8152
4	Lower cooling coil outlet	D	CWD-8151
6	Vessel vent	E	VV-8161
1-1/2	Chemical addition	F	CA-8301
4	Upper cooling coil inlet	G	RW-8492
4	Lower cooling coil inlet	H	RW-8491
2	Spray ring for A-001	K	RW-8499
2	Air purge	L	PA-8463
2	Spray ring for P-001	S	RW-84910

c. Cooling Coils

The upper and lower helical cooling coils each have an area of 662 square feet and are constructed of 3-inch, schedule 40, type 304L stainless steel pipe. The lower coil begins approximately 9 inches from the bottom of the tank and is approximately 63 inches high. The upper coil begins at approximately 99 inches from the bottom of the tank and is also approximately 63 inches high. Raw water flow through the cooling coils is controlled by manual valves (see Figure V-5). There are no flow or temperature indicators on either coil. The waste cooling water is discharged to the Gable Mountain pond 216-A-25 via the waste cooling water and steam condensate line CWD-815.

Reference print: H-2-62092

Specifications: HWS-7542

d. PAW Transfer Pump EPN-244-AR-P-001 (PAW Transfer to 221-B-Plant)

The continuous service P-001 pump (see Figure V-6) is constructed of types 303 and 304 stainless steel and is manufactured by the E. E. Schleyer Pump Co., Inc. The PAW pump has a specified capacity of 100 gpm at a total dynamic head of 355 feet (includes a 60' static head). It is designed to pump PAW at a temperature of 140 F with a viscosity of 2.0 cps. and a specific gravity of 1.16. The pump has an available Net Positive Suction Head (NPSH) of 18.6 feet with a suction pressure greater than 1.0 psig. The pump suction is located approximately 2.5 inches from the bottom of the tank. The pump discharges through a 3-inch nozzle (designation CC) to the wall connector T-16. The 25 hp, continuous service, 3-phase, 60-cycle, 240/480-volt pump motor rotates counter clockwise at 3600 rpm when viewed from the top of the motor. Operation of the pump is controlled by MS-001-1 on the motor control center panel MCC-1C in the control room. There is no flow transmitter or discharge pressure indicator for the pump.

Reference print: H-2-62085

Specifications: HWS-7537

Performance Curve: Figure V-7

CVI #: 16757

e. PAW Transfer Jet EPN-244-AR-J-001 (PAW Transfer to TK-244-AR-003)

The 3-inch submerged, 75 gpm PAW transfer jet is constructed of type 304L stainless steel. The Schutte and Koerting type jet is located in a 14-inch flanged riser and its suction extends to within one inch from the bottom of the tank. The jet discharges through the Cell 1 wall nozzle T-5 to the 003-AR tank via the 3-inch PAW-809 line. Steam is supplied to the jet through the 2-inch steam line STM-8486 and a jumper from Cell 1 wall nozzle G-14 to nozzle EE on the jet. The operation of the jet is controlled by the jet gang valves #1 (see Figure V-8) located on the north wall of the control room and a jet gang valve key lock switch located on the east instrument panel. A pressure gauge (range - 15 inches to 145 psig) has been provided on the instrument panel below the jet switch to monitor the jetting pressure. Upon termination of a transfer, the jet is automatically blown with 100 psig process air for 60 seconds. A manual valve and a hose connector have been provided to supply raw water to the jet.

Reference prints: H-2-58078, H-2-58745,
H-2-62117, H-2-62138

CVI #: 16720

f. Agitator EPN-244-AR-A-001 (Figure V-9)

The tank 244-AR-001 agitator is constructed of type 304L stainless steel and has three impeller assemblies on a solid 5-inch diameter shaft (see Table V-2). The impellers are 4 feet in diameter with the deepest impeller located 6 inches from the bottom of the tank. The agitator rotates at 45 rpm and may be operated under no-load conditions without harm to the unit and associated equipment. MS-001-2 on MCC-1A in the control room controls the operation of the agitator. The functions of the agitator are to mix the contents of the tank to a homogeneous concentration and to promote heat transfer. The agitator is manufactured by Wilkins & Associates, Inc., and is powered by a 50 hp, 3-phase, 60-cycle, 230/460-volt Westinghouse motor which rotates at 1800 rpm.

Reference prints: H-2-62086, H-2-62115

Specifications: HWS-7535

CVI #: 16785

g. Spray Rings

Spray rings have been provided for P-001 and A-001. Raw water is supplied to the two spray rings through the 2-inch stainless steel lines 84910 and 8499, and cell wall line designations G-3 and G-11, respectively. The water flow is controlled with 2-inch manual valves located in the control room. There are no flow indicators on the supply lines. (For location of the spray ring valves, see Figure V-2.)

h. Purge Air System

Purge air for the dilution of radiolytic hydrogen in the 001 tank is supplied through the 1-1/2 inch, 10 psig process air line PA-8463. The purge air enters the tank from the Cell 1 wall line designation G-9 and is expelled into the solution from a dip leg located 12 inches from the bottom of the tank. The purge air flow rate is indicated by FI-001 (70.7 scfm at 10 psig and 70 F), and is controlled by a 1-1/2-inch manual valve downstream of the rotameter. (For location of the flow indicator and associated valves, see Figure V-2.)

i. Sampler (See Section V-I - Samplers and pH meters)j. Vessel Vent (See Section V-C - Vessel Vent System)k. Chemical Addition (See Section V-J - Aqueous Makeup Facilities)l. Instrumentation

The PAW storage tanks have been provided with the following instrumentation:

Weight Factor and Specific Gravity Dip Tube Assembly - The weight factor and specific gravity (WF/SpG) dip tube assembly is constructed of type 304L stainless steel and is located in nozzle J of the 244-AR-001 tank. The dip tubes were fabricated from 1/2-inch, schedule 40 pipe with a specific gravity tube spacing of 10 inches. The high weight factor tube (designation A) extends to within one inch of the tank bottom, and the reference leg (designation B) is referenced to the tank atmosphere. The WF/SpG assembly is connected to the weight factor transmitter WFT-001-1 and the specific gravity transmitter SGT-001-1 via the Cell 1 wall connector G-13. The signal output from WFT-001-1 is transmitted to the dual contact high and low weight factor alarm switch WFAS-001-1, the low liquid level pump cut-off switch WFAS-001-2, and to Point 1 on the weight factor/specific gravity recorder WFR/SGR-2. Activation of WFAS-001-2 sounds an audible horn and flashes an alarm light on ANN-2. Switches have been supplied to silence and test the alarming circuit. Activation of WFAS-001-2 deactivates the P-001 pump circuit. The signal output from SGT-001-1 is conducted to Point 2 on WFR/SGR-2.

Reference prints: H-2-62116, H-2-58745

Tank Pressure Indicator PI-001-1 - A pressure indicator (-50 inches W.G. to + 30 inches W.G.) has been provided to monitor the static pressure within the PAW storage tank. The pressure indicator is connected to the WF/SpG dip tube assembly reference leg B (tank atmosphere) at WFT-001-1 and is located in the control room.

Tank Temperature Element TE-001 - The temperature element (TE-001) is located in nozzle P of the 244-AR-001 tank and extends to within 3 inches of the tank bottom. The 0 - 120 C resistance wire thermometer temperature element with protecting sheath is located in a 1-inch schedule 40, type 304L stainless steel pipe thermowell. The temperature element is connected to the electrical to pneumatic converter CVT-001 via the Cell 1 wall connector G-6. The pneumatic signal from CVT-001 is transmitted to the high temperature alarm switch TAS-001 and to Point 1 on TR-1. Activation of the alarm switch sounds an audible horn and flashes the appropriate high temperature alarm light on ANN-1. The alarm may be silenced or tested by the silencing and test switches located on the instrument panel in the process control room. Four temperature elements similar to TE-001 have been provided to obtain sludge temperature measurements. TE-001-A, B, C, and D are connected to the Cell 1 nozzle G-12. The electrical leads from nozzle G-12 terminate in the control room. A portable resistance instrument may be used to determine the sludge temperatures.

Reference prings: H-2-58745, H-2-62114, H-2-32144

Specifications: HWS-7539

2. TK-244-AR-002 (Slurry Receiving Tank)

The slurry receiving tank (see Figure V-10) is located in Cell 2 of the 244-AR Vault and is constructed of 3/8-inch, type 304L stainless steel plate. The flat-bottomed vessel (bottom elevation - 644.25') is 20 feet in diameter by 19.75 feet in height and has an internal volume of 43,438 gallons. The tank is equipped with upper and lower dual service (heating and cooling) coils, a transfer pump, a sluice pump, a transfer jet, an agitator, spray rings, a purge air system, a sampler, vessel vent and chemical addition lines, a radiation monitoring drywell, instrumentation, three spare tank nozzles, and a spare permanent piping line.

Reference prints: H-2-58745, H-2-58750, H-2-62056,
H-2-62057, H-2-62064, H-2-62090,
H-2-62091, sht 1 and 2

Specifications: HWS-7542

a. Tank Nozzles

The following tank nozzles have been provided. (All tank nozzles are approximately 20 feet from the bottom of the tank.)

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Jumper Print Reference</u>
4	Piping spare	A	-
4	Waste inlet	F	H-2-62143
3	Sump inlet	H	H-2-62157
2	Solution temp.	N	H-2-62114
3	WF/SpG tubes	P	H-2-62116
3	Sampler	S	H-2-62121
3	Piping spare	T	-
3	Instrument spare	U	-

b. Permanent Piping

The following permanent piping has been provided:

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Line No.</u>
4	Upper coil outlet	B	CWD-8154
4	Lower coil outlet	C	CWD-8153
6	Vessel Vent	D	VV-8162
3	Waste inlet	E	CSW-813
3	Piping spare	G	PAW-8141
4	Upper coil inlet	J	STM-8483
4	Lower coil inlet	K	STM-8482
2	Spray ring (P-002-1)	L	RW-8492
3	Chemical addition	M	CA-8302 and RW-8494
2	Spray ring (A-002)	Q	RW-84911
2	Air purge	R	PA-8464
2	Spray ring (P-002-2)	V	RW-84911
6	RM drywell	W	-

c. Cooling Coils

The upper and lower helical dual service (heating and cooling) coils each have an area of 662 square feet and are constructed of 3-inch, schedule 40, type 304L stainless steel pipe. The lower coil begins approximately 9 inches from the bottom of the tank and is approximately 63 inches high. The upper coil begins at approximately 99 inches from the bottom of the tank and is also approximately 63 inches high. Raw water and process steam are supplied to the upper and lower coils from the 8-inch raw water header RW-849 and the 20 psig, 6-inch process steam header STM-8480. Manual valves have been provided in the 4-inch coil supply lines STM-8482 and RW-8493 to the 4-inch lower coil inlet line STM-8482. The upper coil is supplied from the lower coil inlet line STM-8482 via the upper coil inlet line STM-8483 which contains a manual shut-off valve. The lower coil outlet line CWD-8153 contains a flow control valve DOV-002-2 which maintains a back pressure on the coil and responds to a control signal from temperature indicator controller TIC-002. TIC-002 has been provided to control the heating cycle of sluicing solution (see Section V-B, 2-n). The upper coil discharge line CWD-8154 contains a manual control valve for maintaining back-pressure and controlling the heat transfer rates. CWD-8153 & 4 discharge to the Gable Mountain pond 216-A-25 via the CWD-815 line. Process air (15 psig) has been supplied to the dual service coils to remove steam condensate and to maintain a positive coil pressure in case of a coil leak.

d. Slurry Transfer Pump EPN-244-AR-P-002-2 (Purex Sludge Waste to TK-244-AR-004)

The continuous service P-002-2 pump (see Figure V-6) is manufactured by the E. C. Schleyer Pump Company, Inc., and is constructed of carbon steel. The pump has a specified capacity of 50 gpm with a total dynamic head of 38 feet (includes a 26-foot static head). It is designed to pump PSW slurry at a temperature of 180 F with a viscosity of 3.0, and a specific gravity of 1.6 containing 1 to 1.5 pounds per gallon of solids having a specific gravity of 2.2 and a maximum dimension of 3/8-inch. The pump has an available NPSH of 18.6 feet with a suction pressure greater than 1.0 psig. The pump suction is located approximately 6 inches from the bottom of the tank. The pump discharges through the 3-inch pump nozzle FF and through flow transmitter FT-002 to the TK-244-AR-004 via Cell 2 wall nozzle T-15 and the 2-inch line PSW-811. The 2 hp, continuous service, 3-phase, 60-cycle, 240/480-volt pump motor rotates clockwise at 1750 rpm when viewed from the top of the motor. Operation of the pump is controlled by MS-002-3 on MCC-1C in the control room. An in-cell flow rate magnetic

transmitter FT-002 has been provided on the pump discharge to measure the flow rate of PSW to the 004 tank, and a normally closed in-cell control valve DOV-002-1 has been provided on the discharge to control the flow rate. There is no discharge pressure indicator for the pump. Section V-B, 2-n further describes the flow control instruments for the pump.

Reference prints: H-2-62085, H-2-62113, H-2-62122,
H-2-62132, H-2-62125

Specifications: HWS-7525

Performance Curve: Figure V-7

CVI #: 16757

e. Sluice Pump EPN-244-AR-P-002-1 (Transfer of Radioactive Supernatant Liquid from TK-002 to the Sluice Tank)

The continuous service P-002-1 pump (see Figure V-11) is manufactured by the Barrett Haentjens Company and is constructed of carbon steel. The pump has a specified capacity of 600 gpm with a total dynamic head of 390 feet (includes a 36-foot static head). It is designed to pump 176 F sluicing solution with a viscosity of 1.02 cps and a specific gravity of 1.5 to one of two sluicer assemblies (see Section V-L) located in an underground storage tank. The pump has a NPSH of 18 feet of water and its suction is located approximately 53 inches from the bottom of the tank. The pump discharges through the 4-inch pump nozzle CC to the sluicer via the Cell 2 wall nozzle T-4 or T-6 and the 6-inch transfer line PSW-802 or PSW-801, respectively. The 150-hp, continuous service, 3-phase, 60-cycle, 240/480-volt pump motor rotates clockwise at 1750 rpm when viewed from the top of the motor. Operation of the pump is controlled by MS-002-1 on MCC-1B in the control room. There is no flow rate indicator or discharge pressure indicator for the pump.

Reference prints: H-2-62085, H-2-62124, H-2-62139

Specifications: HWS-7534

Performance Curve: Figure V-12

CVI #: 16958

f. Transfer Jet EPN-244-AR-J-002-1 (Purex Sludge Supernatant Transfer to TK-241-C-105)

The 3-inch submerged 75-gpm PSS transfer jet is constructed of type 304L stainless steel. The Schutte and Koerting type jet is located in a 14-inch flanged riser and its suction is extended to within 54.5 inches from the bottom of the tank. The jet discharges through the Cell 2 wall nozzle T-9 to the 241-C-105 tank via the 3-inch PSS-812 line. Steam is supplied to the jet through the 2-inch steam line STM-8488 and a jumper from Cell 2 wall nozzle G-4 to nozzle EE on the jet assembly. The operation of the jet is controlled by the jet gang valve #4 (see Figure V-8) located on the north wall of the control room, and a jet gang valve key lock switch located on the east instrument panel. A pressure gauge (range -15 in. w.g. to 145 psig) has been provided on the instrument panel below the jet switch to monitor the jetting pressure. Upon termination of a transfer, the jet is automatically blown with process air for 60 seconds. A manual valve and a hose connector has been provided to supply raw water to the jet.

