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ENGINEERING STUDY
FAST FLUX TEST FACILITY FUEL REPROCESSING

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ENGINEERING STUDY FAST FLUX TEST FACILITY FUEL REPROCESSING

INTRODUCTION

This is the third of a series of progress reports^(1,2) on the study of reprocessing Fast Flux Test Facility (FFTF) fuels in the 200 areas at Richland, Washington (Hanford). The last report⁽²⁾ stated the bases and assumptions, defined some of the problem areas, and described in some detail the facility for the decontamination and storage of FFTF fuels in the 221-T Building (T Plant).

This report is a continuation of the facilities descriptions that were initiated in the previous documents on the most promising alternatives. These are as follows:

ALTERNATIVE I

Purex and T Plant would be utilized for the reprocessing of FFTF fuels. Fuel preparation--decontamination, storage, and partial disassembly--would be performed at T Plant followed by the electrolytic dissolution at the Purex Plant.

ALTERNATIVE II

A new facility would be constructed for disassembly, shearing and leaching the FFTF fuels. All phases of fuel preparation would be accommodated in the new facility.

ALTERNATIVE III

The possibility of offsite reprocessing creates a third alternative of onsite decontamination and storage prior to shipping. The facility modifications for the alternative are also an integral part of Alternative I.

Information on these proposals, which have been developed to a limited extent in past reports, has been expanded. Material has been included from past reports wherever it contributes to the estimate or enhances the subject.

SUMMARY

Several alternatives have been studied for reprocessing FFTF fuels at Hanford. Alternative I would be to decontaminate and trim the fuel at T Plant and electrolytically dissolve the fuel at Purex. Alternative II would be to decontaminate and shear leach the fuels in a new facility near Purex. Alternative III would be to decontaminate and store fuel elements indefinitely at T Plant for subsequent offsite shipment. A summary of the costs and construction schedules for all alternatives are shown in Table I and Figure 1.

TABLE I
FAST FLUX TEST FACILITY FUEL REPROCESSING ALTERNATIVES
COST ESTIMATE AND SCHEDULES

Alternative	Estimated Cost	Schedule Date after Authorization	
1. T Plant and Purex (electrolytic dissolver)	\$8,000,000 to \$10,000,000	A-E Initiated	1st Quarter
		Construction Starts	6th Quarter
		Construction Ends	
		T Plant	11th Quarter
		Purex	13th Quarter
2. New Facility (Fuel Prepared, sheared, and leached)	\$24,000,000 to \$28,000,000	A-E Initiated	1st Quarter
		Construction Starts	8th Quarter
		Construction Ends	20th Quarter
3. T Plant (fuel decontaminated and stored indefinitely)	\$3,000,000 * to \$4,000,000	A-E Initiated	1st Quarter
		Construction Starts	4th Quarter
		Construction Ends	8th Quarter

It should be noted that unless there is considerable slippage in the FFTF shipping schedule, it would not be possible to build a new facility as described in Alternative II in time without building temporary storage facilities at T Plant, as described in Alternative III.

* Each additional 47 elements at \$600,000 per storage pool.

FAST FLUX TEST FACILITY FUEL REPROCESSING ALTERNATIVES SCHEDULE AND COST ESTIMATE

Note: Cost are expressed in FY 78 dollars which compares with about mid-point of construction assuming the program were a FY 76 budget item.

FIGURE 1

ALTERNATIVE I

T PLANT FACILITIES

T Plant is an original Bismuth Phosphate Separations Plant. It is a massive reinforced concrete structure designed for the remote handling and processing of radioactive materials in a series of deep concrete cells, located in a canyon building and serviced by an overhead crane (75-ton capacity). The series of cells consist of a storage cell for failed equipment (a single unit made up of two standard cells), a railroad tunnel cell, a pool cell, 35 standard processing cells, and a deep waste collection cell. The cells used for FFTF fuel processing would be the railroad tunnel, pool cell, and four of the standard cells.

At present, T Plant is being used to decontaminate and repair failed equipment. The preparation of FFTF fuels at T Plant for Purex processing appears to be compatible with its current use. Both activities could be performed concurrently with additional personnel.

Canyon cell usage is proposed as follows:

Cell 3 - Existing railroad tunnel.

Cell 4 - Storage pool for decontaminated fuel subassemblies waiting transfer to the mechanical cell. This pool also provides storage for casks loaded with trimmed subassemblies waiting transfer to Purex.

Cell 5 - Storage of the empty casks used for storing and transporting trimmed fuel subassemblies. The mechanisms for transfer into and out of the mechanical cell are also located in this canyon cell.

Cell 6 - Leaching operations. The leach basket for the chopped up plenum pieces is located in this cell along with the burial boxes for all excess waste.

Cells 7

and 8 - Sodium and Dowtherm A decontamination of the subassemblies.

An inert atmosphere mechanical cell for trimming the fuel subassemblies and chopping the gas plenum into six-inch long pieces would be constructed on the deck level over parts of cells 5 and 6 and the adjacent pipe trench. The operating gallery of the mechanical cell would be accessible from the rear of the 221-T Building and would be shielded by a five-foot thick wall of keyed and precast concrete blocks. The block structure would facilitate removal should it be necessary to have future access to that portion of the pipe trench. The mechanical cell itself would be a two-foot concrete wall lined with one-fourth-inch thick mild steel.

The following descriptions and cell layout arrangements are conceptual, however, the canyon cells used and the locations of the mechanical cell and handling equipment have been carefully considered to provide optimum handling of the fuel subassembly.

The T Plant flow pattern is shown on drawing SK-2-4160. The T Plant process flow diagram for FFTF fuel subassembly decontamination is described on attached drawing SK-2-22418 with cell layouts and section views given on attached drawings SK-2-22416, SK-2-22417, SK-2-22420, SK-2-22436, and SK-2-22437. Drawing SK-2-4164, sheets 1 and 2, describes the bottom loading transfer cask.

Transfer Cask

The bottom loading transfer cask (BLTC) shall be a carbon steel vessel with its bottom face coupling designed to attach to the top of the Liquid Metal Fast Breed Reactor (LMFBR) cask and T Plant decontamination vessel, TK-7-1. Inert gas supply tanks for gas purging would be carried on the crane and would be manually connected to the cask via a flexible hose each time the cask is used. Compressed motive air and electrical power to the cask would be handled in the same manner.

The transfer cask would contain a mechanism to remove the cover plug from over a fuel subassembly in the LMFBR cask and also a mechanism to grapple a fuel subassembly and lift it out of the LMFBR cask. The cask shall also be equipped with a bottom closure valve.

Dowtherm* A Decontamination

A constraint on the dissolution of the FFTF fuel is the prior removal of residual sodium contamination to prevent an explosion or fire in the dissolver. Sodium decontamination is complicated by the shipment of the subassemblies in a cask filled with the heat transfer media, Dowtherm A. The Dowtherm A degrades leaving a residue of tar which must be removed from the fuel subassembly to expose the sodium film.

Early in the study, a literature search on tar removal was performed. Benzene, the indicated solvent, is still proposed in absence of sufficient information from the laboratory investigation.

The process suggested for Dowtherm A decontamination would be to circulate hot benzene over each fuel subassembly to dissolve the tar. The tar-contaminated benzene would be purified by distillation before being reused; tars accumulating in the bottom of the organic concentrator would be periodically transferred to a waste car for disposal. All equipment required in this process would be carbon steel.

* Trade name, Dow Chemical Company

Cell 7 would contain the decontamination vessel (7-1) which would be common to both decontamination processes. The decontamination vessel (7-1) would be specially equipped to receive fuel subassemblies from the transfer cask and maintain these subassemblies under an inert atmosphere (such as argon). When the vessel is filled with benzene during Dowtherm A decontamination, the excess inert gas would be vented through a seal pot. Additional inert gas would be automatically added from the surge tank whenever the vessel is being emptied.

The remaining major pieces of Dowtherm A decontamination equipment would be located in Cell 8 and would be as follows:

- o A solvent flush tank (8-2) with a capacity of 150 gallons
- o A 10-gallon per minute pump
- o An organic evaporator (8-3) with a capacity of 200 gallons and a heat transfer area of approximately 60 square feet
- o A condenser (8-4) with a transfer area of approximately 100 square feet
- o A high efficiency particulate air (HEPA) filter
- o A seal pot

The seal pot would minimize the fire hazard in the vent system by isolating this system from the remaining canyon equipment. An inert gas purge in the solvent flush tank would blanket all filling operations. Fire protection equipment capable of suppressing a benzene fire would be located in both cells 7 and 8.

Sodium Decontamination

After the tar residue from Dowtherm A degradation is removed from the subassembly, sodium decontamination can be initiated. The process suggested is the same as used at Idaho Falls for decontamination of Experimental Breeder Reactor II fuels. The conversion of the reactive sodium metal to the relatively innocuous sodium hydroxide is a two-step conversion. Initially the sodium is converted to the oxide by purging the decontamination vessel with a low flow, then a higher flow rate of moisturized inert gas (Idaho Falls uses 0.4 cfm of moisturized argon initially then increases the flow rate to 7.0 cfm). After converting the sodium metal to sodium oxide water or a weak solution of sodium hydroxide is added to the decontamination vessel (7-1) to convert the sodium oxide to sodium hydroxide.

The processing equipment for the sodium decontamination of FFTF fuel sub-assemblies would be located in Cell 7 of T Plant. The equipment pieces, all constructed of carbon steel, would be as follows:

- o A water flush tank (7-2) with a capacity of 150 gallons
- o A 10-gallon per minute pump
- o A caustic concentrator (7-3) with a capacity of 200 gallons and a heat transfer area of approximately 40 square feet
- o A condenser (7-4) with a heat transfer area of approximately 135 square feet
- o A venturi scrubber (7-5)

The venturi scrubber would remove sodium oxide particles entrained in the moisturized inert gas leaving the decontamination vessel (7-1). The de-entrainment would be effected by the high velocity impingement of water and sodium oxide within the throat of the venturi scrubber. The sodium hydroxide solution for the venturi scrubber would be supplied by the pump in the water flush tank (7-1). The gas liquid phase leaving the venturi scrubber would be routed back to the vapor space of tank (7-1) where the two phases separate. The off-gas would be vented to the canyon ventilation system.

Transfer Mechanisms

The transfer mechanism into the mechanical cell would consist of a cask permanently mounted on a framework in Cell 5. The fuel subassembly would be placed in this permanent cask and the mechanism would be driven by an electric motor to travel on rails underneath the mechanical cell where the cask top flange would mate with a mechanical cell inlet port flange. The subassembly would then be transferred into the mechanical cell by the five-ton hoist located in that cell.

The transfer mechanism design for transfer of the trimmed fuel subassemblies out of the mechanical cell is similar except the cask would not be permanently mounted but would be the final storage and transfer cask for shipment to Purex. This cask would be placed on the mechanism by the canyon crane prior to transfer, mechanically sealed after transfer, and then removed to the storage pool.

Mechanical Cell

The mechanical cell would be provided with a five-ton trolley hoist, a viewing window from the operating area, manipulators, a horizontal cutting machine, a small equipment transfer air lock, and stationary self-contained overhead hoist to lift the main hoist off its track and place it on the

floor for repair work. The repair hoist would be enclosed in a hermetically sealed steel enclosure. When the hoist is in use, this enclosure would maintain the integrity of the main cell atmosphere. When the hoist is not in use, the penetration communicating between the main cell and the enclosure would be remotely sealed. A small inert atmosphere supply ventilation room would have to be provided near the mechanical cell on the canyon deck level.

Once in the mechanical cell, the excess hardware would be removed and the plenum cut into six-inch long sections by a horizontal cutting machine. The excess hardware would then be dropped to a burial box in Cell 6 while the plenum pieces would be dropped into a leaching basket in Cell 6 for a sodium removal leach treatment prior to being discarded to waste.

Most repair work on mechanical cell equipment would be done remotely in cell; however, since this is not always possible, equipment in the mechanical cell would have to be designed to break down into small sub-assemblies for transfer out of the mechanical cell through the small equipment port.

Pool Cell

The pool cell in the 271-T Building would be refurbished for the storage of casks with trimmed FFTF fuel subassemblies. The pool cell would be cleaned with solvent and painted with Amercoat. Heat released to the storage pool from the stored fuel subassemblies would be removed by a shell and tube heat exchanger located within the storage pool. The storage pool water, potentially contaminated by fuel subassembly leakage and activation of particulate material, would be contained within a closed-loop cooling system with purification by filtration and ion exchange. A 90 gpm pump would circulate the pool water through an eight-inch diameter by ten-foot long heat exchanger. The pool water would be cooled below 100° F and returned to the opposite end of the pool. The cooling water (shell side) would be maintained at a high pressure than the pool water (tube side) to minimize the possibility of contamination being introduced into the cooling water. Low differential pressure between the tube side and shell side would result in the automatic shutdown of the storage pool pump. A pool water sidestream of about three gpm would bypass the heat exchanger and pass through a filter and an ion exchange unit. The filter would remove particulate corrosion products containing induced radioactivity from the pool water and thus maintain high clarity and low contamination.

The water purification unit and the heat exchanger would be designed for remote maintenance. The filter medium itself would be of a cartridge design for ease of replacement by the overhead crane. The ion exchange column would be of similar design with a basket or cartridge of resin contained within the vessel. When the ion exchange bed becomes loaded with fission products, the resin basket would be removed and placed in a burial box for solid waste disposal.

Services to the storage pool would include demineralized water supply, liquid level measurement, temperature measurement, sampling, electrical power to the pump, and a cooling water supply to the heat exchanger. Additional sampling and a radiation monitoring would be required to determine the effectiveness of the water purification equipment. A monitor and proportional sampling would also be required on the cooling water outlet of the heat exchanger.

Storage Cell

One storage unit probably would be required to store fuel subassemblies while Purex Plant modifications are being completed. In this case, a standard T Plant canyon cell would be modified for storage by installation of an open-top tank for the fuel subassembly storage. Material of construction would be stainless steel to minimize corrosion. Peripheral equipment and operation would be the same as described for the T Plant pool cell.

Canyon Crane

The T Plant canyon crane is a 75-ton capacity with a 10-ton secondary hoist. The 10-ton hoist would be used for fuel transfer operations.

T PLANT FUEL HANDLING

The fuel subassemblies would be transferred from the LMFBR cask at the railroad tunnel to the bottom loading transfer cask and then taken one at a time by the canyon crane to the decontamination facility in Cell 7. After decontamination is complete, the empty bottom loading transfer cask would be returned by the canyon crane to the railroad tunnel. The canyon crane must then take the exposed subassembly out of the decontamination tank and place it in the transfer mechanism in Cell 5 for transfer to the mechanical cell.