Reference prints: H-2-62117, H-2-62120
CVI #: 16720

g. Agitator EPN-244-AR-002 (Figure V-9)

The tank 244-AR-002 agitator is manufactured by Wilkins and Associates Inc., and is constructed of carbon steel. The agitator (located in the center of the 002 tank) has three separate 4-foot diameter impellers on a solid 5-inch diameter shaft. The deepest impeller is located 6 inches from the bottom of the tank (see Table V-2). The agitator rotates at 45 rpm and may be operated under no-load conditions without harm to the unit and associated equipment. MS-002-2 on MCC-1A in the control room controls the operation of the agitator. The agitator is powered by a 60 hp, 3-phase, 60-cycle, 230/460-volt, 1800 rpm Westinghouse motor with a type MV-Triple Reduction Straight Line Gear Motor reduction assembly.

Reference prints: H-2-62086, H-2-62115

Specifications: HWS-7535

CVI #: 16785

h. Spray Rings

Spray rings have been provided for P-002-1, P-002-2, and A-002. Raw water is supplied to the three spray rings through the 2-inch stainless steel lines 84912, 84913, 84911 and cell wall line designations G-14, G-1, and G-9, respectively. The raw water flow is controlled with 2-inch manual valves located in the control room. There are no flow rate indicators on the supply lines. (For location of the spray ring valves, see Figure V-2.)

i. Purge Air System

Purge air for the dilution of radiolytic hydrogen in the 002 tank is supplied through the 2-inch, 10 psig process air line 8464. The purge air enters the tank from the Cell 2 wall line designation G-7 and is expelled into the solution from a dip leg located approximately 12 inches from the bottom of the tank. The purge air rate is indicated by FI-002 (20 scfm at 10 psig and 70 F) and is controlled by a 1.5-inch manual valve located upstream of the flow indicator. The rotameter may be isolated by closing the control valve and a 1.5-inch manual valve on the downstream side of the rotameter. (For location of the flow indicator and associated valves, see Figure V-2.)

j. Sampler (See Section V-I - Samplers and pH Meters)k. Vessel Vent (See Section V-C - Vessel Vent System)l. Chemical Addition Line (See Section V-J - Aqueous Makeup Facilities)m. Radiation Drywell

The 002 tank has been provided with a 6-inch schedule 40, type 304L stainless steel pipe drywell which extends to the bottom of the tank. The drywell is used for determination of the sludge level in the slurry receiver tank by radiation profile measurements.

n. Instrumentation

The slurry receiver tank is equipped with the following instrumentation:

Weight Factor and Specific Gravity Dip Tube Assembly - The weight factor and specific gravity (WF/SpG) dip tube assembly is constructed of type 304L stainless steel and is located in nozzle P of the 244-AR-002 tank. The dip tubes are fabricated from 1/2-inch schedule 40 pipe with a specific gravity tube spacing of 10 inches.

The high weight factor tube (designation A) extends to within 1 foot from the tank bottom and the reference leg (designation B) is referenced to the tank atmosphere. The WF/SpG assembly is connected to the weight factor transmitter WFT-002-1 and the specific gravity transmitter SGT-002-1 via the Cell 2 wall connector G-11. The signal output from WFT-002-1 is transmitted to the high and low weight factor alarm switches WFAS-002-1 (dual contact) and WFAS-002-2 (dual contact), WFAS-002-3 (dual contact) and to Point 3 on the weight factor/specific gravity recorder WFR/SGR-1. Activation of either WF alarm switch sounds an audible horn and flashes the high or low weight factor alarm light on annunciator panel ANN-2. Silencing and test switches have been provided to test the operability of the alarm system. Activation of WFAS-002-1 stops P-100 and activation of WFAS-002-2 starts P-100. Activation of WFAS-002-3 (dual contact) stops P-002-1 and P-002-2. The signal output from SGT-002-1 is transmitted to Point 4 on WFR/SGR-1.

Reference prints: H-2-62116, H-2-58745

Tank Pressure Indicator PI-002 - A pressure indicator (range -50 in. w.g. to +30 in. w.g.) has been provided to monitor the static pressure within the slurry receiver tank. The pressure indicator is connected to the reference leg B (tank atmosphere) of the WF/SpG dip tube assembly at WFT-002-1 and is located in the control room.

Temperature Element - TE-002 - The temperature element (TE-002) is located in nozzle N of the 244-AR-002 tank and extends to within 3 inches of the tank bottom. The 0 - 120 C resistance wire thermometer temperature element with protecting sheath is located in a 1-inch, schedule 40, type 304L stainless steel pipe thermowell. The temperature element is connected to the electrical to pneumatic converter CVT-002-2 via the Cell 2 wall connector G-2. The pneumatic signal from CVT-002-2 is transmitted to the temperature alarm switch TAS-002, TR-1 (Point 2), and the temperature indicator controller TIC-002. Activation of high temperature alarm switches sounds an audible horn and flashes the high temperature alarm light on ANN-1. The alarm may be silenced or tested by the silencing and test switches located on the control panel in the service building control room. The TIC-002 controls the solution temperature in the slurry receiver tank by automatically adjusting the valve loading pressure of DOV-002-2 located on the outlet of the lower dual service coil.

Reference prints: H-2-58745, H-2-62114

Specifications: HWS-7539

3. TK-244-AR-003 (Neutralized High Level Waste Storage)

The NHW storage tank (see Figure V-13) is located in Cell 3 of the 244-AR Vault and is constructed of 1/2-inch, type 18-8Cb stainless steel plate. The sloped bottom vessel is 9.5 feet in diameter by 9 feet in height and has an internal volume of 4793 gallons. The tank is equipped with a cooling coil, two transfer jets, an agitator, a spray ring, a purge air system, a sampler, vessel vent and chemical addition lines, three spare tank nozzles, and instrumentation.

Reference prints: H-2-58745, H-2-58750, H-2-62097,
H-2-62059, H-2-62062, H-2-62064,
H-2-62058, D-62069, HW-72776

Specifications: HWS-5938

a. Tank Nozzles

The following tank nozzles have been provided:

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Jumper Print Reference</u>
3	Spare	A	-
3	Spare	B	-
3	NHW inlet	C	H-2-62135
3	Waste out	H	H-2-62130
3	WF/SpG tubes	J	H-2-62131
3	Sampler	K	H-2-62070
3	Spare	L	-
3	Solution temp	R	H-2-62129
3	Sump inlet	S	H-2-62158
3	Waste out	T	H-2-62132

b. Permanent Piping

The following permanent piping has been provided:

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Line No.</u>
3	Cooling water outlet	D	CWD-8155
4	Vessel Vent	E	VV-8163
3	PAW inlet	F	PAW-819

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Line No.</u>
3	Cooling water inlet	M	RW-8495
1	Purge air	N	PA-8465
2	Spray ring (A-003)	P	RW-84926
1-1/2	Chemical addition	Q	CA-8303

c. Cooling Coils

The helical cooling coil has a surface area of 219 square feet and is constructed of 3-inch, schedule 40, type 304L stainless steel pipe. The coil begins approximately 10 inches from the bottom of the tank and is approximately 66 inches high. Raw water is supplied to the coil through a control valve DOV-003-1 in the 3-inch raw water line RW-8495 via permanent piping wall designation G-27 (see Figure V-5). There is no flow or temperature indicator on the coil. The waste cooling water is discharged to the Gable Mountain pond 216-A-25 via the waste cooling water and steam condensate line CWD-815.

Reference print: H-2-62097

d. NHW Transfer Jet EPN-244-AR-J-003-1 (NHW Transfer to UGS)

The 2-inch, 75 gpm NHW transfer jet is constructed of type 304L stainless steel. The Group I siphon jet suction is located in nozzle H of the 003-AR tank and extends to within 1 inch from the tank bottom. The jet discharges through Cell 3 wall nozzle T-15 to underground storage (UGS) via the 3-inch NHW-817 line (No. 4019) and the 151-AX diverter station. Steam is supplied to the jet through the 2-inch steam line STM-8489 and a jumper from Cell 3 wall nozzle G-31 to nozzle BB on the jet. The operation of the jet is controlled by the jet gang valves #5 (see Figure V-8) located on the north wall of the control room, and jet gang valve key lock switch located on the east instrument panel. A pressure gauge (range -15 in. w.g. to 145 psig) has been provided on the instrument panel below the jet switch to monitor the jetting pressure. Upon termination of a transfer, the jet is automatically blown with 100 psig process air for 60 seconds. A manual valve and a hose connector have been provided to supply raw water to the jet.

Reference prints: H-2-58078, H-2-58745, H-2-62058,
H-2-62130, H-2-62134

CVI #: 16720

e. NHW Transfer Jet EPN-244-AR-J-003-2 (NHW Transfer to 004-AR)

The 3-inch, 75 gpm NHW transfer jet is constructed of type 304L stainless steel. The Group II siphon jet suction is located in nozzle T of the 003-AR tank and extends to within 1 inch from the tank bottom. The jet discharges into the 004-AR tank above the liquid surface through nozzle J. Steam is supplied to the jet through the 2-inch steam line STM-84810 and a jumper from Cell 3 wall nozzle G-19 to nozzle CC on the jet. The operation of the jet is controlled by the jet gang valves #6 (see Figure V-8) located on the north wall of the control building and a jet gang valve key lock switch located on the east instrument panel. A pressure gauge (range -15 in. w.g. to 145 psig) has been provided on the instrument panel below the jet switch to monitor the jetting pressure. Upon termination of a transfer, the jet is automatically blown with 100 psig process air for 60 seconds, and the jet supply line downstream of the steam and air DOV's is vented to the Cell 2 sump. A manual valve and a hose connector have been provided to supply raw water to the jet.

Reference prints: H-2-58078, H-2-58745, H-2-62058,
H-2-62132, H-2-62133

CVI #: 16720

f. Agitator EPN-244-AR-A-003 (see Figure V-14)

The tank 244-AR-003 agitator is constructed of type 304L stainless steel and has two impeller assemblies on a 2.5-inch diameter shaft (see Table V-2). The impellers are 20 inches in diameter with the deepest impeller located approximately 3 inches from the bottom of the tank. The agitator rotates at 68 rpm and may be operated under no-load conditions without harm to the unit and associated equipment. Oil is supplied to the agitator bearings through the 1-inch oil line OIL-822 and a jumper from tank nozzle U to nozzle DD on the agitator. The functions of the agitator are to promote heat transfer and to suspend solids. The agitator is manufactured by the Philadelphia Gear-Works and is powered by a 15 hp, 3-phase, 60-cycle, 440-volt motor which rotates at 1150 rpm.

Reference prints: H-2-62087, H-2-62136, H-2-62147

CVI #: 71555

TABLE V-2

244-AR VAULT AGITATORS

AGITATOR	DRIVE		Height (ft.)*			SHAFT		No. of Impellers and Pitch**	No. of Blades/ Impeller			Diam. (in.)	Construction Material
	Hp	Speed rpm	1	2	3	Diam. (in.)	Blade Width and/or Type		1	2	3		
A-001	50	45	0.5	7.1	13.9	5	5" Turbine	3 at 10°	6	4	4	48	SS
A-002	60	45	0.5	7.1	13.9	5	5" Turbine	3 at 10°	6	4	4	48	CS
A-003	15	68	0.5	4.5	-	4	6" Turbine	2 at 0°	4	4	-	36	SS
A-004	15	68	0.5	4.5	-	4	6" Turbine	2 at 0°	4	4	-	36	SS
A-A30	2	420	0.6	1.4	-	1.5	Propeller	2	3	3	-	11	SS

* Distance from tank bottom to impeller bottom

** Measured from vertical

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g. Spray Rings

A spray ring has been provided for A-003. Raw water is supplied to the spray ring through the 2-inch stainless steel line RW-84926 and Cell 3 wall line designation G-23. The water flow is controlled by operating a 2-inch manual valve in the control room. There is no flow indicator on the supply line. (For location of the spray ring valves, see Figure V-2.)

h. Purge Air System

Purge air for the dilution of radiolytic hydrogen in the 003 tank is supplied through the 1-inch, 10 psig process air line PA-8465. The purge air enters the tank from the Cell 3 wall line designation G-25 and is expelled into the solution from a dip leg located approximately 14 inches from the bottom of the tank. The purge air flow rate is indicated by FI-003 (20 scfm at 10 psig and 70 F) and is controlled by a 3/4-inch manual valve located upstream of the flow indicator. The rotameter may be isolated by closing the control valve and a 3/4-inch manual valve downstream of the rotameter. (For location of the flow indicator and associated valves, see Figure V-2.)

i. Sampler (See Section V-I - Samplers and pH Meters)j. Vessel Vent (See Section V-C - Vessel Vent System)k. Chemical Addition (See Section V-J - Aqueous Makeup Facilities)l. Instrumentation

The NHW storage tank has been provided with the following instrumentation:

Weight Factor and Specific Gravity Dip Tube Assembly - The weight factor and specific gravity (WF/SpG) dip tube assembly is constructed of type 304L stainless steel and is located in nozzle J of the 244-AR-003 tank. The dip tubes are fabricated from 1/2-inch, schedule 40 stainless steel pipe with a specific gravity tube spacing of 10 inches. The high pressure weight factor tube (designation A) extends to within 1 inch from the bottom of the tank and the reference leg (designation B) is referenced to the tank atmosphere. The WF/SpG assembly is connected to the weight factor transmitter WFT-003-1 and the specific gravity transmitter SGT-003-1 via the Cell 3 wall connector G-30. The signal output from WFT-003-1 is transmitted to the high and low weight factor alarm switch WFAS-003-1 and to Point 5 on the weight factor/specific gravity recorder WFR/SGR-1. Activation of either

the high or low section of WFAS-003-1 sounds an audible horn and flashes an alarm light on ANN-2. Switches have been provided to silence and test the alarm circuit. The signal output from SGT-003-1 is transmitted to Point 6 on WFR/SGR-1.

Reference print: H-2-58745

Tank Pressure Indicator PI-003-1 - A pressure indicator (range -50 in. w.g. to +30 in. w.g.) has been provided to monitor the static pressure within the NHW storage tank. The pressure indicator is connected to the reference leg B (tank atmosphere) of the WF/SpG dip tube assembly at WFT-003-1 and is located in the control room.