During the mechanical cell operations, the canyon crane would then place an empty storage cask on the transfer mechanism to receive trimmed subassemblies out of the mechanical cell. Once this is accomplished, the canyon crane would then take the loaded storage cask to the pool cell for storage. It is possible that during the mechanical cell operations, the canyon crane would have enough time to transfer another subassembly to the decontamination tank.

The canyon crane will be utilized for the entire handling of the fuel subassemblies and from the time the railroad car arrives until all nine subassemblies are stored, the canyon crane will not be available for other T Plant operations. In addition to normal fuel handling, the canyon crane will be used for operations involving the waste burial boxes and to empty the leach baskets.

Without extensive modification to the T Plant canyon, delays in operations are inevitable. The T Plant canyon places certain restraints on engineering that are not valid in a new facility (Alternative II). In the new facility, the pattern of operation has been designed to facilitate the transfer of subassemblies, fuel sections, and waste. Complicated transfer mechanisms are avoided wherever possible.

The new facility will have both manipulators and cranes available for transfer between process stations. This allows some of the operation to take place concurrently. In case of a failure, some backup capability is also available.

PUREX FACILITIES

After the FFTF subassembly has been cleaned of sodium and organic coolant and has been trimmed of excess hardware in T Plant, the rest of the processing would be done in the Purex Plant. It would be necessary to remove all of the existing equipment from one of the dissolver cells (C Cell for example), fill the sump and trench, install a new stainless steel floor pan so that the floor would be safe for plutonium solution at concentrations up to 450 grams plutonium per liter, and then install all new equipment designed to handle FFTF fuels.

The major pieces of new process equipment required for handling FFTF fuels at the Purex Plant would be as follows:

- o An off-gas heater
- o Off-gas filters
- o An electrolytic dissolver
- o A centrifuge
- o A cake slurry receiver tank
- o A solution receiver-filter feed tank
- o A dissolver solution storage tank

An instrument engineering flow diagram describing the proposed dissolving system is shown on attached drawing SK-2-22370, sheets 1 and 2. A cell layout of the proposed equipment is shown on attached drawing SK-2-22371.

Off-Gas Heater (C-1 Vessel)

The off-gas heater would be a single pass counter-current tube-in-shell heat exchanger. Because of nuclear safety requirements, the inside diameter of the shell shall not exceed 5.1 inches. Attached drawing SK-2-22372 shows a conceptual design of this equipment piece.

Off-Gas Filters (C-2 Vessels)

The off-gas filter system would consist of two separate filter vessels tied together by a common support framework. Attached drawing SK-2-22373 shows a conceptual design of these vessels. Each filter would be a vertical slab vessel not more than 2.1 inches in width. The off-gas would enter at the bottom of the lower vessel and pass up through the two vessels. Packing in each vessel shall be as shown in Table II.

TABLE II
PACKING FOR OFF-GAS FILTER VESSELS

<u>Layer</u>	<u>Thickness</u>	<u>Type</u>	<u>Density</u>
Top	12 inches	115 K Fiberglass	6.0 lb/cu.ft.
Middle	6 inches	115 K Fiberglass	3.0 lb/cu.ft.
Bottom	12 inches	115 K Fiberglass	1.5 lb/cu.ft.

Electrolytic Dissolver (C-3 Vessel)

The electrolytic dissolver would consist of a charging chute and electrical dissolution chamber containing a niobium basket. It would be connected to a large double-annulus vessel and a small side reservoir to which acid is airlifted and from which acid flows into the electrolytic dissolution unit. The electrolytic dissolver, per attached drawings SK-2-52563 through SK-2-52570, would be hexagonal shaped, and designed to receive a single trimmed FFTF fuel element. The dissolving assembly would be a stainless steel vessel with a sloping base which would serve as a cathode. A niobium insert with a platinum anode explosion bonded onto the niobium covering two sides of the hexagon would be inserted into the assembly. The niobium insert would cover four sides of the hexagon and act as an insulator forcing current to flow across the dissolving assembly. As current flows from the anode to the cathode, through the niobium basket, fuel element and nitric acid solution, the stainless steel cladding and mixed oxide fuel would be dissolved. A fuel element would simply slide down the charging chute as it dissolves. Power requirements would be about 2,600 amp (dc) at 25 volts, necessitating new power leads through the operating gallery wall. This unit would be designed with remote connectors so that it could be removed from the rest of the dissolver vessel by the Purex crane.

The double-annulus vessel (attached drawing SK-2-22375) would have a capacity of 520 gallons of solution. Because of nuclear safety requirements, the maximum allowable thickness of each annulus shall be 2.1 inches and each annulus shall be separated from any other annulus by eight inches of borated concrete. Agitation would be provided by using air spargers through the vertical run of cross-connecting piping between annuli at the bottom of the inner annulus. The inner annulus would contain a coil with a cooling capacity of 230,000 Btu/hour.

The maximum allowable diameter of the acid reservoir shall be 5.1 inches; this reservoir shall be at least two feet from the outer annulus and from the charge chute and dissolution unit.

Centrifuge (C-4 Vessel)

The centrifuge (attached drawing SK-2-22376) shall have a capacity of handling solutions at a five-gallon per minute rate. It shall be geometrically favorable for solids of up to 30 percent plutonium oxide in uranium oxide. It shall contain a fixed poison insert and shall have a safe annular slab thickness not exceed 2.1 inches.

Cake Slurry Receiver Tank (C-5 Vessel)

The cake slurry receiver tank (attached drawing SK-2-22377) would be a safe-slab tank with a capacity of about 150 gallons. Nuclear safety requirements limit the slab thickness to 2.1 inches.

Filter Feed Tank (C-6 Vessel)

The filter feed tank (attached drawing SK-2-22378) would be a vertical pipe tank (inside diameter not to exceed 5.1 inches) with a capacity of at least 10 gallons. Solution would be pumped from this tank through a jumper containing a slab filter (thickness not to exceed 2.1 inches) and into the solution storage tank.

Dissolver Solution Storage Tank (C-7)

The solution in this vessel shall be at a critically-safe concentration; hence, nuclear safety requirements will not impose any geometric limitations upon the design of this vessel. The tank (attached drawing SK-2-22379) shall have a 12,000-gallon capacity; a 10-foot 6-inch by 13-foot 7-inch by 14-foot vessel (bath tub design) would be satisfactory.

ALTERNATIVE II

FACILITIES GENERAL

The proposed new facility, to be located between the 202-A Building and the Hanford Highway, would be interconnected to the Hanford railroad system by a new section of railroad track, shown on attached drawing SK-2-4212. The LMFBR shipping cask would be transported by railroad car to the new facility.

Two adjacent remote processing areas, a manipulator-serviced mechanical cell, and a series of four canyon-type processing cells would be enclosed

within a three-story processing building as shown on attached drawing SK-2-4213. The mechanical cell would be above and parallel to the canyon cells to simplify the transfer between the two areas. Offices and other personnel-related areas would be located in a two-story addition to the processing building. Heating and ventilation for both the offices and the processing building are shown on attached drawing SK-2-4216.

Entrance to the processing building would be from the railroad tunnel or from the office building. The mechanical cell and the canyon cells would be accessible from the railroad tunnel while the office area and truck dock entrances would lead into the service galleries.

The gallery on the lowest elevation shown on attached drawings SK-2-4213 and SK-2-4214, located below grade, would contain a sampler station, decontamination station, and service piping. The second gallery, at grade level, would contain most of the service equipment for the mechanical cell. The third gallery is designed for storage and the fourth level for ventilation equipment and ventilation ducts. Adjacent to the storage gallery on the third level would be the crane cab run. The 100-ton crane with a 10-ton auxiliary hoist would service the canyon cells traveling the length of the processing building above the mechanical cell. The overall design dimensions of the processing building are 63 feet by 229 feet and the office building 63 feet by 96 feet.

Mechanical Cell

The mechanical cell would contain the equipment for disassembling the sub-assembly and chopping the fuel pins into segments. The inside design dimensions of the cell are 10 by 139 by 19 feet high.

The mechanical cell would have eight work stations each equipped with manipulators, shielding window, lighting, and a utility distribution system. Disassembly equipment would be located at five of these work stations; the other three would contain suitable worktables for remote repairs.

Manipulator and Material Handling System

Sealed master-slave manipulators would be installed at the work station to perform most of the disassembly work. The master-slave manipulators would be supplemented by a dual-level overhead system to carry out handling tasks beyond the reach or capacity of the master slaves. This system design, shown on attached drawing SK-2-4218, consists of a five-ton crane on the upper-level rails and a telescoping-tube electromechanical (E-M) manipulator on the lower level rails. The lower end of the telescoping tube may be fitted with a parallel-jaw tong or a double closable hook to grip and rotate equipment, subassemblies, and tools about a vertical axis. An E-M manipulator may also be attached to the lower end of the telescoping tube.

A special repair hoist would be provided in the roof of the mechanical cell to aid in the repair and maintenance of the overhead crane system. The roof hoist would penetrate the cell ceiling in a gas-tight manner and could be serviced manually.

Disassembly Machine

With the exception of horizontal mode of operation, this disassembly machine concept incorporates many of the features of the Vertical Assembler-Dismantler (VAD) that has been successfully used in the Hot Fuel Examination Facility-South (HFEF/S) at Idaho Falls. However, the vertical concept has been dropped in favor of the horizontal to facilitate the sawing and chopping operations. The Experimental Breeder Reactor II subassemblies require vertical handling, a stipulation that does not apply to FFTF subassemblies.

The subassembly would be attached to a swing-arm with eccentric clamps and then the arm would be rotated 90 degrees to a horizontal position (attached drawing SK-2-4221). Once the subassembly is in the horizontal position, the operation of the disassembly machine is very similar to the VAD. The shroud would then be severed from the end piece leaving the subassembly into two pieces: the shroud and upper-end pieces; and the fuel pins still attached to the lower end piece. A final cut would be made to separate the fuel pins from the lower end piece. The pins would then be placed in trays and pushed on a roller conveyor into the containment box for chopping while the shroud would be cut into three-foot sections and compacted to reduce waste volume.

Plenum Removal

The gas plenum which makes up approximately the upper half of the pin would be removed at the first worktable. Pins would be removed from the pin tray by a master-slave manipulator and locked into position on the plenum cutting table. A saw would sever the pin at the reflector that separates the fuel section from gas plenum (attached drawing SK-2-4220). The fuel sections of the pins would be moved to the chopping table by the master-slave manipulators. The remaining plenum sections would then be fed by the pusher and sawed into six-inch segments and transferred to canyon tank (3-5) for logged sodium leaching.

Fuel Chopper

The fuel sections would be taken from the fuel pin transfer tray and clamped into feeder mechanisms on the chopper (attached drawing SK-2-4220). The fuel sections would then be fed incrementally to the chopper where the fuel is severed into one-inch long pieces. A vacuum hood is included in the chopper assembly to remove any dust resulting from the chopping operation. The one inch long fuel segments would be transferred directly to the dissolver for leaching with nitric acid.

Containment Box

The plenum removal and the chopping operations would be enclosed in a containment box for dust control (attached drawing SK-2-4220). The box would be sealed to the wall by means of a seal frame which would surround the electric-service feedthroughs and the manipulator wall penetrations so the manipulators and service lines would enter the box directly. For maintenance within the containment box, the top could be removed to provide access to the crane or the E-M manipulator.

The inert atmosphere in the containment box would be maintained at a lower pressure than the rest of the mechanical cell. Nitrogen from the mechanical cell would be directed in a smooth flow pattern across the worktables to the filter on the opposite side of the containment box. Contamination would be contained to facilitate any necessary contact maintenance on the crane, E-M manipulator, and shroud removal equipment.

Nitrogen System

The mechanical cell would contain a nitrogen atmosphere of approximately 27,000 cubic feet. The gas would recirculate through a cooling system and HEPA filter at about 7,000 cubic feet per minute. Part of this flow would pass through alumina beds to reduce the dew point to approximately -76° F. The oxygen concentration would be maintained at one volume percent or less by dilution with supply nitrogen. The mechanical cell atmosphere would be maintained at a reduced pressure (0.75 to 4 inches of water below the operating corridor). Most penetrations into the mechanical cell would have double seals, with the space between them pressurized with nitrogen to prevent in-leakage.

CANYON

Within the canyon of the new facility would be the sodium decontamination equipment, the storage pool, the plenum leaching vessel, and the dissolver and its auxiliary equipment. Sodium decontamination and subassembly storage equipment are the same as in Alternative I. The flow diagram and the cell arrangement for this equipment are shown on attached drawings SK-2-4224, SK-2-4226, and SK-2-4228.

Dissolver Cell

The one inch fuel segments would be discharged directly to a basket in the dissolver vessel (4-1). The fuel would probably be initially leached with boiling nitric acid followed by a digest at 80° C with fluoride-nitric acid solution. The off-gas from the leaching operation would be routed to condenser E-4-7 (attached drawings SK-2-4227 and SK-2-4229). Condensibles would be returned to the dissolver while the noncondensibles would be routed to steam heater (H-4-8). The heated off-gas would be filtered by two HEPA filters in series and monitored enroute to the stack.

The dissolver solution with stainless steel and oxide fines would be drained to the centrifuge feed tank (4-2) and pumped to the centrifuge (4-4). The solid cake would be discharged from the centrifugation operation and be digested for a period of time in tank (4-3) and then the liquor from the digest would be decanted to the centrifuge feed tank (4-2). The sludge in the bottom of the tank (4-3) would be slurried to an underground storage tank.

The solid liquid separation would leave a relatively clean dissolver solution which would overflow the bowl of the centrifuge to the pump tank (4-6). From tank (4-6), solution would be pumped through a polishing filter to solution storage tank (4-5).

Subassembly Handling

The subassemblies would be received at the new facility in the LMFBR shipping cask. The 75-ton shipping cask, which would be shipped in a horizontal position, would be lifted into a vertical position by the 100-ton canyon crane and a shroud would be fixed to the top of the cask to seal the cask to the bottom of the mechanical cell. Then the railroad car with the cask in the vertical position would be moved under the transfer port which provides access between the railroad tunnel and the mechanical cell (attached drawing SK-2-4219). The gas-tight seal would be made up and permit the transfer of subassemblies into the mechanical cell.

The mechanical cell crane with grapple attached would transfer the subassembly from the LMFBR transfer cask to the decontamination vessel (1-1). The valve, which allows access to the decontamination vessel, would be opened and closed by the overhead electromechanical manipulator. After the decontamination is complete, the subassembly would be moved to either the disassembly device or to the storage pool.