Temperature Element TE-003 - The temperature element (TE-003) is located in nozzle R of the 244-AR-003 tank and extends to within 18.2 inches from the tank bottom. The 0-120 C (100 ohms at 68 F) resistance wire thermometer temperature element with protecting sheath is located in a 1-inch, schedule 40, type 304L stainless steel pipe thermowell. The temperature element is connected to the electrical to pneumatic converter CVT-003 via the Cell 3 wall connector G-20. The pneumatic signal from CVT-003 is transmitted to the high temperature alarm switch TAS-003, temperature indicator controller TIC-003, and to Point 3 on temperature recorder TR-1. Activation of the high temperature alarm switch sounds an audible horn and flashes the appropriate high temperature alarm light on ANN-1. The alarm may be silenced or tested by silencing or test switch located on the instrument panel in the control room. TIC-003 automatically controls the temperature of the NHW solution at the desired set point temperature by controlling the flow of raw water to the cooling coil. The signal from TIC-003 is transmitted to the 3-inch diaphragm operated valve DOV-003-1 in the raw water line RW-8495 supplying the cooling coil. A pressure indicator PI-003 (range 0-160 psig) has been provided to monitor the cooling coil pressure.

Reference prints: H-2-58745, H-2-62129

Specifications: HWS-7539

pH Meter - See Section V-I - Samplers and pH Meters.

4. TK-244-AR-004 (Acidification Tank)

The acidification tank (Figure V-15) producing Purex sludge (PAS) is located in Cell 3 of the 244-AR Vault and is constructed of 1/2-inch, type 18-8Cb stainless steel plate. The sloped bottom vessel is 9.5 feet in diameter by 9 feet in height and has an internal volume of 4708 gallons. The tank is equipped with a dual service (heating and cooling) coil, two transfer jets, an agitator, a sampler, a spray ring, a purge air system, vessel vent and chemical addition lines, three spare tank nozzles, instrumentation, and a radiation monitoring drywell.

Reference prints: H-2-58745, H-2-58750, H-2-62058,
H-2-62059, H-2-62062, H-2-62064,
H-2-62097, D-62069, HW-72776

Specifications: HWS-5938

a. Tank Nozzles

The following tank nozzles have been provided:

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Jumper Print Reference</u>
6	RM drywell	A	-
3	CSW outlet	B	H-2-62142
3	Spare	F	-
3	PAS outlet	H	H-2-62134
3	NHW inlet	J	H-2-62132
3	Sampler	K	H-2-62137
3	Spare	L	-
3	Solution temp	R	H-2-62129
3	Spare	S	-
3	WF/SpG	T	H-2-62131

b. Permanent Piping

The following permanent piping has been provided:

<u>Size (inches)</u>	<u>Service</u>	<u>Designation</u>	<u>Line No.</u>
2	PSW inlet	C	PSW-811
3	Cooling water outlet	D	CWD-8156
4	Vessel vent	E	VV-8164
3	Cooling water inlet	M	RW-8496
1	Purge air	N	PA-8466
2	Spray ring (A-004)	P	RW-84925
1-1/2	Chemical addition	Q	CA-8304
8	Vessel vent	None	-

c. Coils

The helical dual service (heating and cooling) coil has a service area of 219 square feet and is constructed of 3-inch, schedule 40, type 304L stainless steel pipe. The coil begins approximately 10 inches from the bottom of the tank and is approximately 66 inches high. Raw water and process steam are supplied to the dual service coil from the 8-inch raw water header RW-849 and the 20 psig, 6-inch process steam header STM-8480. Manual valves have been provided in the 3-inch coil supply lines STM-84819 and RW-8496 from the steam and raw water headers to the 3-inch coil inlet line (RW-8496) to provide either heating or cooling media to the coil. The coil discharge line (CWD-8156) contains a flow control valve DOV-004-1 which maintains a back-pressure on the coil and responds to a control signal from temperature indicator controller TIC-004 (see Section V-B-4.n). Process air (15 psig) has been supplied to the dual service coil to remove steam condensate and to maintain a positive coil pressure in case of a coil leak. The waste cooling water and steam condensate are discharged to the Gable Mountain pond 216-A-25 via the CWD-815 line.

d. CSW Transfer Jet EPN-244-AR-J-004-1 (CSW Transfer to TK-244-AR-002)

The 3-inch, 75 gpm CSW transfer jet is constructed of type 304L stainless steel. The Group I siphon jet suction is located in nozzle B of the 004-AR tank and extends to within 1 inch from the tank bottom. The jet discharges through Cell 3 wall nozzle T-4 to the 002-AR slurry receiving tank via the

3-inch CSW-813 line. Steam is supplied to the jet through the 2-inch steam line STM-84811 and a jumper from Cell 3 wall nozzle G-5 to nozzle BB on the jet. The transfer jet is controlled by the operation of jet gang valves assembly #9 located on the north wall of the control room (see Figure V-8). Operation of the jet gang valves assembly is initiated by a key-lock switch located on the east instrument panel. A pressure gauge (range -15 in. w.g. to 145 psig) has been provided on the instrument panel below the jet switch to monitor the jetting pressure. Upon termination of a transfer, the jet is automatically blown with 100 psig process air for 60 seconds. A manual valve and a hose connector have been provided to supply raw water to the jet.

Reference prints: H-2-58078, H-2-58745, H-2-62058,
H-2-62142, H-2-62128

CVI #: 16720

e. PAS Transfer Jet EPN-244-AR-004-2 (PAS to TK-244-CR-003)

The 2-inch, 75 gpm PAS transfer jet is constructed of type 304L stainless steel. The Group I siphon jet suction is located in nozzle H of the 004-AR tank and extends to within 1 inch from the tank bottom. The jet discharges through Cell 3 wall nozzle T-9 to the 003 tank in the CR Vault via the 3-inch PAS-810 line (No. 4005) and the 241-C-151 diversion box. Steam is supplied to the jet through the 2-inch steam line STM-84812 and a jumper from Cell 3 wall nozzle G-16 to nozzle CC on the jet. The transfer jet is controlled by the operation of jet gang valves assembly #8 located on the north wall of the control room (see Figure V-8). Operation of the jet gang valves assembly is initiated by a key-lock switch located on the east instrument panel. A pressure gauge (range -15 in. w.g. to 145 psig) has been provided on the instrument panel below the jet switch to monitor the jetting pressure. Upon termination of a transfer, the jet is automatically blown with 100 psig process air for 60 seconds. A manual valve and a hose connector have been provided to supply raw water to the jet.

Reference prints: H-2-58078, H-2-58745, H-2-62058,
H-2-62130, H-2-62134

CVI #: 16720

f. Agitator EPN-244-AR-A-004 (Figure V-14)

The tank 244-AR-004 agitator is constructed of type 304L stainless steel and has two impeller assemblies on a 2.5-inch diameter shaft (see Table V-2). The impellers are 20 inches in diameter with the deepest impeller located approximately 3 inches from the bottom of the tank. The agitator rotates at 68 rpm and may be operated under no-load conditions without harm to the unit and associated equipment. Oil is supplied to the agitator bearings through the 1-inch oil line OIL-823 and a jumper from tank nozzle U to nozzle DD on the agitator. MS-004-2 on MCC-#1 in the control room controls the operation of the agitator. The functions of the agitator are to promote heat transfer and to suspend solids. The agitator is manufactured by the Philadelphia Gear-Works and is powered by a 15 hp, 3-phase, 60-cycle, 44-volt motor which rotates at 1150 rpm.

Reference prints: H-2-62087, H-2-62136, H-2-62147

CVI #: 71555

g. Spray Ring

A spray ring has been provided for A-003. Raw water is supplied to the spray ring through the 2-inch stainless steel line RW-84925 and Cell 3 wall line designation G-9. The water flow is controlled by operating a 2-inch manual valve in the control room. There is no flow indicator on the supply line. (For location of the spray ring valves, see Figure V-2.)

h. Purge Air System

Purge air for the dilution of radiolytic hydrogen in the 004 tank is supplied through the 1-inch, 10 psig process air line PA-8466. The purge air enters the tank from the Cell 3 wall line designation G-11 and is expelled into the solution from a dip leg located approximately 14 inches from the bottom of the tank. The purge air flow rate is indicated by FI-004 (20 scfm at 10 psig and 70 F) and is controlled by a 3/4-inch manual valve located upstream of the flow indicator. (For location of the flow indicator and associated valves, see Figure V-2.)

i. Sampler (See Section V-I - Samplers and pH Meters)j. Vessel Vent (See Section V-C - Vessel Vent System)k. Chemical Addition (See Section V-J - Aqueous Makeup Facilities)

1. Radiation Drywell

The 004 tank has been provided with a 6-inch, schedule 40, type 304L stainless steel pipe drywell. The drywell extends from just below the Cell 3 cover blocks to within 2 inches from the tank bottom and is used for determination of the sludge level in the acidification tank by radiation profile measurements.

Reference prints: H-2-58745, H-2-62097

m. Instrumentation

The 004 tank has been provided with the following instrumentation:

Weight Factor and Specific Gravity Dip Tube Assembly - The weight factor and specific gravity (WF/SpG) dip tube assembly is constructed of type 304L stainless steel and is located in nozzle T of the 244-AR-004 tank. The dip tubes are fabricated from 1/2-inch, schedule 40 stainless steel pipe with a specific gravity tube spacing of 10 inches. The high pressure weight factor tube (designation A) extends to within one inch from the bottom of the tank and the reference leg (designation B) is referenced to the tank atmosphere. The WG/SpG assembly is connected to the weight factor transmitter WFT-004-1 and the specific gravity transmitter SGT-004-1 and the specific gravity transmitter SGT-004-1 via the Cell 3 wall connector G-4. The signal output from WFT-004-1 is transmitted to the high and low weight factor alarm switch WFAS-004-1 and to Point 1 on the weight factor/specific gravity recorder WFR/SGR-2. Activation of either the high or low section of WFAS-004-1 sounds an audible horn and flashes an alarm light on ANN-1. Switches have been provided to silence and test the alarming circuit. The signal output from SGT-004-1 is transmitted to Point 2 on WFR/SGR-2.

Reference prints: H-2-58745, H-2-62131

Tank Pressure Indicator PI-004 - A pressure indicator (range ± 20 inches W.G.) has been provided to monitor the static pressure within the acidification tank. The pressure indicator is connected to the reference leg B (tank atmosphere) of the WF/SpG dip tube assembly at WFT-004-1 and is located in the control room.

Temperature Element - TE-004 - The temperature element (TE-004) is located in nozzle R of the 244-AR-004 tank and extends to within 18.2 inches from the tank bottom. The 0-120 C (100 ohms at 68 F) resistance wire thermometer temperature element with protecting sheath is located in a 1-inch, schedule 40, type 304L

stainless steel pipe thermowell. The temperature element is connected to the electrical to pneumatic converter CVT-004 via the Cell 3 wall connectof G-6. The pneumatic signal from CVT-004 is transmitted to the high temperature alarm switch TAS-004, temperature recorder TR-1 (Point 4), and the temperature indicator controller TIC-004. Activation of the high temperature alarm switch sounds an audible horn and flashes the appropriate high temperature alarm light on ANN-1. The alarm may be silenced or tested by the silencing or test switch located on the instrument panel in the control room. TIC-004 automatically controls the temperature of the PAS solution at the desired set point temperature by controlling the flow of steam or raw water to the dual service coil. The signal from TIC-004 is transmitted to the 3-inch diaphragm-operated valve DOV-004-1 in the waste cooling water line CWD-8156 from the cooling coil. A pressure indicator PI-004 (range 0-160 psig) has been provided to monitor the coil pressure.

Reference prints: H-2-58745, H-2-62129

Specifications: HWS-7539

pH Meter - See Section V-I - Samplers and pH Meters

C. Vessel Vent

1. General Description

The 244-AR Vault vessel vent system is designed to maintain a vacuum within the four process vessels by removing and filtering their contaminated off-gases. The off-gases from the 001, 002, 003, and 004 process vessels are drawn from the vessels through the permanent type 304L stainless steel vessel vent pipes VV-8161 (6-inch); VV-8162 (6-inch); VV-8163 (4-inch); and VV-8164 (4-inch), respectively, into the 8-inch header VV-816 (see Figure V-16). An 8-inch vent line, in addition to the 4-inch VV-8164 vent line, has been provided in Cell 3 between the 004 vessel and the VV-816 vent header. The two parallel vent lines provide increased off-gasing capabilities for the 004 vessel during the sludge waste acidification cycles. The process vessel off-gases pass through the Cell 3 remote 8-inch wedge connector T-2 and into the vessel vent heater. The heater evaporates any entrained solution droplets and raises the temperature of the off-gas to reduce the relative humidity to less than 85%. The heated off-gas exiting the heater passes through another 8-inch remote wedge connector and into the high efficiency filter assembly. The filter assembly removes the radioactive particulate matter and passes the off-gas through the 8-inch remote Cell 3 connector to T-1 to the back-up filter assembly located behind the canyon building. The off-gas exiting the back-up filter assembly passes through a vacuum control valve to the vessel vent exhaust fan. The exhaust fan discharges to a 150-foot vessel vent stack where it is sampled, monitored, and discharged to the atmosphere.

Reference prints: H-2-58745, SK-2-23120

2. Off-Gas Heater EPN-244-AR-K4-V10-1 (Figure V-17)

The vessel vent heater is located in Cell 3 of the 244-AR Vault. The heater is a baffled shell and tube type heat exchanger and is constructed of type 304L stainless steel. The insulated heater is approximately 6 feet long by 2 feet in diameter and is connected to the filter assembly and the vessel vent header VV-816 via the remote 8-inch wedge connector E and the Cell 3 remote wedge connector T-2, respectively. Steam is supplied to the heater through a 2-inch jumper from Cell 3 wall nozzle G-3 to nozzle B on the heater assembly. The steam passes through 144, 0.75-inch, 12 BWG tubes 4 feet long. The steam condensate exits the heater through a 2-inch jumper between heater nozzle A and Cell 3 wall nozzle T-3. The steam condensate is discharged to the Gable Mountain pond 216-A-25 via lines CWD-8159 and CWD-815. The heater is designed for a heating load of 151,000 Btu/hr with a heat transfer coefficient of 8.5 Btu/hr $F ft^2$. The tubes and shell sides of

the exchanger are designed for a pressure of 110 psig and the design temperature is 400 F. The unit is designed to handle 1652 lb/hr of entering fluid at 116 F containing 6% liquid. 100 psig saturated steam is to be supplied at 171 lb/hr. 15 psig process air has been provided to blow the steam condensate from the heater coils. The air is supplied by operating a manual valve in the process line 84618 which is connected to the steam line STM-84815 supplying the heater. The temperature control system is described in Section V-C-6.