If the subassembly is destined for storage rather than immediate disassembly, the crane would load the subassembly into the transfer mechanism* for transfer to the pool cell (attached drawings SK-2-4218 and SK-2-4219). Once the subassembly is moved into the canyon, the subassembly would be accessible with the 10-ton auxiliary crane which removes the subassembly from the transfer mechanisms and places it into the rack in the storage pool. These movements would be reversed for the movement of subassemblies from the rack in the storage pool to the mechanical cell.

Subassemblies would be directed to the disassembly device from either the storage pool or the decontamination vessel. At the disassembly work station, the subassembly would be broken down into its components. The individual fuel pins would be placed on trays by master-slave manipulators

* Described previously under Alternative I.

and the trays of fuel pins would be moved on roller conveyors by master-slave manipulators into the containment box for chopping and sawing of the fuel pins. The hardware remaining from the disassembly would be collected, compacted whenever possible, and then carried by in-cell crane or the electromechanical manipulator to a disposal chute. Hardware dumped down this chute would be collected in burial boxes in the canyon. Chutes will also be used to transfer gas plenum pieces to the leaching vessel (3-5) and fuel pin segments to the dissolver. Waste collected in burial boxes would be transferred to the railroad tunnel by the canyon crane.

Maintenance Features

A major design criteria for the chop leach facility is the remote maintenance, repair, or replacement of all failed equipment in the mechanical cell without having personnel enter that cell.

Most of the work in the cell would be performed with the master-slave manipulators. Heavy work and work beyond the reach of the master slaves would be performed with the overhead electromechanical manipulator. This manipulator would have four positioning motions (bridge travel, carriage travel, telescoping tube travel, and telescoping tube rotation), and a grip motion. Normally, a closable double hook would be attached to the bottom of the lower telescoping tube. Other devices, such as a parallel-jaw hand or electromechanical arm, could also be attached to facilitate specific handling tasks. The in-cell crane would provide high-capacity high-lift handling.

The special repair hoist on top of the main cell would permit the repair of equipment otherwise inaccessible. It would be used to lift the trolley crane or manipulator carriage off their bridges and lower them to the cell floor. It could also lift a crane or manipulator bridge, turn it 90 degrees, and lower it to the cell floor. Once the equipment is at floor level, modules could be remotely replaced or repaired using the remaining operational equipment. The bridge, trolley, or carriage would then be reinstalled with the repair hoist.

The repair hoist would be enclosed in a hermetically sealed steel enclosure. When the hoist is in use, this enclosure would maintain the integrity of the main cell atmosphere. When the hoist is not in use, the penetration communicating between the main cell and the enclosure would be remotely sealed.

Main cell equipment to be repaired out of cell would be moved to the decontamination transfer cart running in the tunnel beneath the cells. After decontamination in the transfer tunnel, the failed equipment would then be lifted from the transfer cart directly into the hot repair room. Here, it would be repaired by personnel in radiation work procedure (RWP) clothing except for irreparable equipment which would be lowered back down to the transfer cart and carried to the canyon for transfer to a burial box.

Repair Hoist

With the repair hoist and a few fixtures, the following tasks involving main cell equipment would be performed.

1. The crane trolley or manipulator carriage would be removed from its bridge, lowered to the cell floor level, and reinstalled on its bridge.
2. The crane or manipulator bridge would be lifted off its runway rails, rotated 90 degrees, and lowered to the cell floor. Conversely, the bridge would be installed on its rails.
3. The drive motor assembly of a crane or manipulator bridge would be replaced without removing the bridge from its rails.

The hoist would incorporate a telescoping tube to guide and stabilize equipment (bridges, trolleys, and carriages) when the equipment is near its installed position.

All crane and manipulator bus bar assemblies, whether installed on the bridges or on the cell walls, could be remotely removed and replaced. Each modular assembly would consist of a steel frame, insulators, bus bars, and connector pins.

A single, standardized brush design would be used for all equipment powered and controlled through bus bars. This includes the crane bridge and trolley, and the manipulator bridge and carriage. The brushes would be remotely replaceable and plugged into holders with two-prong connector pins. A knob in the center of each brush would aid remote removal and insertion. Each brush would have two contacts to preclude arcing or current interruptions as they slide over the bus bar joints.

The bridges would be designed so all mechanical and electrical components (including wiring) could be remotely removed, taken out of the cell for repair, and then returned to the cell and remotely installed. The only parts that could be difficult or impossible to repair are the bridge structures; these would be too large to pass through the transfer locks.

Wiring

The entire bridge wiring would be remotely replaced when the bridge is on the cell floor. A main junction box mounted on the bridge would be the primary link for this system. All power and control wires from the bridge brushes would be assembled into a harness and terminated in a connector that would plug into a receptacle in the junction box. This receptacle would be wired (inside the junction box) to other receptacles in the box. Connectors at the end of the wires from the individual components on the bridge would, in turn, be plugged into these receptacles. The wiring

would be bundled for each component so the component, its wires, and its connector would be removed as a unit. Simple hooks with long lead-ins would permit the wire bundles to be remotely hung along the bridge. The T-bars attached to the junction box and other modules would aid in the remote replacement of these items.

Miscellaneous

The crane trolley electrical brushes would be remotely replaceable as well as the limit switches. The hoist load brake and gear reducer could be removed as an assembly by personnel in the hot repair room.

The manipulator carriage subassemblies that would be remotely replaceable include all motor drive units, gear boxes, electrical brushes, and drive shafts.

The sealed master-slaves in the main cell would consist of three major subassemblies: a master arm, a through-the-wall seal tube, and a slave arm. The master arm would be removed from the seal tube and repaired in any convenient clean area. The slave arm could be remotely detached from the seal tube using the in-cell crane and then transferred to the hot repair room. The seal tube would maintain the gas-tight integrity of the main cell during these operations and would be replaced with a portable glove box sealed to the wall penetration.

FAILED EQUIPMENT DECONTAMINATION

Equipment may be decontaminated in the transfer tunnel connecting the mechanical cell and the hot shop. The transfer cart with decontamination vessel would be moved under the mechanical cell and raised against the mechanical cell penetration. The container would maintain the inert atmosphere with a gas-tight seal. The contaminated piece of equipment would be placed in the container by the crane, the hatch closed, and the transfer cart lowered to the track. The cart would then be moved to the decontamination station where hoses would be attached by manipulators and flushing begun.

After flushing is complete, the transfer container would be disconnected from the flush line and moved under the hot shop or to the canyon. Contact maintenance may be performed on equipment lifted into the hot shop while failed equipment would be moved through the transfer tunnel to the canyon, where the canyon crane could place it in a burial box.

Since the transfer tunnel will become contaminated, some provisions for remote maintenance are in order. The cart drive motor and hydraulic pumps would be located outside the tunnel in the lower service gallery.

ALTERNATIVE III

Alternative III would provide facilities at T Plant to receive, clean, and store the fuel elements indefinitely. The facilities would be identical to those described above in T Plant Facilities Section of Alternative I, except that a mechanical cell would not be required since no trimming of the element would be done under this alternative. Facilities would include a transfer cask, a Dowtherm A decontamination cell, a sodium decontamination cell, a pool cell, and a fuel storage cell. The pool cell, which is also capable of storing 47 elements, would serve as the examination cell and spare storage should a storage tank unit fail but would not be a permanent storage location. Additional storage tank units can be added as required.

REFERENCES

- (1) ARH-2855 (unclassified), June 14, 1973, R. A. Yoder, "Engineering Study - Fast Flux Test Facility Fuel Reprocessing"
- (2) ARH-2855 SUP (unclassified), October 15, 1973, M. M. Beary, G. J. Raab, R. A. Yoder, "Engineering Study - Fast Flux Test Facility Fuel Reprocessing"

DRAWINGS ILLUSTRATING
ALTERNATIVE I

T PLANT

SK-2-4160

SK-2-4164

SK-2-22416

SK-2-22417

SK-2-22418

SK-2-22420

SK-2-22436

SK-2-22437

PUREX

SK-2-22370

Thru
SK-2-22373

SK-2-22375

Thru
SJ-2-22379

SK-2-52563

Thru
SK-2-52570

1. RECEIVE THE FFTF FUELS IN AN LMFOR CASK. MATE UP AN INERT GAS PURGE TRANSFER CASK TO THE LMFOR CASK & WITHDRAW A FUEL SUB-ASSEMBLY TRANSFER THE SUB-ASSY TO THE DECONTAMINATION TANK.

4. STORE THE SUB-ASSYS IN THE STORAGE POOL RACKS

3. TRANSFER THE SUB-ASSY TO THE MECH CELL REMOVE THE BOTTOM HARDWARE & GAS PLENUM CUT THE GAS PLENUM INTO 6 LONG SECTIONS & PLACE THE REMAINDER OF THE SUB-ASSY IN STORAGE CASK & MECHANICALLY SEAL

DROP THE EXCESS BOTTOM HARDWARE TO A BURIAL BOX & DROP THE GAS PLENUM PIECES INTO A LEACH BASKET FOR SODIUM DECONTAMINATION, THE GAS PLENUM PIECES MAY THEN BE PLACED IN THE BURIAL BOX

2. TRANSFER THE SUB-ASSY TO THE COMMON DECONTAMINATION TANK & CLEAN OFF THE DOWTHERM 'A' & THEN THE SODIUM.

T-Plant Flow Pattern

1. RECEIVE TRIMMED FUEL ELEMENTS IN A MODIFIED NPR CASK CAR CHARGE AN ELEMENT IN THE ELECTROLYTIC DISSOLVING UNIT.

2. DISSOLVE THE FUEL ELEMENT IN A BATCH OF ACID COOL AND SAMPLE THE BATCH OF DISSOLVED FUEL.

3. CENTRIFUGE THE BATCH TO REMOVE THE SOLIDS PERIODICALLY SLURRY OUT THE SOLIDS INTO THE SLURRY RECEIVER TANK.

4. PUMP THE SOLUTION THROUGH A FILTER TO ASSURE COMPLETE SOLIDS REMOVAL.

5. COLLECT SOLUTION IN A STORAGE TANK FOR A CAMPAIGN THROUGH PUREX SOLVENT EXTRACTION.

PUREX

6. SOLIDS ARE DIGESTED LEACH SOLUTION IS RECYCLED BACK TO THE CENTRIFUGE. LEACHED SOLIDS ARE DISCARDED TO AN UNDERGROUND WASTE TANK.

ALTERNATIVE I

T-PLANT FUEL DECONTAMINATED OF DOWTHERM 'A' & SODIUM, TRIMMED & STORED

PUREX FUEL DISSOLVED IN AN ELECTROLYTIC DISSOLVER, & SOLUTION CENTRIFUGED, FILTERED, & STORED.

U S Atomic Energy Commission Richland Operations Office Atlantic Richfield Hanford Company Richland, Washington 99352	
FLOW PATTERN ALTERNATIVE I FFTF FUEL REPROCESSING	
DATE: 11/1/60	SCALE: NONE
PROJECT: 221-T-6202A	SHEET: 7000
DESIGN: SK-2-4160	STATUS: 6377

I TRANSFER CASK

- (1) CASK PORT. SHIELDING SEALING SLIDE CLOSURE. PNEUMATIC CYLINDER OPERATED.
- (2) GRAPPLE (FUEL ASSY) POSITIVE CHAIN DRIVE. FINGERS CONTROLLED AT ALL POSITIONS.
- (3) GRAPPLE LIFT DRIVE. AIR MOTOR POWERED. ROTARY POSITION INDICATOR SWITCH MOUNTED AT REDUCER. MANUAL OVER-RIDE PROVIDED FOR.
- (4) GRAPPLE ACTUATOR. AIR MOTOR DRIVEN REDUCER ROTATES THE HEXAGONAL GUIDE/ACTUATING ROD DRIVING A SCREW THREAD SET/RELEASE CAM TO OPERATE THE FINGERS.
- (5) RADIATION DETECTOR. SENSES PRESENCE AND PASSAGE OF FUEL ASSEMBLY.

II ADAPTER

- (10) ADAPTER BODY. 2 INCH LEAD SHIELDING. JUMPER CONNECTIONS. MOUNT CLAMPS FOR CASK CONNECTING. PROVIDES CONNECTIONS FOR ELECTRIC POWER AND PNEUMATIC REQUIREMENTS FOR LMFB MAGAZINE DRIVE AND INDEXING PIN.
- (11) PLUG GRAPPLE MECHANISM. MOUNTING AND POSITIONING FOR LMFB CASK HOLD-DOWN PLUG GRAPPLE.
- (12) PORT PLUG REMOVAL MECHANISM. REMOVES AND STORES LMFB CASK PORT PLUG.

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

U S ATOMIC ENERGY COMMISSION	
RICHLAND OPERATIONS OFFICE	
AUTOMATION INDUSTRIES INC.	
VITRO ENGINEERING DIVISION	
TRANSFER CASK	
WO NO. CE 0876	FFTF FUELS PROCESSING
205 A 22	3902
SK-2-4164	2

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
FRACTIONS DECIMALS ANGLES
TOLERANCES ON
SURFACE ROUGHNESS IN ACCORDANCE
WITH ASA B46.1-1962

REV	DATE	DESCRIPTION
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SECTION A-A SCALE: 1/8
FROM SK-2-4164 SHT 1

VIEW B-B SCALE: 1/8
FROM SK-2-4164 SHT 1

SECTION C-C SCALE: 1/8

SECTION D-D SCALE: 1/8

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES INC. VITRO ENGINEERING DIVISION	
TRANSFER CASK	
WFO NO CE 0872	FF F FLFL D-PROCESSING
208 A 221-T	3902
SK-2-4164	
2 2	

REV	DATE	DESCRIPTION
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REFERENCE DRAWINGS		
NEXT USED ON

U S ATOMIC ENERGY COMMISSION	
RICHMOND OPERATIONS OFFICE	
Atlantic Richfield Hanford Company	
Richmond, Washington 99312	
CELL ARRANGEMENT	
CELL-7	
FFTF ENGR STUDY	
DRAWN BY: 221-T	
CHECKED BY: 8404	
NONE	
SK-2-22416

REV	NO	DATE	DESCRIPTION
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U S ATOMIC ENERGY COMMISSION	
RICHMOND OPERATING DIVISION	
Atlantic Richfield Hanford Company	
For and With Region 9532	
CELL ARRANGEMENT	CELL - 8
FFTF ENGINEER	STUDY
DATE	22-1-7
REVISION	8404
NONE	SK-2-22417