Reference prints: H-2-62078, H-2-62089,
H-2-62145, H-2-62146

Specifications: HWS-7538

3. Filter Assemblies

The primary vessel vent filter assembly is located in Cell 3 of the 244-AR Vault. The assembly is constructed of type 304L stainless steel and contains two high efficiency filters in series separated by a metal screened low efficiency filter. The insulated and metal sheathed filter assembly is approximately 7.5 feet long by 2 feet square and tapers on either end (see Figure V-18). The assembly is connected to the vessel vent lines via 8-inch remote wedge connectors on either end.

a. K4-3-1 and 2

The K4-3-1 and 2 filters are high efficiency type filters 24 inches square and 11.5 inches thick containing approximately 200 ft² of filtering area. The filters have a design capacity of 1000 cfm air with a relative humidity less than 85% and a temperature less than 250 F. The initial resistance of each filter at 1000 cfm is approximately 0.9 inch of water. Each filter has a particle removal efficiency of 99.97% for 0.3 micron or greater and a maximum recommended operating differential pressure of 4 in. W.G.

b. K4-12-1

K4-12-1 is a low efficiency filter 20 inches square by 2 inches thick. The filter is designed to handle 1000 cfm of heated air and has a particle removal efficiency of 5%. The maximum expected differential pressure is 0.1 inch of water.

c. Back-up Filter

The vessel vent back-up filter assembly is located behind the 244-AR Vault canyon building upstream of the vessel vent exhaust fan. The filter assembly consists of three separate layers of 115K Fiberglas packing encased in a 7-foot square concrete pit. The first layer of the assembly consists of 12 inches of 115K Fiberglas packed to a density of 1.5 lb/ft³. The second layer is 16 inches thick with a packing density of 3.0 lb/ft³. The final layer consists of 20 inches of 115K Fiberglas packed to a density of 6.0 lb/ft³. The initial resistance of the back-up filter assembly at 1000 cfm is approximately 1.6 inches of water. The back-up filter assembly may be valved in or out of the vessel vent system by three 8-inch butterfly valves (see Figure V-19).

Reference print: H-2-34147

d. Exhaust Fan EPN-244-AR-K4-11-1 (Figure V-20)

The 244-AR Vault vessel vent exhaust fan is located on a concrete stand north of the west end of the 244-AR Vault canyon building. The 3900 rpm centrifugal exhaust fan (capacity 950 cfm at 70 F and -20 inches W.G.) is constructed of series 300 stainless steel with a 21.5-inch diameter wheel and 3-inch inlet and outlet lines. The fan is connected to the 8-inch vessel vent header VV-8166 and the 8-inch fan to stack header VV-8168 by 8-inch to 3-inch reducers and rubber boots. The fan is powered through an adjustable ratio pulley drive by a continuous service Duty Master, 10 hp, 3510 rpm motor operating from 480-volt, 60-cycle, 3-phase current. The operation of the fan is controlled by MS-V1 on MCC-2 in the control room. (For location of the exhaust fan, see Figure V-20.)

Reference print: H-2-58745

CVI #: 16900

e. Vessel Vent Header Seal Loop

A water seal loop has been provided on the vessel vent header downstream of the filter assembly. The seal is designed to provide a vessel vacuum relief and to prevent condensate from running back into the filter assembly. The seal is constructed of 1.5-inch stainless steel pipe and provides a 36-inch water-filled seal loop. It is located in Cell 3 on the vessel vent filter outlet and is filled via a 1/2-inch raw water line containing a manual valve. The raw water valve is located on the west end of the north canyon building wall.

Reference print: H-2-62062

f. Vessel Vent Stack

The 150-foot vessel vent stack is located northwest of the 244-AR Vault on a 3-foot square concrete support (see Figure V-22). The stack is constructed of two sections of 8-inch, schedule 40 stainless steel pipe supported within a 16-inch, schedule 10 carbon steel pipe. A stainless steel cap (at elevation - 125 feet) has been provided at the top section to prevent corrosive exhaust gases from entering the carbon steel support pipe. The stack is supported at the 61.5-foot level and at the 123-foot level by three, 5/16-inch stainless steel pre-formed wire ropes with a minimum breaking strength of 12,500 pounds. Two 1-1/2-inch, schedule 40 stainless steel sampling ports have been provided 8 feet downstream of the 8-inch, schedule 40 long radius 90 degree elbow at the breech of the stack. All exposed carbon steel surfaces have been painted with SPC-1 paint as per specification HWS-7539.

Reference prints: H-2-61988, H-2-62-10, H-2-62098,
Sht. 3

Specifications: HWS-7539

g. Instrumentation

The following instrumentation has been provided to control and monitor the operation of the 244-AR Vault vessel vent system:

Heater Outlet Temperature Control - The heater outlet temperature is controlled by a diaphragm-operated valve DOV-AR-1 on the 2-inch, 100 psig steam supply line STM-84815 in the control room. Temperature element TE-AR-1 (0-120 C resistance wire thermometer element with protecting sheath) is located in the heater outlet line ahead of the filter assembly. The temperature element is connected to CVT-AR-1 via heater connector C and Cell 3 wall nozzle G-2. The pneumatic signal from CVT-AR-1 is transmitted to the temperature indicator controller TIC-AR-1. The temperature indicator controller maintains the set point temperature by transmitting a pneumatic signal to DOV-AR-1 which throttles the steam flow in the 100 psig steam supply line STM-84815. Two manual valves and a by-pass line and valve have been placed at DOV-AR-1 to allow maintenance work on the control valve without interruption of vessel vent service. A pressure indicator with a manual shut-off valve has been provided on the downstream side of the control valve to measure the heater coil pressure.

Reference print: H-2-58745

Specifications: HWS-7539

Vessel Vent Vacuum Control - The static pressure in the vessel vent header VV-816 (upstream of the heater) is conducted to the pressure transmitter PT-V1 via the 1/4-inch stainless steel tube IA-8477. The signal output from the transmitter is conducted to the pressure indicator controller PIC-V1. PIC-V1 maintains the static pressure set point by transmitting a valve loading signal to DOV-V1 in the vessel vent line VV-8166 located ahead of the exhaust fan.

Vessel Vent Seal Pressure Indicator - A 0-25-inch water Magnehelix pressure indicator has been provided on the vessel vent header at the water seal position. A loss in vacuum on this gauge indicates a blown water seal. The Magnehelix pressure indicator is located on the back wall of the canyon building at the northwest end.

Filter Differential Pressure - The differential pressures across the vessel vent filters are monitored by DPI-AR-1 (range 0-5 in. W.G.). The static pressure at the entrance to the filter assembly (connector A) between the high efficiency filters (connector C) and the filter outlet (connector B) is conducted to the differential pressure transmitter DPT-AR-1 through a jumper to Cell 3 wall connector G-1 and a valving system. The output from DPT-AR-1 is transmitted to the differential pressure indicator DPI-AR-1 which indicates the differential pressure across the valved-in filter. The following valving arrangements are used to obtain the desired filter differential pressures:

<u>Filter</u>	<u>Valves Opened</u>	<u>Valves Closed</u>
K4-3-1	1H & 1L	2H & 2L
K4-3-2	2H & 2L	1H & 1L
Total	1H & 2L	2H & 1L

Radiation Monitor - See Section V-H.

D. Closed Circuit Television

The purpose of the closed-circuit television system is to visually monitor maintenance operations in the high-level nuclear radiation fields within the process cells. Three COHU video cameras, each having its separate enclosure, have been provided. Each camera system has a pan and tilt mechanism with controls for 360-degree panoramic range, a 16 mm zoom lens, a 17-inch video monitor, hardware, cabling, and the necessary electronics equipment to provide a complete closed-circuit television system. Two cameras (channels "A" and "B") have been provided for portable placement on any two

of 16 canyon wall brackets prior to removal of the process area cover blocks. The third channel ("C") has been mounted on the crane. The 17-inch video monitors and associated camera and monitor controls are located in the crane control room against the east wall.

Reference print: H-2-62017

Specifications: HWS-7544

CVI #: 16758

E. Industrial Wall Periscope

An industrial wall periscope has been provided to supplement the closed circuit television system for remote viewing of operations within the 244-AR Vault canyon. Operation and viewing through the periscope is carried out in the crane control room. The periscope extends through the 1.5-foot concrete crane control room wall to the canyon building. The periscope penetrates to approximately 6 inches beyond the 1.5-foot thick concrete canyon wall at an elevation of 691 feet 4 inches. The periscope has been approximately centered over Cell 2 to allow good coverage of the Cell 2 equipment during jumper changes or remote maintenance work. The periscope has a hemispheric scanning solid angle of 180 degrees as centered about the objective end. A counter balanced vertical arm has been provided to rotate the eye piece through an angle of 90 degrees in the vertical plane about the axis of the horizontal arm. The periscope with a single eye piece has angular magnifications of 3x and 10x for infinite object distances, and the field of view for the 2x magnification is 15 degrees. The periscope may be focused between 4 feet and infinity by rotating the eye piece. The optical elements which are exposed to the high nuclear radiation fields are constructed of non-browning glass. All optical elements are free of spherical and chromatic aberrations, coma, astigmatism, distortion, and curvature of field. A radiation shield has been provided in line with the horizontal arm in the control room.

Reference prints: H-2-62007

Specifications: HWS-7536

F. Bridge Crane

The 244-AR Vault is equipped with a motor-driven bridge crane. This crane has a 20-ton capacity. On either side of the main hook are located two 1-ton monorail hoists. The crane is controlled remotely

from the crane control room which also houses the TV monitors, periscope, and crane electrical gear.

Reference prints: H-2-62004, H-2-62046

Specifications: HWS-7359

1. Bridge

The bridge rides on No. 60 ASCE crane rails at an elevation of 712 feet, 6 inches. It will travel at three speeds: 10, 20, and 40 feet per minute. Should the bridge travel mechanism fail, it may be drawn to the east end of the canyon manually for repair. The bridge and trolley drives have solenoid (torque) brakes rated at no less than 50 percent full load motor torque.

2. Main Hoist

The main hoist has a rated capacity of 20 tons. It may be lifted to a maximum elevation of 712 feet and it will travel at either 7.5 feet per minute or 3 feet per minute. The hook has a drive mechanism such that it may be rotated from the crane control room. Limit switches prevent lifting loads greater than 125 percent capacity. An automatic clutch is used to disengage the drive mechanism of the main crane should power to this equipment fail. The bridge crane is equipped with two independent braking systems. A load brake, rated at 125 percent hoist capacity, automatically controls the lowering speeds. A solenoid-operated hoist motor brake, interlocked with the motor control circuit, automatically stops the hoist when power to the motor is interrupted. The torque rating of the motor control brake is at least 125 percent of the motor capacity.

3. Auxiliary Hoists

Two, 1-ton capacity auxiliary hoists are located on each side of the main crane (total of four). Auxiliary hoists and motors travel together on monorails on the same trolley. The monorails are located beneath the main bridge crane and are provided with end stops that do not interfere with the main bridge crane in any position.

<u>Distance from</u> <u>Wall</u>	<u>Hook</u> <u>Separator</u>	<u>Lift</u>	<u>Speed</u>	<u>Manufacturer and Cat. No.</u>
39-7/8	17	60'	7-20	Harnis CH FE 6 ER (P&H) -322 B124
37	18	59'	31-10	Hale - 2565

Braking mechanisms for these hoists are the same as those described above for the main hoist.

4. Limit Switches

Limit switches prevent the crane bridge, 20-ton trolley and hook, and auxiliary hoist trolleys from traveling too far in any direction. A backup limit switch limits the "up" motion of all hooks. A load limit switch prevents lifting greater than 125 percent of rated capacity.

5. Crane Control Room

The crane control room houses the TV monitors, crane control console, and electrical controls for the crane. The crane controls are located on a free standing, mobile enclosure with a slanted top. The control of each individual speed and direction of rotation of each individual motor is controlled by on-off switches on the crane control console. A cabinet, 17-1/2 inches x 48 inches x 72 inches, contains contactors, motor controllers, relays, and all other electrical equipment for the crane.

6. Electrical

The motors on the bridge crane are supplied with 480-volt, 3-phase, 60-cycle power through the electrical cabinet in the control room. All motors are fan cooled and totally enclosed and do not exceed 1750 rpm at full load. The crane control console is supplied with 120-volt AC power.

G. Ventilation Systems (Figure V-23)

The 244-AR Vault has been provided with two individual ventilation systems. One is for the canyon area and process cells, and the other for the service area. The canyon ventilation system is further divided into supply and exhaust systems. The ventilation supply systems each consist of the following equipment (in order of flow): A louvered damper, a filter, two preheaters, an evaporator cooler, a reheater, a radial damper, and non-overloading centrifugal fans. The service area ventilation air is exhausted through three powered exhaust ventilators. The canyon ventilation air is drawn through 99.97 percent DOP filters*, located in the 291-AR filter building, by an industrial centrifugal fan and is exhausted through a concrete stack. A description of the 291-AR filter building is given in Section III-F.

Reference prints: H-2-58749, H-2-62028, H-2-62029,
H-2-62030, H-2-62031, H-2-62032,
H-2-62033

Specifications: HWS-7539

*Diocetlphthalate (DOP) particle removal test.

1. Service Area Ventilation System

The service area supply system supplies 5700 cfm air to the service building. It is distributed as follows:

Main Operating Room	3400 cfm
Restroom Area	1100
Chemical Makeup Tank	200
Sampling Room	500
Crane Control Room	<u>500</u>
	5700

The service area ventilation system consists of the following equipment:

	<u>Designation</u>
Louvered Damper	D-1
35% NBS Filter	K-1-1-1
2 Preheaters	K-1-4-1 & 2
Evaporative Cooler	K-1-5-1
Reheater	K-1-6-1
Radial Damper	D-10
Non-Overloading Centrifugal fan	K-1-7-1
5 Diffusers	
3 Powered Exhaust Ventilators	K-1-8-1, K-1-10-1, K-1-10-2
Industrial Centrifugal fan	K-1-9-3

a. Filter K-1-1-1

Air enters the system through a louvered 57-inch high by 46-inch wide damper controlled by damper motor D1 and passes through a 35 percent NBS* filter (K-1-1-1). This is a

*National Bureau of Standards (NBS) test for filter efficiency.

renewable media roll-type filter with replaceable high-efficiency cartridges. The renewable media is glass fiber material of progressive fiber diameter and density. This media has a minimum depth of 2 inches and is supported by a flexible mesh. The area of filter exposed to flow is 30 inches wide and 58 inches high. Filter media is automatically fed across the air stream from a roll of clean media at the top of the filter casing and is re-rolled under compression at the bottom. This automatic section consists of a drive motor and adjustable timer to control the rate of feed, along with a media run-out switch and media run-out indicating light. The pressure drop across this filter is read on PI-1 located on the HVAC instrument panel.

b. Preheaters K-1-4-1 and K-1-4-2

After the air passes through filter K-1-1-1, it goes through preheaters K-1-4-1 and K-1-4-2. The preheaters consist of the non-freeze, steam distributed tube, extended fin-type coils. The heating surface consists of flat aluminum fins mounted on copper tubing. Each coil consists of 10 horizontal copper tubes 55 inches long, all located in one vertical plane. The over-all height of each heater is 29 inches.