LEGEND

- BALL VALVE - AIR OPERATED
- DIRECTION OF FLOW
- DIAPHRAGM OPERATED VALVE
- CONNECTOR HEAD
- JET
- CHECK VALVE
- INSTRUMENT (LOC IN OPER GAL)
- CRM COUNT RATE METER
- DP DIFFERENTIAL PRESS
- LDA LEAK DETECTION ALARM
- LDE LEAK DETECTION ELEMENT
- MS MANUAL SWITCH
- P PUMP
- POV PISTON OPERATED VALVE
- RE RADIATION ELEMENT
- RR RADIATION RECORDER
- SG SPECIFIC GRAVITY
- TC TEMPERATURE CONTROLLER
- TE TEMPERATURE ELEMENT
- TR TEMPERATURE RECORDER
- VS VALVE SWITCH
- WF WEIGHT FACTOR

NOTE:
THE FOLLOWING FUNCTIONS SHALL BE NECESSARY FOR CELL OPERATION BUT ARE NOT INDICATED ON CELL DIAGRAM
CELL DP
CELL MIKE
CELL WASHDOWN

CELL #7 - SODIUM DECONTAMINATION

CELL #8 - DOWTHERM-A DECONTAMINATION

U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE Atlantic Richfield Hanford Company Richland, Wash. 99352	
E.F.D. CELLS 7 & 8	
FFTE ENGR STUDY	
221-T 7001	
NONE SK-2-22418	

REV	DATE	DESCRIPTION
1	1/11/72	INITIAL DESIGN
2	1/11/72	REVISED FOR CELL 8
3	1/11/72	REVISED FOR CELL 7

CELL No.-7

CELL No.-8

ONLY MAIN ROUTING SHOWN

DRAWING TITLE OR WORD NO.		DATE		U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE Atlantic Richfield Hanford Company Richland, Washington 99352	
REFERENCE DRAWINGS		REVISIONS		LAYOUT ARRANGEMENT CELLS *7 & *8	
NEXT USED ON		DRAWING STATUS		FFTF ENGR STUDY	
		316432		221-T 8434	
				NONE SK-2-22420-1-

SECTION A-A

NOTE:
MECHANICAL & OPERATING CELLS
STRUCTURE TO BE PRECAST &
KEYED CONCRETE BLOCKS -
SHOWN AS

U.S. ATOMIC ENERGY COMMISSION RICHMOND OPERATIONS OFFICE Atlantic Richfield Refining Company Richmond, Virginia 23261	
CELL LAYOUT-ELEVATION	ARRANGEMENT & STORAGE
DECONTAMINATION & STORAGE	
DATE: 11/1/73	SCALE: 1/4" = 1'-0"
PROJECT: 221-T	SK-2-22437
REVISION: 1	DATE: 11/1/73
BY: J. L. HARRIS	CHECKED: J. L. HARRIS
APP: J. L. HARRIS	DATE: 11/1/73
CONVERTED FROM: 221-T	DATE: 11/1/73
REFERENCE DRAWINGS:	
NEXT USED ON:	
DRAWING STATUS: D1 GS18

THIS DWG. WAS SK-2-52413/1
REVISED 3-29-73

U. S. ATOMIC ENERGY COMMISSION RICHMOND OPERATIONS OFFICE Atlantic Richfield Harford Company Richmond, Washington 20352	
INSTRUMENTATION ENGINEERING DIAGRAM - FTF DISSOLVING CELL	
DATE: 3-29-73	BY: J. G. J.
DESIGNED BY: J. G. J.	CHECKED BY: J. G. J.
SCALE: NONE	PROJECT: 202A
FIGURE: 7032	SHEET: 12
PROJECT: SK-2-22370	FIGURE: 12

REV.	DATE	DESCRIPTION	BY	CHKD.
1	3-29-73	GEN. UP-DATE	J. G. J.	J. G. J.

CONTRACT NO. 202A	CONTRACT PART NO. 1	CONTRACT PART NO. 1
CONTRACT PART NO. 1	CONTRACT PART NO. 1	CONTRACT PART NO. 1

CONTRACT PART NO. 1	CONTRACT PART NO. 1	CONTRACT PART NO. 1
CONTRACT PART NO. 1	CONTRACT PART NO. 1	CONTRACT PART NO. 1

THIS DWG. WAS 54-2-52414
OFF 3-29-73

U. S. ATOMIC ENERGY COMMISSION RICHMOND OPERATIONS OFFICE Atlantic Richfield Hanford Company Richland Washington 99232	
FFTF-DISSOLVING CELL LAYOUT	
DATE	202-4
BY	SK-2 22371
CHECKED	NONE
APPROVED	NONE
SCALE	840 4

NO.	DESCRIPTION	DATE	BY	CHKD.	APPD.
1	RECEIVER TK WAS CAKE WASH	1/1/73	SK-2 22371		
2	GEN. UP-DATED	1/1/73	SK-2 22371		

REVISIONS	DATE	DESCRIPTION
1	1/1/73	GEN. UP-DATED
2	1/1/73	RECEIVER TK WAS CAKE WASH

REFERENCE DRAWINGS	DRAWING STATUS	91-5186
NEXT USED ON

TUBE PATTERN

DETAIL - I.
SCALE $\frac{1}{2} = 1"$

[illegible]

PLAN VIEW

ELEVATION VIEW

OFF-GAS FILTERS

U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE Atlantic Richfield Hanford Company Richland, Washington 99352		DATE: 7/16/64 BY: [Signature]	
OFF-GAS FILTERS (C2-A & C2-B)		SCALE: NONE	
PROJECT NO: 202-A		SHEET NO: 2500	
DRAWING STATUS: 01 6321		DATE: 7/16/64	
REVISIONS		DESCRIPTION	
NO.	DATE	BY	DESCRIPTION
1	7/16/64	[Signature]	AS SHOWN
REFERENCE DRAWINGS		COMMENT PRT. BLUE NO.	
NEXT USED ON		DATE

SECTION "AA"
DOUBLE ANNULUS VESSEL
CAPACITY: 520 GAL

PLAN VIEW

SK-2-22344 ANNULUS TK / CORE 5 / RPAAT		DATE: 10/1/58		BY: J. G. G. / 10/1/58		REV: 1		DESCRIPTION: ELECTROLYTIC DISSOLVER ANNULAR TANK (C3)	
REFERENCE DRAWINGS		CONVENT PRT. SHEET NO.		DATE: 10/1/58		CHECK PRT. SHEET NO.		DATE: 10/1/58	
NEXT USED ON		DRAWING STATUS		D 1 6321		NONE		SK-2-22375 1 12	

U. S. ATOMIC ENERGY COMMISSION
RICHLAND OPERATIONS OFFICE
Atlantic Richfield Harford Company
Richland, Washington 99352

202-A 2500

										CENTRIFUGE (C4)																									
BY DATE		FOR		BY DATE		FOR		REV		DESCRIPTION										DATE		REV													
										NORCESTER										1/3/74															
APPRO FOR CONFORM WITH SPEC-48 C-17										APPRO										DATE															
DRAWING TITLE OF ORDER NO.										REVISEMENTS										DATE		202-A		2600											
REFERENCE DRAWINGS										COMMENT PREV ISSUE NO.										DATE CHECK PREV ISSUE NO.										DATE		NONE			
NEXT USED ON										DRAWING STATUS										D.A. 6321										NONE		SK-2-22376		- -

[illegible]