The first preheat coil (Coil K-1-4-1) outlet temperature is controlled by TCV-1 on the incoming steam line through TIC-1 and controls the temperature of the air leaving this preheater. The temperature of the air leaving the evaporative cooler is controlled through TIC-2 by TCV-2 on the steam line into preheater K-1-4-2. TIC-1 and TIC-2 are located on the HVAC control panel. Preheater K-1-4-1 has a capacity of 308,000 Btu per hour and K-1-4-2 has a capacity of 246,000 Btu per hour.

c. Evaporative Cooler K-1-5-1

After leaving the preheaters, the air enters evaporative cooler K-1-5-1. This cooler consists of a casing containing glass fiber cells arranged in a single tier, a water spray system, metal blade eliminators, and a tank to collect the spray water. The cooler casing is made of zinc-coated sheetmetal. The cell casings have zinc-coated sheetmetal sides and zinc-coated wire ends. The cells are 20 inches by 20 inches by 8 inches and have 125 feet² of contact surface. There are six of these cells located in two rows of 3 in a slightly off-horizontal plane. The maximum rated capacity of each cell is 1100 cfm at 9 gpm of coolant flow.

Twenty-four nozzles are located on a common header above the glass fiber cells. Nozzles are made of bronze and deliver a solid stream in a square pattern. The spray water pump is

the vertical submerged centrifugal type. The pump discharge piping is schedule 40, zinc-coated steel. The 3/4 horsepower pump is capable of delivering a minimum of 9 gpm to the spray header at a pressure not less than 6 psi at the spray nozzles. The nozzles may be inspected through wire glass, water tight, inspection ports.

d. Reheater K-1-6-1

The reheat coils are constructed the same as preheat coils K-1-4-1 and K-1-4-2 described previously. They provide the final adjustment of the operating area temperature. This temperature is controlled through TIC-3 located on the ventilation systems control panel by TCV-3, which controls the flow of steam to the heater. The reheat coil has a capacity of 185,000 Btu per hour.

e. Non-Overloading Centrifugal Fan K-1-7-1

The pressure in the operating area is controlled automatically by a 15-inch diameter radial damper at the inlet of fan K-1-7-1. The damper is controlled by damper motor D-10 through PIC-1. The normal capacity of the fan is 5700 cfm at 70 F. It is belt-driven from a 7-1/2 hp motor operating at 1725 rpm. This motor is operated on 480-volt, 3-phase, 60-cycle power. The V-belt drives are sized at 150 percent of the motor horsepower.

f. Diffusers

The air is distributed in the operating area and restroom area by five, 950 cfm diffusers. Four are located in the operating area and one in the restroom area. Diffusers are of the internal induction type with four concentric cones and a combination air flow deflector with volume control damper. The concentric cones are manually adjustable. The diffusers have a neck diameter of 18 inches, an outside diameter of 40 inches, and are mounted at a height of 9 feet above the floor. Air is supplied to the sampling room and crane control room from ducts in the operating area. The flow to the crane control room is controlled by a manual damper. Flow to the sampling room is controlled by damper motor D-11 through PC-3 and PT-1 and is governed by the canyon pressure.

g. Operating Area Exhaust Systems

Air from the operating areas is exhausted at six locations through two 1700 cfm powered exhaust ventilators (K-1-10-1 and K-1-10-2), one 1100 cfm powered exhaust ventilator (K-1-8-1) and a 200 cfm industrial centrifugal fan (K-1-9-3)

which vents the chemical makeup tank. The crane control room is vented through an exhaust duct to the atmosphere, and the sampling room air is discharged through a damper into the canyon. This damper is controlled by damper motor D-12 and is controlled by the canyon pressure through PT-1 and PC-3.

The roof ventilator (K-1-8-1) is a centrifugal wheel type with weather-hooded-bird screened outlets, a spun venturi inlet, and a backwardly inclined, non-overloading, multi-blade wheel. The fan is operated by a 1/4 hp motor on single phase, 120-volt, 60-cycle power. The fan is V-belt driven. An adjustable damper is provided.

The wall ventilators (K-1-10-1 and K-1-10-2) have backwardly inclined non-overloading, multi-blade wheels and back draft dampers. They are V-belt driven by 1/2 hp motors operated on 440-volt, 3-phase, 60-cycle power.

The industrial centrifugal fan (K-1-9-3) used to vent the chemical makeup tank (TK-A-30) with 200 cfm is powered by a 1/4 hp motor operated on 1-phase, 120-volt, 60-cycle electricity. It vents to roof of the crane control building through a duct.

2. Canyon and Cell Ventilation System

The canyon and cells are ventilated with 22,000 cfm of air supplied by a system similar to the operating area ventilation supply system but with a larger capacity and some additional instrumentation. The air is supplied to the canyon from the roof through two ducts. It passes through the canyon and into the cells through two ducts located at the west end of the building. The air then passes through all three cells and into a filter building containing two banks of high efficiency filters. It is drawn through these filters by one of two industrial centrifugal fans and is vented to the atmosphere through a concrete stack.

a. Canyon Ventilation Supply System

The canyon ventilation supply system consists of the following equipment listed in order of flow.

Louvered damper	
85% NBS filter	K-2-2-1
Preheater	K-2-4-1
Preheater	K-2-4-2
Evaporative cooler	K-2-5-1
Reheater	K-2-6-1
Radial damper	

Non-overloading
centrifugal fan K-2-7-1

The above equipment is very similar to that in the K-1 system. In description of the above equipment, only differences between it and the K-1 system equipment will be discussed.

b. 85 Percent NBS Filter K-2-2-1

Air enters the system through a normally open louvered damper controlled by a damper motor D-2. This damper consists of two 46-inch wide and 72-inch high dampers operating in unison from common controls. The pressure drop across the filter is recorded on PI-2 located on the ventilation systems control panel. This filter contains two separate rolls of media, one 45 inches wide and the other 30 inches wide. Both are 72 inches high in the air stream. They are operated together from common controls.

c. Preheaters K-2-4-1 and K-2-4-2

The capacity of preheat coils K-2-4-1 is 1,160,000 Btu/hr and that of preheat coils K-2-4-2 is 930,000 Btu/hr. The temperature of the air from heater K-2-4-1 is controlled by TCV-4 and TCV-5 on the steam lines into the heater. The temperature control is accomplished through TIC-4. An alarm will sound on the control panel should this temperature drop below 35 F. The temperature from evaporative cooler K-2-5-1 is controlled by TCV-6 on the steam line into preheater K-1-4-2 through TIC-5. Each of these units consists of two sets of coils with eleven 88-inch horizontal tubes. Each set of coils is 33 inches high. All tubes within a given heater are in a common vertical plane.

d. Evaporative Cooler K-2-5-1

The cooler contains two tiers of 10 glass fiber cells arranged in two rows or 5. It has a spray header for each tier, each containing 40 spray nozzles. Each of these spray headers has a 0-30 psi pressure indicator on it. The glass fiber cells are exactly the same as those in the K-1 cooler. The pump is powered by a 3 hp motor.

e. Reheater K-2-6-1

Reheater K-2-6-1 is the same as the preheaters in the K-2 system. It has a capacity of 700,000 Btu/hr while handling 21,500 cfm air. The temperature of the air entering the canyon is controlled by TCV-7 in the steam line to K-2-6-1 through TC-1.

f. Non-Overloading Centrifugal Fan

The pressure in the duct for air entering the canyon is controlled by a 33-inch diameter radial damper located at the entrance to non-overloading centrifugal fan K-2-7-1 operated by damper motor D-9 through PT-2 and PC-2. The fan is V-belt driven from a 25 hp motor operating at 1725 rpm on 440-volt, 3-phase, 60-cycle power.

3. Canyon Exhaust System

Ventilation air passes from Cell 1 through a 2-foot 8-inch by 3-foot duct to the 291-AR filter building (see Section C-VI) which houses two banks of 99.97 percent DOP filters. Each of these banks contains 24 separate filter units. The air is drawn through these filters by one of two centrifugal fans and is exhausted through a 3-foot 6-inch inside diameter concrete stack (see Section III-F).

a. Filters

The canyon ventilation air is filtered through two banks of 99.97 percent DOP filters. Each of these banks contains three rows of 8 units per row. Each unit is 23.5 inches square by 11.5 inches deep and contains 200 ft² of filtering area.

b. Industrial Centrifugal Fans K-3-9-1 and K-3-9-2

The canyon air is exhausted through one of two Buffalo Industrial Exhauster, type MW, size 80, centrifugal fans located on top of the 291-AR building enclosure. Fan K-3-9-1 is used during normal operation while fan K-3-9-2 is used only as a backup in case of mechanical, electrical, or pneumatic air failure. Fan K-3-9-2 (emergency fan) is powered by a diesel motor generator which operates in case of an electrical failure and is located just west of the operating area. There are two dampers associated with each fan; a radial damper at the inlet of each fan, and a louvered damper at the exit from each fan. The radial damper is used to control the canyon pressure through PT-1 and PC-1. The exit damper is controlled by PT-1 through damper motor D-8. The fans are powered by continuous duty Pacemaker, 75 hp motors operating on 3-phase, 440-volt, 60-cycle electricity.

H. Radiation Monitoring

Permanently mounted radiation detectors are provided at seven locations in the 244-AR Vault area: in the canyon building above each of the three process cells; adjacent to the waste cooling water manhole; in the control room; and in the vessel vent and canyon ventilation stacks. In addition to the seven permanently mounted radiation detectors there is a portable radiation detector used for determining radiation profile measurements in the 002 and 004 vessels and in cells 1, 2, and 3.

The following list summarizes the radiation monitoring equipment in the 244-AR Vault area (see Figure V-31).

<u>Detector</u>	<u>Detector Location</u>	<u>Indicator</u>	<u>Recorder</u>	<u>Alarm</u>	<u>Range</u>
RE-1	Canyon Cell 1	RI-1	RR-001	RA-7	0.1 mr/hr → 10 mr/hr
RE-2	Canyon Cell 2	RI-2	RR-001	RA-7	"
RE-3	Canyon Cell 3	RI-3	RR-001	RA-7	"
RE-4	Operating Area	RI-4	RR-001	RA-8	"
RE-AR-2	Cooling Water Manhole	RAM-AR-2	RR-001	RAM-AR-2*	10^3 cpm → 10^6 cpm
RE-244-AR-2	Vessel Vent Stack		AR-244AR-1	RAM-244AR-2	10 cps → 10^5 cps
RE-244-AR-1	Canyon Ventilation Stack		RR-244AR-1	RAM-244AR-1	10 cps → 10^5 cps
	Portable		None	None	

*Upon alarm, the cooling water to the 216-A-25 swamp is automatically diverted to the diversion ditch.

The radiation level indicators and recorders for the above listed instruments are all located adjacent to the sample room air lock on the radiation monitoring panel board except the portable detector. The portable detector is stored in the canyon building and is used to obtain radiation profiles through the two radiation monitoring drywells and the 3 radiation monitoring access ports.

There are four particulate matter air filter paper samplers and two activated charcoal iodine samplers which have been supplied to measure the amount of radionuclides that are released to the environs. The air filter samplers are located in the control room, canyon, canyon ventilation stack, and vessel vent stack. Iodine samplers are provided at the vessel vent stack and the canyon ventilation stack.

Reference prints: H-2-58745, H-2-62041

I. Samplers and pH Meters (Figure III-4)

Samplers - Provisions have been made for obtaining samples from 244-AR-001, 002, 003, and 004 tanks. Samplers for each of these tanks are located in 2 ft 9-1/2 in x 2 ft 7 in x 2 ft 9 in deep sampler pits located in the sample room (see Section III-C). All four sampler pits are identical (e.g. contain identical piping and have common nomenclature for all valves, nozzles, and lines). Each sampler pit is supplied with raw water and process air through a 2-inch, 3-way nozzle (designated U1) and process air from a 1/2-inch pipe located 8 inches above nozzle U1. There are three lines from each sampler pit to its associated vessel in the process cell. These are a 1/4-inch suction line (Line A), a 1/4-inch bleed air line (Line B), and a 1/2-inch return line (Line C). Lines A and C leave through a 2-inch, 3-way nozzle (designated H1); line B through a 1/2-inch pipe located 8 inches above H1.

Non-permanent equipment in the sampler pits includes a modified "Type A" 1/2-inch sampler, a 0.026 - 0.053 gpm sampler air jet, and associated piping. The jet is used to draw samples through the sampler cup. This cup is approximately 5/8-inch in diameter and 7/8-inch deep and has a baffle perpendicular to the direction of flow. The baffle forces flow through the bottom of the cup to assure complete flushing of the cup. Samples may be drawn from the cup with a doorstop sampler. Valving is provided so that the sampler, the return line, and the suction line may be flushed with raw water. All valves have extension handles which permit samples to be taken with the pit cover blocks in place.

Lines A, B, and C enter the process cells through 2-inch, 3-way nozzles. Sampling jumpers are designated 1-TK-001-G8-M, 2-TK-002-G6-S, 3-TK-003-G29OK, and 3-TK-004-G15-K. All three lines from the sampling jumper enter the associated tank. Line A, the suction line, draws the sample 18 inches above the bottom of tanks 001 and 002, and 12 inches above the bottom of tanks 003 and 004. Pressurized bleed air from Line B enters Line A at a point 1 foot 10 inches above the bottom of the suction line in tanks 001 and 002, and 1 foot 2 inches above this point in tanks 003 and 004. The portion of sample which is not used is returned to the tank of its origin through Line C. A schematic diagram of the jumper, sampler, and piping may be found in Figure III-4).

Reference prints: H-2-3224 , H-2-58744, H-2-62006,
H-2-62069, H-2-62070, H-2-62121,
H-2-62137

pH Meters - Instrumentation has been provided to obtain the pH of the NHW in TK-244-AR-003 and to monitor the acidification of sludge in TK-244-AR-004. Each pH installation includes a flow cell, a buffer tank, a rinse tank, a pH analyzer with indicator, a pH recorder point, associated wiring and stainless steel piping.

The flow cell contains a pH glass electrode (Beckman # 19008), a pH reference electrode (Beckman # 78129V) and a thermocompensator electrode (Rosemount Engineering Co. Model 137BP). The flow cell has been installed in the modified "Type A" sampler as shown on drawing H-2-63354.

The buffer and rinse tanks are located on the west wall of the sample room. Each tank is 11 inches high by 8 inches in diameter and is constructed of natural opaque polyethylene. Each of the four tanks has been provided with a hinged dust cover and is connected to its sampler via a manual Gate valve, a solenoid valve and stainless steel piping.

Each set of flow cell electrodes is connected to a pH analyzer with indicator located in the west wall of the sample room airlock. The pH analyzers (Beckman # 72302 Model J) are connected to the pH recorder pHR-1.

The following list represents the nomenclature used for the pH system:

Flow cell	TK-003	TK-004
Recorder	pHR-1 (Pt. #1)	pHR-1 (Pt. #2)
pH analyzer with indicator	pHAN-1-1	pHAN-1-2
Selector switch	SS-1-1-1	SS-1-1-2
Pos. #1	TK-003 Rinse	TK-004 Rinse
#2	Off	Off
#3	TK-003 Buffer	TK-004 Buffer

Reference prints: Flow Cell H-2-32653 Assy. 11
 Jumper H-2-63354
 Instrumentation H-2-34166

J. Aqueous Makeup Facilities (AMU) - (See Figure V-24)

Chemical solutions are added to the four process vessels in the AR Vault by means of AMU facilities. The AMU facilities consist of a nitric acid storage tank, a sodium hydroxide storage tank, a chemical addition tank, instrumentation, a chemical drywell, pumps and associated piping.

1. TK-244-AR-A-10 (57 Wt.% Nitric Acid Storage) (See Figure V-25)

The nitric acid storage tank is located on a concrete pad at the west corner of the 244-AR-Vault Service Building. The vessel is constructed of stainless steel and has a capacity of 7762 gallons. TK-A-10 is approximately 14 feet 10 inches in height by 10 feet in diameter. The tank is equipped with a liquid level indicator, a pump, an overflow and vent line, a fill and transfer line, a gravity flow drain, three spare risers, and an 18-inch covered access hole.

Reference prints: H-2-62060, H-2-62099

a. LI-A-10 (Liquid Level Indicator)

The liquid level indicator (range 0-260 inches of water) is locally mounted on the A-10 vessel. 20 psig instrument air is supplied to a control valve and a purge air rotameter which controls the purge air rate through the liquid level indicator dip tube. The dip tube assembly is constructed of 1/2-inch, schedule 40, stainless steel pipe and extends to within 1 inch from the bottom of the vessel.

b. P-A-10 (Nitric Acid Transfer Pump)

The nitric acid pump is located on a concrete pad a few feet south of the A-10 vessel. The 30 gpm pump is constructed of stainless steel and has been provided with type 304L stainless steel piping. The discharge from the pump may be routed to either the A-30 chemical makeup tank or recycled back to the A-10 vessel by manual valves located at the pump discharge. Nitric acid is pumped to the A-10 vessel from a tank truck. Manual switch MS-P-A10-1 on motor control center MCC-1A controls the operation of the 7-1/2 hp, 440-volt, 3-phase, 60-cycle General Electric pump motor which rotates at 3470 rpm.

Reference prints: H-2-62019, H-2-62060

c. Overflow, Vent and Drain Lines

The tank A-10 overflow, vent and drain lines are constructed of 2-inch, schedule 40, type 304L stainless steel pipe. The overflow and drain from the A-10 vessel discharge into the chemical drywell CD-831.

2. TK-244-AR-A-20 (50 Wt.% Sodium Hydroxide Storage) (See Figure V-26)

The caustic storage tank is located on a concrete pad in the front and to the west end of the Service Building. The insulated vessel is constructed of carbon steel and has an internal volume of 1342 gallons. TK-A-20 is approximately 9 feet 1 inch in height by 5 feet 4 inches in diameter. The vessel is equipped with a steam coil, a temperature controller, a pump, a liquid level indicator, a temperature indicator, overflow and vent lines, pump feed and discharge lines, and vessel and transfer line drains.

Reference prints: H-2-62060, H-2-62100

a. Steam Coil and Temperature Controller

The A-20 vessel steam coil is constructed of carbon steel and has a heat transfer area of 19.2 square feet. 20 psig process steam is supplied to the coil from the 6-inch process steam header STM-8480 via the 2-inch steam line STM-8416. The flow of steam to the coil is controlled by a 3/4-inch temperature control valve TCV-A-20 on the inlet steam line and a pneumatic temperature controller located within the A-20 vessel. The TCV may be by-passed and isolated by the use of two manual valves located in the steam line on either side of the TCV and manual valve in a by-pass line parallel with the TCV. The steam condensate discharging from the steam coil passes through a 3/4-inch condensate line to the 4-inch steam condensate header CNDS-845. The steam trap may be by-passed and isolated for maintenance by the use of two manual valves located in the condensate line on either side of the trap and a manual valve in a by-pass line parallel with the steam trap. The steam header STM-845 discharges to the Gable Mountain pond 216-A-25 via the CWD-815 line.

Reference prints: H-2-58745, H-2-62060

Specifications: HWS-7539

b. P-A-20 (Caustic Transfer Pump)

The caustic pump is located on a concrete pad a few feet south of the A-20 vessel. The 10 gpm pump is controlled by the manual switch MS-P-A20 on MCC-1A in the control room. The 3-phase, 60-cycle, 220/440-volt General Electric induction motor operates at 3435 rpm. The discharge from the pump may be routed either to the A-20 vessel or to the A-30 chemical makeup vessel. All caustic lines outside of the control room have been lagged and electrically heat-traced to prevent solidification of the caustic within the lines during cold weather.

c. TI-A-20 (Temperature Indicator)

A 0-55 C temperature indicator has been provided to monitor the solution temperature of the A-20 vessel. The temperature indicator is locally mounted on the A-20 vessel and its sensing bulb is located approximately 18 inches from the bottom of the tank.

Specifications: HWS-7539

d. LI-A-20 (Liquid Level Indicator)

The 0-160-inch W.G. liquid level indicator is locally mounted on the A-20 vessel. 20 psig instrument air is supplied to a control valve and a purge air rotameter which are used to control the purge air flow rate through the liquid level indicator dip tube. The dip tube is constructed of 1/2-inch, schedule 40, carbon steel pipe and extends to within 1 inch from the bottom of the A-20 vessel.

Reference prints: H-2-62100

Specifications: HWS-7539

3. TK-244-AR-A-30 (Chemical Addition Tank) (See Figure V-27)

The chemical addition scale tank is located at the east end of the Service Building control room. The vessel is constructed of stainless steel and has a capacity of 790 gallons. Tank A-30 is approximately 6 feet in height by 6.5 feet in diameter. The vessel is equipped with an agitator, a steam coil, a temperature indicator, a dry chemical addition hatch, a vessel vent exhaust fan, an overflow and associated piping.

Reference prints: H-2-62101, H-2-62060,
H-2-61976

CVI #: 72817

a. Agitator EPN-244-AR-A-A30

The A-30 agitator is manufactured by the Alsop Engineering Corporation and is constructed of stainless steel. The agitator has two, 3-bladed propellers set on a 1.5-inch diameter shaft with the deepest propeller located approximately 7 inches from the bottom of the tank (see Table V-2). The agitator rotates at 420 rpm and may be operated under no-load conditions without harm to the unit and associated equipment. The Alsop-Hy Speed Mixer (type 119VM) is powered by a 2 hp, 3-phase, 60-cycle, 220/440-volt motor. The operation of the agitator is controlled by MS-A-30-1 located on MCC-1C.

b. Steam Coil

The TK-A-30 steam coil is a bottom oriented coil and is constructed of 1-inch, schedule 40 stainless steel pipe. The coil has a surface area of 12.4 square feet. 20-psig steam is supplied to the coil from the 6-inch process header 8480 via the 2-inch steam line 84817. The steam flow is controlled by means of a manual valve in the 2-inch supply line. Steam condensate discharges from the coil through the 1/2-inch steam condensate line CNDS-8453 which contains a steam trap with a manual by-pass. The steam condensate discharges into the Gable Mountain pond 216-A-25 via the cooling water and steam condensate manhole and the CWD-815 line.

Reference prints: H-2-58745, H-2-62060,
H-2-62101

c. TI-A-30 (Temperature Indicator)

A 0-55 C temperature indicator has been provided to monitor the solution temperature of the A-30 tank. The temperature indicator is locally mounted on the A-30 vessel and its sensing bulb is located 18 inches from the bottom of the tank.

Specifications: HWS-7539

d. LI-A-30 (Liquid Level Indicator)

The 0-80-inch W.G. liquid level indicator is locally mounted on the A-30 vessel. 20 psig instrument air is supplied to a control valve and a purge air rotameter which are used to control the purge air flow rate through the liquid level indicator dip tube. The dip tube is constructed of 1/2-inch, schedule 40 stainless steel pipe and extends to within 8 inches from the bottom of the A-30 vessel.

Reference prints: H-2-62101

Specifications: HWS-7539

e. Dry Chemical Addition Hatch

A hatch has been provided on the A-30 vessel for the addition of chemicals. The rectangular opening in the vessel is 20 inches long by 12 inches wide and is covered by a removable stainless steel cover plate. Access to the hatch is made possible by a set of stairs with a platform located adjacent to the A-30 vessel.

f. A-30 Exhaust Fan

The A-30 vessel has been provided with a 200 cfm vessel vent exhaust fan. The operation of the exhaust fan is controlled by MS-A-30-2.

g. Piping

The following process piping has been provided for the A-30 vessel:

<u>Line Designation</u>	<u>Size (inches)</u>	<u>Service</u>	<u>Origin or Destination</u>
NaOH-833	1-1/2	Sodium Hydroxide Addition	TK-244-AR-A-20
HNO ₃ -832	1-1/2	Nitric Acid Addition	TK-244-AR-A-10
RW-84929	2	Raw Water Addition	8"-RW-849 Header
CA-8305	2	Overflow Line	Chemical Drywell 4"-CD-831
CA-830	1-1/2	Chemical Addition	Hose, Connectors, TK-244-AR-004
CA-8304	1-1/2	Chemical Addition	TK-244-AR-004
CA-8303	1-1/2	Chemical Addition	TK-244-AR-003
CA-8302	1-1/2	Chemical Addition	TK-244-AR-002
CA-8301	1-1/2	Chemical Addition	TK-244-AR-001

The gravity flow chemical addition line CA-830 from the A-30 vessel supplies TK-244-AR-004 through CA-8304 and a seal pot via a permanent piping connection between CA-830 and CA-8304 and a manual valve. The other three process vessels are supplied from the CA-830 line via manual valves, seal pots, and hose connectors on the CA-830 line and the CA-8303, CA-8302, CA-8301 lines.

K. Jet Gang Valves (Figure V-8)

The type of gang valves used to operate the jets in the 244-AR Vault facilities are remotely air operated from key locked control switches located on the east process instrument panel in the control room. Jet operation is effected through simultaneous opening and closing of

spring loaded diaphragm operated valves. Each gang valve station consists of four sequence-controlled diaphragm operated valves (steam, air, shut-off, and vent). The use of the four automatic sequence-operated valves prevents the back flow of radioactive solutions caused by the condensation of steam in unpurged jet supply lines.

Each jet controller has a two-position "on-off" key locked handle. In the "on" position, steam is being supplied to the jet. When the handle is turned to the "off" position, the controller automatically adjusts the diaphragm valves first to an intermediate position and then to the "off" position. The controller maintains the intermediate position for 60 seconds during which time the air and shut-off valves are open to purge steam from the jet supply line. The positions of the diaphragm valves for the three controller positions are shown below.

<u>Manual Control</u> <u>Switch Position</u>	<u>Valve A</u> <u>Steam</u>	<u>Valve B</u> <u>Air</u>	<u>Valve C</u> <u>Vent</u>	<u>Valve D</u> <u>Shutoff</u>
On	Open	Closed	Closed	Open
Off (Intermediate)	Closed	Open	Closed	Open
Off (60 Sec. Delay)	Closed	Closed	Open	Closed

L. Sluicer Assembly (Figure V-28)

The sluicer assembly is designed to break up and slurry the strontium bearing sludge so that it may be removed and transferred to TK-244-AR-002 via the P100 waste recovery pump. A sluicer assembly is installed in a sluice pit above the sluice tank and is connected to the 600 gpm sluice pump (EPN-244-AR-002-1) via the 153-A transfer box and a 4-inch flexible sluice pit jumper (see Section IV for routings).

The motion and orientation of the sluicing nozzle is controlled with equipment located on top of the sluice pit cover blocks through a 12-inch diameter cover block hole. The vertical angle of nozzle may be controlled between a vertical angle of -45 degrees to +90 degrees from the straight down position with a manually operated lever. The sluicing nozzle moves back and forth through a maximum adjustable arc of ~130 degrees during operation. The horizontal sweep is controlled by the use of two adjustable reversing micro switches connected to the drive motor circuit. The nozzle is driven by a 1/2 hp motor through two gear boxes and a cam drive. The horizontal motion is translated to the nozzle through a 4-inch O.D., 3-inch I.D. steel tube. The section of this tube passing through the flanged riser is encased in a 4-inch, schedule 40, carbon steel pipe. Inside this tube is a 2-3/8-inch steel tube used to control the vertical position of the nozzle by means of an adjustable pivot located approximately 28 feet below the sluicer adapter flange. The nozzle is connected to the pivot joint by a 28-inch long, 2-1/2 inch diameter pipe containing four flow control vanes. The nozzle is 12 inches long and has a 1-inch nozzle exit.

M. Waste Recovery Pump EPN-241-A-P-100 (PSW to AR Vault)

The continuous service P-100 pump (see Figure V-29) is constructed with a stainless steel shaft, carbon steel casings, discharge heads, pipes, and a corrosion-resistant alloy impeller. The pump has a specified capacity of 660 gpm at a total dynamic head of 116 feet (includes 48.5 feet of static head) and has an available NPSH of 10.4 feet including no static head. The pump is designed to pump PSW at 220 F with a viscosity of 0.83 cps, a specific gravity of 1.6, and a vapor pressure of 7.5 psia. A strainer at the pump inlet prevents particles with diameters greater than 1 inch from entering the pump. This strainer is located 1 foot from the tank bottom. The pump is equipped with six sluicing jets at the strainer. These are provided with a total of 100 gpm water at 200 psig and are used when placing the pump initially and may be used for cooling during pumping.

Operation of the 75 hp P100 pump is controlled from the 244-AR Vault service building by a motor control switch and weight factor switches located on MCC-1 and the CVT transmitter rack. When the motor control switch MS-P-100 is closed, the pump is controlled by TK-244-AR-002 weight factor switches. (Low weight factor starts the pump and high weight factor stops the pump.) A safety switch has been locally mounted at the waste recovery pump to provide further control over pumping operation.

Reference prints: H-2-62084

Specifications: HWS-7527

Performance Curve: Figure V-30

CVI #: 16959

N. Utilities

The following utility systems have been provided:

1. Electricity

Normal Supply - The electric power to the 244-AR Vault facilities is supplied from the previously existing 13.8 KV, 3-phase, 3-wire feeder lines at pole #C8L5-158. The Hanford coordinates of this pole are N40817.0-W48189.4. The power is conducted through three #4, 7STR-ASCR cables supported by four 45-foot wooden utility poles to pole #1 located approximately 50 feet west of the 244-AR Vault. The power cables terminate at a 200 amp - 15 KV fused hook-stick operated cutout-disconnect located at the #1 pole. A 15 KV lighting arrester has been provided at this point in the supply circuit. From pole #1 a transition is made to three #1, 15 KV power cables which are encased

in a 3-1/2 inch conduit run to the transformer fuse compartment located with the transformer at the west end of the 244-AR service building. The transformer is a 4-wire, 750 KVA, 3-phase unit with a 13.8 KV Delta connected primary winding and 480 V and 277 V "Y" connected secondary taps. A 1600 amp bus and ground connects the 480 volt secondary to the switch gear located inside the service building. The switch gear supplies two separate motor control centers (MCC). The equipment supplied through motor control center No. 1 is as follows:

<u>Equipment Piece</u>	MCC #1		
	<u>Ammeter</u>	<u>Fuse Amperage</u>	<u>Circuit Breaker Trip Amperage</u>
Crane	No	-	125
A-001	Yes	-	125
A-002	Yes	-	125
A-003	Yes	-	50
A-004	Yes	-	50
A-A30	No	-	20
P-A10	No	15	-
P-A20	No	15	-
P-002-1	Yes	-	500
P-002-2	Yes	-	30
P-001	Yes	-	30

The equipment supplied through motor control center No. 2 is as follows:

<u>Equipment Piece</u>	MCC #2		
	<u>Ammeter</u>	<u>Fuse Amperage</u>	<u>Circuit Breaker Trip Amperage</u>
Crane Maintenance Platform	No	15	-
Welding Receptacle #1	No	70	-
Welding Receptacle #2	No	70	-
Canyon Door #1	No	15	-
K-1-10-1, K-1-10-2	No	15	-
K-1-5-1	No	15	-
K-1-7-1	Yes	-	30

<u>Equipment Piece</u>	<u>Ammeter</u>	<u>Fuse Amperage</u>	<u>Circuit Breaker Trip Amperage</u>
K-2-5-1	No	15	-
K-2-7-1	No	-	70
K-3-9-1	Yes	-	250
K-3-9-2 ¹	No	-	125
K-4-11-1	No	-	20
Air Compressor	-	-	-
P-100	Yes	-	175
Lighting Panel ¹ Boards A and B	No	-	70
Lighting Panel ¹ Board C	No	-	70

¹Transformer 480 volt to 120 volt, 45 KVA

Emergency Supply - Emergency power for the 244-AR Vault is supplied from a diesel-generator located at the west end of the service building. The emergency power supply has a capacity of 92.3 KVA and supplies 480 volt, 3-phase power to the K-3-9-2 process area exhaust fan only. The diesel-generator is automatically started during a power outage by the use of an under voltage relay in the diesel motor starting circuit.

Reference prints: H-2-62012, H-2-62014,
H-2-62015, H-2-62019

2. Water

Raw Water Supply - Raw water is supplied to the 244-AR Vault from the 20-inch, (7406) Purex raw water supply line through an 8-inch transite and carbon steel header (849). A manual shut-off valve has been provided at the tie-in located at N40185.0-W48402.0. The raw water header pressure is indicated on PI-AR-7.

Sanitary Water Supply - Sanitary water is supplied to the 244-AR Vault from the 6-inch Purex sanitary water supply through a 6-inch transite and carbon steel line. The sanitary water supplies the

HVAC evaporative coolers through PRV-AR-7 (100 psig - 45 psig), the safety showers, the fire hydrant, and acts as an emergency cooling water supply during raw water outage. The HVAC evaporative coolers supply pressure as indicated on PI-AR-10 located downstream of the PRV-AR-7. The sanitary water header (850) pressure is indicated on PI-AR-8. A back flow preventer has been provided between the sanitary water header and the raw water header. A manual shut-off valve has been provided at the tie-in located at N40421.68-W48200.0.

3. Steam

Steam enters the 244-AR Vault through a 6-inch carbon steel line at the west end of the building. The steam supply is divided and distributed through high and low pressure headers. The low pressure header supplies steam to heating coils in tanks and in the ventilation systems. The high pressure steam is used by the jets and the vessel vent heat exchanger. All condensate is sent to the Gable Mountain pond 216-A-25 via the cooling water drain manhole north of the AR Vault canyon building.

Reference prints: H-2-62033, H-2-62062, H-2-62063,
H-2-62066, H-2-62067, H-2-62068

Steam Supply - Steam is supplied at 225 psig to the 244-AR Vault through a 6-inch line from the Purex steam supply header. After the steam enters the building, it goes through PRV-AR-2 which reduces the pressure from 225 to 100 psig. The 100 psig steam goes to the high pressure header, the vessel vent heat exchanger through DOV-AR-1 and to PRV-AR-3 which reduces the pressure from 100 psig to 20 psig. The 20 psig goes to the low pressure header to be used as a heating agent.

20 psig Steam - All heating coils are supplied by the 6-inch low pressure steam header (8480). The pressure in the 8480 header is indicated on PI-AR-4 located downstream of PRV-AR-3.

100 psig Steam Header - 100 psig steam supplies the vessel vent off-gas heater through DOV-AR-1 and the transfer jets through a common 6-inch header (848). Steam from the 848 header supplies the jets through 2-inch carbon steel lines containing manual and control valves. The pressure in the 848 header is indicated on PI-AR-3 located downstream of PRV-AR-2.

4. Air Supply

Process air and instrument air for the 244-AR Vault are supplied from a compressor located adjacent to the west end of the canyon building. The compressor supplies 100 psig process air to an air receiver via an after cooler and a condensate and oil separator. The pressure in the air receiver is controlled between 95 and 100 psig by unloading valves located on the compressor. The process air exiting the air receiver is filtered and distributed via the 100 psig process air header PA-846 to the process and sampler jets, process air PRV stations and the instrument air dryer strainer unit.

5. Process Air

Process air has three general uses at the AR Vault: 10 psi air for purging process tanks; 15 psi air to purge all steam heating coils and tubes; and 100 psi air to blow all jets and to operate the sampler jets.

100 psig Process Air - Air at 100 psi is used to blow all process jets after transfers and for use in samplers. This air is distributed from a 2-inch header (line 846) which is located along the north wall of the control room. 100 psig process air is also distributed through a 1/2-inch line (84621) to the AMU utility station which is located on the outside wall of the operating area near the A10 and A20 vessels. The 100 psig process air goes through a pressure reduction valve at the station which reduces the pressure to 25 psig.

15 psig Process Air - Process heating coils in the 002, 003, and 004 tanks and the tubes of the vessel vent heater have been supplied with 15 psig process air which is used for air purging the heating equipment immediately after the steam is turned off. The 15 psig air is supplied from the main (100 psig) header through a pressure reduction valve (PRV-AR-4) and is distributed through line 8462.

10 psig Process Air - Purge air for all four process vessels of the AR Vault is supplied from line 8461 through a pressure reduction valve (PRV-AR-5, 100 # to 10#). The four purge air streams have been provided with rotameters which are located along the west wall of the control room.

6. Instrument Air

The 244-AR Vault instrument air is supplied from the 100 psig process air supply through an air filter and a dryer-strainer unit. The 100 psig instrument air is supplied to the pressure

transmitters through the 1-inch instrument air header 8476. The 20 psig instrument air is supplied from the 100 psig 8476 header through PRV-AR-1 to the instrument panel via the 1-1/2-inch instrument air header 847. PI-AR-2 indicates the pressure in the 20 psig instrument air header and a relief valve, set at 25 psig, has been provided.

Reference prints: H-2-58745, H-2-62060

Dryer-Strainer CVI #: 10207

VI. SAFETY FEATURES (Figure V-31)

The following safety features have been provided:

A. Fire Alarm System

The fire alarm system in the 244-AR Vault consists of 7 rate of rise and fixed temperature, 190 F, fire detectors, 5 gong fire alarms (6-inch, single stroke, 120 vac); 2 auxiliary fire alarm boxes; 1 supervisory and local alarm panel with extension relay; and a master alarm box (3-fold, shunt type, weatherproof). Four ABC type fire extinguishers are provided.

B. Emergency Lighting

Emergency lighting is provided by five, 6-volt, wet cell, automatic recharging units. Two units are located in the canyon, two in the operating area and one between the sample room and crane control room with one light illuminating each area.

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FIGURE II-1

Process Flow Diagram

FIGURE III-2
244-AR Vault
Sections and Elevation

FIGURE III-3

Equipment Arrangement Plan

H-2-58744	SHEET	REV
	3	

FIGURE III-4
Sampler System

- GENERAL NOTES
1. CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS. FOR CONCRETE EXCAVATION BACKFILL AND FINISH GRADING REFER TO SPECIFICATION MNS 7530.
 2. THE BUILDING SHALL BE A PREFABRICATED SELF-FRAMING STRUCTURE AND SHALL BE THE DESIGN OF A MANUFACTURER REGULARLY ENGAGED IN THE FABRICATION OF PRE-ENGINEERED BUILDINGS CONFORMING TO THE METAL BUILDING MANUFACTURERS ASSOCIATION CODE OF STANDARD PRACTICE. THE BUILDING SHALL BE ARMO TYPE LS 1, OR APPROVED EQUAL, CONSTRUCTED FOR DESIGN LOADING. E. ROOF PANELS SHALL BE 24 GA X 3 DEEP INTERLOCKING PANELS HAVING FACTORY ENAMEL FINISH BOTH SIDES. COLOR WHITE. SIDEWALL PANELS SHALL BE 24 GA X 3 DEEP INTERLOCKING SCULPTURED PANELS HAVING FACTORY ENAMEL FINISH ONE SIDE ONLY. COLOR GREEN TO MATCH METAL WALL PANELS ON EXISTING BUILDING. CEILING PANELS SHALL BE 24 GA X 3 DEEP INTERLOCKING FLAT SURFACE PANELS AND SHALL BE GALVANIZED BONDORIZED AND FACTORY PRIMED. INSULATION FOR CEILING SHALL BE 3" FIBERGLASS BLANKET TYPE OBTAINING A U-VALUE OF NOT LESS THAN 10 BTU HR/SQ FT °F. INTERIOR METAL LINER PANEL SHALL BE 26 GA X 1 DEEP LOCK IN TYPE WITH 1" FOAMED INSULATION OBTAINING A U-VALUE OF NOT LESS THAN 20 BTU HR/SQ FT °F. INTERIOR METAL LINER PANELS SHALL BE GALVANIZED BONDORIZED AND FACTORY PRIMED.
 3. DOORS SHALL BE HOLLOW METAL TYPE WITH A MINIMUM OF 20 GAUGE FACES AND STILES WITH A FACTORY APPLIED BAKED ON PRIMER. UPPER PANELS TO BE GLAZED WITH 1/8" QUALITY GLASS. DOOR FRAMES SHALL BE PRESSED STEEL 16 GAUGE WITH FACTORY APPLIED BAKED ON PRIMER.
 4. HARDWARE - EACH DOOR:
A. BUTT HINGES 1 1/2" PAIR N 1/2 X 4 1/2 FEDERAL SPECIFICATION FF H 110C TYPE T2107 WITH U S 10 FINISH.
B. LOCKSET MORTISED CYLINDER TYPE FEDERAL SPECIFICATION FF H 106A TYPE B08B WITH U S 10 FINISH. DOOR NO 11 ONLY.
C. PANIC DEVICE MORTISED LOCK TYPE FEDERAL SPECIFICATION FF H 106A TYPE B08B WITH U S 10 FINISH. DOORS NO 9 & 10 ONLY.
D. DOOR CLOSURE FEDERAL SPECIFICATION FF H 121C TYPE 3001 WP WITH BROWN LACQUER FINISH.
E. THRESHOLD SHALL BE SADDLE TYPE 3 1/2 X 3 1/4 HIGH WITH VINYL INSERT.
F. WEATHERSTRIPPING SHALL BE JAMB UP TYPE OF EXTRUDED ALUMINUM KEEPER WITH VINYL OR NEOPRENE INSERT.
 5. PAINTING THE FS COLOR NUMBERS SHOWN ARE TAKEN FROM FEDERAL STANDARD NO 595 DATED 3 1 56. THE FIRST DIGIT INDICATES GLOSS (1 GLOSS 2 SEMI GLOSS 3 LUSTERLESS). THE LAST 4 DIGITS DEFINE THE COLOR.
A. EXTERIOR STRUCTURAL AND MISCELLANEOUS STEEL ITEMS SHALL BE PRIMED WITH ONE COAT OF RED LEAD PER FEDERAL SPECIFICATION TT P 60C OR ZINC CHROMATE PER FEDERAL SPECIFICATION TT P 645 (EXCEPT GALVANIZED SURFACES SHALL BE PRIMED WITH ZINC CHROMATE ONLY). AND TWO FINISH COATS ALKYL GLOSS ENAMEL PER FEDERAL SPECIFICATION TT E 480C. COLOR GREEN TO MATCH EXTERIOR METAL WALL PANELS.
B. ROOF FLASHING SHALL BE FINISH PAINTED TO MATCH NEW ROOF PANEL COLOR.
C. DOORS SHALL RECEIVE TWO FINISH COATS OF ALKYL GLOSS ENAMEL. COLOR BURNT ORANGE FS 12276.
D. DOOR FRAMES (EXTERIOR TO STOP) TWO COATS ALKYL GLOSS ENAMEL TO MATCH EXTERIOR WALL PANELS.
E. DOOR FRAMES (INTERIOR INCLUDING STOP) TWO COATS ALKYL SEMI GLOSS ENAMEL. COLOR LT. GREEN FS 24672.
F. INTERIOR WALLS GYPSUM BOARD PARTITION. FRAMED OPENING AND STEEL BENT SHALL RECEIVE TWO COATS ALKYL SEMI GLOSS ENAMEL. COLOR LT. GREEN FS 24672.
 6. PROVIDE 2 1/2" SANITARY WOOD BASE ON GYPSUM BOARD PARTITION AND PAINT TO MATCH PARTITION. PROVIDE METAL COVE ON ALL OTHER WALLS. COVE SHALL BE INLAND STEEL CO "MILCOR" NO 630 COVE OR APPROVED EQUAL. PAINT TO MATCH WALLS.
 7. FLOOR COVERING FLOOR SHALL BE COVERED WITH VINYL ASBESTOS FLOOR TILE. COLOR DARK GREEN. SIZE 9 X 9 X 1/8 THICK FLINTKOTE #F B1 OR APPROVED EQUAL.

FIGURE III-5

244-AR Vault Addition

FIGURE III-6
291-AR Filter Building

FIGURE III-7

241-A-153 Transfer Box

UNCLASSIFIED

FIGURE V-2
Raw Water and
Purge Air Systems

Ref. H-2-62090.

FIGURE V-4
TK-244-AR-001

FIGURE V-5

244-AR Vault Hot Piping

FIGURE V-7

Pump Performance Curves,
P-001 and P-002-2

FIGURE V-8

Jet Gang Valve Arrangement

1 AGITATOR ASSEMBLY

FIGURE V-9

Agitator Assembly,
A-001 and A-002

Ref. H-2-62090

FIGURE V-10
TK-244-AR-002

FIGURE V-11

Sluice Pump Assembly
(P-002-1)

UNCLASSIFIED

ARH-374

FIGURE V-12

Sluice Pump Performance
Curve (P-002-1)

UNCLASSIFIED

ARH-374

Ref. H-2-62097

FIGURE V-13

TK-244-AR-003

UNCLASSIFIED

FIGURE V-14

Agitator Assembly,
A-003 and A-004

Ref. H-2-62097

FIGURE V-15
TK-244-AR-004

QTY	UNIT	DESCRIPTION	MATERIAL
1		ASSEMBLY	
2		NUT RETAINER	N 2 3/4 1/2 7

GENERAL NOTES:
UNLESS OTHERWISE NOTED
1. ALL MATERIAL TO BE 304L SST.
2. TO BE FABRICATED IN ACCORDANCE WITH
SPEC HWS-7538.

FIGURE V-17
Vessel Vent
Heater Assembly

FIGURE V-18
Vessel Vent
Primary Filter Assembly

FIGURE V-19

Vessel Vent
Backup Filter Assembly

FIGURE V-20

Vessel Vent Fan
(K-4-11-1) Assembly

FIGURE V-21
Vessel Vent Fan
Performance Curve

FIGURE V-22

Canyon Exhaust Ventilation
Fan Performance Curve

WAS FORMERLY SK-2-3672 9/30/65

FIGURE V-23

HVAC Air Flow Diagram

FOR LEGEND AND GENERAL NOTES SEE H-2-62061

FIGURE V-24
Engineering Flow Diagram
Auxiliary Equipment

QTY	PART NO.	DESCRIPTION	MATERIAL
X	1	TK AIO MODIFICATION	
1	2	VESSEL	SEE NOTE 1
AR	3	2 SCH 40 S PIPE	ASTM A37.304L SST
AR	4	2 SCH 40 S PIPE	
	5	STRIP 2 x 4 x 8 THK	ASTM A440 304L ST
3	6	50° RF BLND ANGE	ASTM A440 304L SST
	7	50° RF BLND ANGE	
	8	50° RF BLND ANGE	
	9	50° RF BLND ANGE	
2	0	50° RF BLND ANGE	
1	11	ATE	ASTM A440 304L SST
2	2	GASKET 7.0 D 7.0 D 6 THK	BLUF 1000000 COMP 1000000
1	3	GASKET 7.0 D 7.0 D 6 THK	
14	4	GASKET 5.0 D 5.0 D 6 THK	
5	5	GASKET 4.0 D 4.0 D 6 THK	
6	6	GASKET 3.0 D 3.0 D 6 THK	
7	7	GASKET 2.0 D 2.0 D 6 THK	
8	8	BRACKET 2	ELEN F 6 640 OR EQUAL
9	9	L 2 x 2 x 1/4 x 3 LG	ASTM A37.304L SST
20	10	3/8 DIA U BOLT W/ NUTS	304 SS COMM
2	11	PIPE W/ PORT	SEE DETAIL II 1000000
22	12	22 AMP 2	ELEN F 6 650 OR EQUAL

GENERAL NOTES

- TK AIO S EXISTING 6 S LOCATED IN 22 U AREA (X 3.4) RE DWG CV 28.9 TK 8 & DWG 2.42 G
- EXIST INSULATION SHALL BE REMOVED & VESSEL TO BE CLEANED INSIDE & OUTSIDE
- WEIRING OF SST SHALL BE IN ACCORDANCE WITH HANFORD SPEC NWS 8242
- ALL BUTT WELDS SHALL BE FULL PENETRATION WHEN JOINING SST TO STL USE 308L FILLER ROD
- VESSEL SHALL BE TESTED BY FILLING WITH WATER & ALLOWED TO STAND FOR A PERIOD OF ONE HOUR. REPAIR ALL LEAKS & RETEST
- UNLESS OTHERWISE NOTED REUSE EXISTING STUDS AND NUTS WHEN INSTALLING NEW FLANGES OR GASKETS
- TOLERANCE UNLESS OTHERWISE NOTED SHALL BE ANGULAR 0.1 FROM 0.001

FIGURE V-25

TK-244-AR-A10

UNCLASSIFIED

FIGURE V-28
Sluicer Assembly

AEC RL RICHLAND WASH

ARH-374

FIGURE V-30

Waste Recovery Pump
Performance Curve

SPECIFICATIONS

NSP-1888	SEWATION FOR FLUX SLUDGE REMOVAL & WASTE TRANSFER FACILITIES
NSP-1889	SLURRY TRANSFER PUMP
NSP-1890	WASTE RECOVERY PUMP
NSP-1891	SLUDGE PUMP
NSP-1892	WASTES
NSP-1893	INDUSTRIAL WALKWAYS
NSP-1894	ADD WASTE TRANSFER PUMP
NSP-1895	VENT GAS HEAT EXCHANGER
NSP-1896	PURGE SLUDGE REMOVAL & WASTE TRANSFER FACILITIES
NSP-1897	CROSS COUNTRY LINES
NSP-1898	TRANS 244-AR-TK001 AND 244-AR-TK-002
NSP-1899	MAGNETIC FLOWMETER
NSP-1900	CLOSED CIRCUIT TELEVISION SYSTEM
NSP-1901	CONTROL VALVE FOR A-CELL SERVICE

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H-2-61963	PLOT PLAN YARD PIPING 244-AR VAULT, 241-A TANK FARM
H-2-61964	PLOT PLAN YARD PIPING 241-A TANK FARM
H-2-61965	PLOT PLAN YARD PIPING 241-B PLANT AREA
H-2-61966	PLOT PLAN YARD & SERVICE PIPING 241-A PLANT AREA
H-2-61967	CIVIL PLAN & PROFILE 3" P&N LN NO 812
H-2-61968	CIVIL PLAN AND PROFILE AND DETAILS OF TRANSFER LINES LINE NOS 1033, 1034 & 1037
H-2-61969	CIVIL PLAN & PROFILE TRANSFER LINE 3" P&N LN NO 1034
H-2-61970	CIVIL PLAN & PROFILE TRANSFER LINES LN NOS 807 & 818
H-2-61971	CIVIL PLAN & PROFILE TRANSFER LINES LN NOS 4005 (D.S.), 4015 & 4019
H-2-61972	CIVIL TRANSFER LINES ENCASUREMENT DETAILS
H-2-61973	CIVIL TRANSFER LINES ENCASUREMENT DETAILS
H-2-61974	CIVIL TRANSFER LINES ENCASUREMENT DETAILS
H-2-61975	CIVIL TRANSFER LINES ENCASUREMENT DETAILS
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H-2-61997	CONCRETE PLAN @ DECK LEVEL & LONG. SECTION PROCESS AREA
H-2-61998	CONCRETE LOWER WALLS SECTIONS & DETAILS PROCESS AREA
H-2-61999	CONCRETE LOWER WALLS SECTIONS & DETAILS PROCESS AREA
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H-2-62001	CONCRETE ROOF PLAN SECTIONS & DETAILS PROCESS AREA
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H-2-58744	FUNCTION SCHEMATIC 244-AR VAULT SAMPLING SYSTEM
H-2-58745	ENGR FLOW DIAG SLUDGE REMOVAL & WASTE TRANSFER 244 AR VAULT
H-2-58746	ENGR FLOW DIAG SLUDGE REMOVAL 241-A & 1 AX TANK FARMS
H-2-58747	PROCESS FLOW DIAGRAM SLUDGE REMOVAL
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H-2-62054	PIPING EQUIPMENT ARRG T - PLAN
H-2-62055	CELL #1 EQUIPMENT ARRG T
H-2-62056	CELL #2 EQUIPMENT ARRG T
H-2-62057	TK-001 & TK-002 PIPING SECTIONS 244-AR VAULT
H-2-62058	CELL #3 EQUIPMENT ARRG T
H-2-62059	TK-003 & TK-004 PIPING SECTIONS 244-AR VAULT
H-2-62060	ENGR FLOW DIAGRAM AUXILIARY EQUIP & UTILITIES
H-2-62061	ENGR FLOW DIAGRAM 244 CR VAULT MODIFICATIONS
H-2-62062	HOT BURIED PIPING PLAN & SECTIONS 244-AR VAULT
H-2-62063	COLD BURIED PIPING PLAN & DETAILS 244 AR VAULT
H-2-62064	IN-CELL PERMANENT PIPING 244-AR VAULT
H-2-62065	CONTROL ROOM PIPING PLAN & DETAILS 244-AR VAULT
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H-2-62070	AMU PIPING PLAN & SECTION 244-AR VAULT
H-2-62071	AMU PIPING SECTIONS - 244-AR VAULT
H-2-62072	EMBEDDED PIPING PLAN & SECTIONS 244 AR VAULT
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H-2-62074	VESSEL VENT SYSTEM ARRANGEMENT
H-2-62075	VESSEL VENT SYSTEM PREHEATER DUNNAGE
H-2-62076	FILTER ASSEMBLY
H-2-62077	WEDGE CONNECTOR & PPE
H-2-62078	WASTE RECOVERY PUMP ERN 241-A P00
H-2-62079	PUMP ASSEMBLY & DETAILS 244-AR-P-000 & 244 AR-P-002 &
H-2-62080	AGITATOR ERN 244 AR-A-001 & 244 AR-A-002
H-2-62081	A-003 & A-004 AGITATOR MODIFICATION
H-2-62082	SLUICE PUMP TANK-002 ERN-244-AR-P-002()
H-2-62083	VENT GAS HEAT EXCHANGER K4 V101
H-2-62084	TKS-001 & 002 PLAN & ELEVATION 244 AR VAULT
H-2-62085	TKS-001 & 002 MECH DETAILS 244 AR VAULT
H-2-62086	TKS-001 & 002 MECH DETAILS 244 AR VAULT
H-2-62087	TKS-001 & 002 COIL DETAILS 244 AR VAULT
H-2-62088	TKS-003 & 004 MODIFICATIONS 244 AR VAULT
H-2-62089	MISC DETAILS
H-2-62090	MISC DETAILS
H-2-62091	TK-A10 VESSEL MODIFICATION 244 AR VAULT
H-2-62092	TK-A20 VESSEL MODIFICATION 244 AR VAULT
H-2-62093	TK-A30 C-HEM ADD VESSEL MODIFICATION 244 AR VAULT
H-2-62094	241-A TANK FARM SLUICE PITS EQUIP ARRG T
H-2-62095	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62096	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62097	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62098	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62099	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62100	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62101	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62102	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62103	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62104	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62105	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62106	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62107	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62108	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62109	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62110	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62111	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62112	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62113	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62114	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62115	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62116	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62117	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62118	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62119	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62120	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62121	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62122	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62123	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62124	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62125	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62126	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62127	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62128	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62129	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62130	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62131	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62132	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62133	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62134	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62135	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62136	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62137	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62138	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62139	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62140	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62141	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62142	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62143	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62144	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62145	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62146	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62147	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62148	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62149	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62150	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62151	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62152	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62153	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62154	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62155	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62156	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62157	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62158	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62159	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62160	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62161	241-A TANK FARM PUMP PIT EQUIP ARRG T
H-2-62162	241-A TANK FARM PUMP PIT EQUIP ARRG T

PIPING (CONT)

H-2-62113	JUMPER ASSY POWER TO PUMPS P-001 & P-002-2
H-2-62114	JUMPER ASSY SOLUTION TEMP & CELL MIKE TK-001 & TK-002
H-2-62115	JUMPER ASSY POWER TO AGIT A-001 & A-002
H-2-62116	JUMPER ASSY WEIGHT FACTOR & SPECIFIC GRAVITY TK-001 & TK-002
H-2-62117	JUMPER ASSY STEAM TO J-001 & J-002
H-2-62118	JUMPER ASSY 1-TK-001-T10-CC
H-2-62119	JUMPER ASSY 1-TK-001-T1-A
H-2-62120	JUMPER ASSY 2-TK-002-T9-00
H-2-62121	JUMPER ASSY 2-TK-002-G6-S
H-2-62122	JUMPER ASSY 2-TK-002-G6-U
H-2-62123	JUMPER ASSY 2-TK-002-G19-HH
H-2-62124	JUMPER ASSY 2-TK-002-T2-T4-T6-T8-CC
H-2-62125	JUMPER ASSY 2-TK-002-T10-6F
H-2-62126	JUMPER ASSY 1-TK-001-T5-00
H-2-62127	JUMPER ASSY 3-FILTER-G1-D
H-2-62128	JUMPER ASSY 3-TK-004-G5-88
H-2-62129	JUMPER ASSY SOLUTION TEMP & CELL MIKE TK-003 & TK-004
H-2-62130	JUMPER ASSY STEAM TO JET TK-003 & TK-004
H-2-62131	JUMPER ASSY WEIGHT FACTOR & SPECIFIC GRAVITY TK-003 & TK-004
H-2-62132	JUMPER ASSY 1-TK-003-J-1(TK-004)
H-2-62133	JUMPER ASSY 2-TK-003-G19-CC
H-2-62134	JUMPER ASSY SYNCHRON JET TK-003 & TK-004
H-2-62135	JUMPER ASSY 3-TK-003-T10-C
H-2-62136	JUMPER ASSY POWER TO AGIT A-003 & A-004
H-2-62137	JUMPER ASSY 3-TK-004-G15-K
H-2-62138	ASSY & DETAILS JET 001 & 002
H-2-62139	JUMPER ASSY 2-TK-002-G5-88
H-2-62140	JUMPER ASSY 2-TK-002-T9-1 (ALTERNATE)
H-2-62141	JUMPER ASSY 2-TK-002-T10-T11-T12-T14-K4 (ALTERNATE)
H-2-62142	JUMPER ASSY 3-TK-004-T9-B
H-2-62143	JUMPER ASSY 2-TK-002-T10-T11-T12-T14-F
H-2-62144	JUMPER ASSY 3-HEATER-G2-C
H-2-62145	JUMPER ASSY 3-HEATER-G3-B
H-2-62146	JUMPER ASSY 3-HEATER-T3-A
H-2-62147	JUMPER ASSY 3-TK-003-00-U & 3-TK-004-00-U
H-2-62148	JUMPER ASSY 3-TK-003-00-U
H-2-62149	JUMPER ASSY 241-A-153-B-U1 THRU U6
H-2-62150	JUMPER ASSY 241-A-153-A-U1 THRU U12
H-2-62151	JUMPER ASSY 241-A PUMP PIT U-1-A
H-2-62152	JUMPER ASSY 241-A PUMP PIT U-10-B
H-2-62153	JUMPER ASSY 241-A PUMP PIT U-11-C
H-2-62154	JUMPER ASSY 241-A PUMP PIT U-12-D
H-2-62155	241-A PUMP PIT NOSE JUMPER ASSEMBLIES
H-2-62156	JUMPER ASSY 241-A SLUICE PITS
H-2-62157	TKS-00 & 002 REINFORCEMENT 244 AR VAULT
H-2-62158	PIPE SUPPORT DETAILS

REVISED EXISTING DRAW VGS

H-2-58329	REV 3 PUMP COLLING WATER EXHAUST
H-2-58546	REV 2 200 EAST AREA PUMP TANK RELOCATED 241-A-153
H-2-57945	SH/REV 3 PUMP PIT OVER WASTE TANK 241-A-153

FIGURE V-32

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