FILTER FEED TANK

H-2-59972 P-JS PUMP ASSY DETS		BY-DATE		FOR	BY-DATE	FOR	REV	DATE	DESCRIPTION
H-2-59971 JS VESSEL DETAILS		BY-DATE		FOR	BY-DATE	FOR	REV	DATE	DESCRIPTION
DRAWING NO.		DRAWING TITLE OR VESSEL NO.		REVISIONS		DATE		CHECKED BY	DATE
REFERENCE DRAWINGS		COMMENT PRT		ISSUE NO.		DATE		CHECKED BY	DATE
NEXT USED ON		DRAWING STATUS		DATE		LATE		DATE	DATE

U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE Atlantic Richfield Hanford Company Richland, Washington 99352	
SOLUTION FILTER FEED TANK (CG)	
SCALE	202-A
SCALE	2500
SCALE	SK-2-22378

[illegible]

1 ASSEMBLY SCALE $\frac{1}{4}$ 0 2 4 IN

GENERAL NOTES:

1. ALL PARTS AND MATERIALS SHALL BE AS SPECIFIED OR BUYER APPROVED EQUAL.
2. INSULATOR (PN 14) SHALL BE 1.241 00 x .788 10 x .218 THICK MATERIAL PHENOLIC ASTM D709 TYPE IX GRADE 63.
3. APPROXIMATE TOTAL WEIGHT : 370 LBS.

QTY	PT NO	DESCRIPTION	
1	1	ASSEMBLY	
1	2	HOUSING	SK-2-52564 PN 2
1	3	ANODE	SK-2-52565 PN 3
1	4	BASKET & CHUTE ASST	SK-2-52566 PN 1
1	5	TOP INSULATOR	SK-2-52570 PN 5
1	6	BOTTOM INSULATOR	SK-2-52570 PN 6
1	7	ANODE SPACER	ROD 1/4 DIA GLASS
1	8	NUT	SK-2-52570 PN 8
2	9	RETAINING RING	5100-150-H (TRUARC) WALDES KOHINOOR INC
2	10	SCREW INSULATOR	SK-2-52569 PN 10
1	11	PIN INSULATOR	SK-2-52569 PN 11
1	12	RETAINING RING	5100-125-H (TRUARC) WALDES KOHINOOR INC
3	13	CP SCREW	FLAT SCH 1/4-20 UNC-2A x 1-1/4L ANS B16.3 AISI 416 SST
2	14	INSULATOR	SEE NOTE 2

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
+ .010
SURFACE ROUGHNESS IN ACCORDANCE
WITH ANSI B 46.1-1962

REV	DATE	BY	CHKD	APPD	DESCRIPTION
1	10/1/68	W. J. OLSON			PROTOTYPE
2	10/1/68	W. J. OLSON			ELECTROLYTIC DISSOLVER FOR FUEL ELEMENTS
3	10/1/68	W. J. OLSON			202-A
4	10/1/68	W. J. OLSON			2500
5	10/1/68	W. J. OLSON			NONE
6	10/1/68	W. J. OLSON			SK-2-52563

U.S. ATOMIC ENERGY COMMISSION	
RICHLAND OPERATIONS OFFICE	
AUTOMATION INDUSTRIES, INC.	
VITRO ENGINEERING DIVISION	
PROTOTYPE	
ELECTROLYTIC DISSOLVER	
ASSEMBLY	
DATE	10/1/68
BY	W. J. OLSON
CHKD	
APPD	
REV	1
DATE	10/1/68
BY	W. J. OLSON
CHKD	
APPD	
REV	2
DATE	10/1/68
BY	W. J. OLSON
CHKD	
APPD	
REV	3
DATE	10/1/68
BY	W. J. OLSON
CHKD	
APPD	
REV	4
DATE	10/1/68
BY	W. J. OLSON
CHKD	
APPD	
REV	5
DATE	10/1/68
BY	W. J. OLSON
CHKD	
APPD	
REV	6
DATE	10/1/68
BY	W. J. OLSON
CHKD	
APPD

GENERAL NOTES:

1. ALL PARTS AND MATERIALS SHALL BE AS SPECIFIED ON BUYER APPROVED EQUIP.
2. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES
3. ALL MACHINED SURFACES SHALL BE $\frac{1}{16}$ UNLESS OTHERWISE SPECIFIED
4. DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED IN ACCORDANCE WITH ANSI Y14.5
5. WELD SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.0
6. NONDESTRUCTIVE TESTING SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.2
7. HOLDING SHALL BE IN ACCORDANCE WITH NPS-230-W
8. GROUND PLATE $10-1/4 \times 4-1/4$ AREA IN ACCORDANCE WITH MIL-G-45249 TYPE I GRADE A CLASS 1
9. CHROME PLATE THREADS TO 0002 - 0005 THICK IN ACCORDANCE WITH QQ-C-320 CLASS 28
10. NONDESTRUCTIVE TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SECTION XIII DIVISION I, ASME BOILER AND PRESSURE VESSEL CODE

HOUSING SCALE: $\frac{1}{2}$ IN
MATL: ASTM A 240 TYPE 304L
AND NOTED

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
 $\pm 1/32$ $\pm .005$ $\pm 0^{\circ} 30'$

SURFACE ROUGHNESS IN ACCORDANCE
WITH A 1.1 B46.1 1962

U S A T O M I C E N E R G Y C O M M I S S I O N		OFFICE OF RESEARCH AND DEVELOPMENT	
A T O M I C I N D U S T R I E S I N C .		V I T R O E N G I N E E R I N G - S O N	
<div style="text-align: center;"> </div>		<div style="text-align: center;"> PROTOTYPE ELECTROLYTIC DISSOLVER DETAILS </div>	
<div style="text-align: center;"> DATE 9-9-72 </div>	<div style="text-align: center;"> PROJECT NAME PROT-1 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
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<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
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<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>	<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>
<div style="text-align: center;"> PROJECT NO. 102-A </div>	<div style="text-align: center;"> PROJECT DATE 7-5-72 </div>

GENERAL NOTES

1. ALL PARTS AND MATERIALS SHALL BE AS SPECIFIED OR BUYER APPROVED EQUAL.
2. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES
3. ALL MACHINED SURFACES SHALL BE 125 UNLESS OTHERWISE SPECIFIED
4. DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED IN ACCORDANCE WITH ANSI Y14.5.
5. WELD SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.0
6. EXPLOSION BOND PLATINUM CLADDING TO NIOBIUM AS SPECIFIED BY BUYER
7. WELDING OF NIOBIUM SHALL BE IN ACCORDANCE WITH AWS-9365
8. GOLD PLATE 10-1/4 x 4 AREA IN ACCORDANCE WITH MIL-G-45204B, TYPE I GRADE A CLASS I

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
1/32 .005 0° 30'
SURFACE ROUGHNESS IN ACCORDANCE
WITH ANSI B 46.1-1962

REFERENCE DRAWINGS
NEXT USED ON SK 2-52565

REVISIONS
DATE CHECKED BY ISSUE NO 2
DRAWING STATUS

U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES INC. VITRO ENGINEERING DIVISION	
PROJECT ELECTROLYTIC DISSOLVER DETAILS	
SK 2-52565	202-A
2500	2500
NONE	SK-2-52565

1 ASSEMBLY SCALE: 1/2" = 1" 0 1 2 IN

VIEW C-C SCALE: 1/2" = 1" 0 1 2 IN

SECTION A-A SCALE: 1/2" = 1" 0 1/2 1 IN

SECTION B-B SCALE: 1/2" = 1" 0 1/2 1 IN

QTY	PT	NO	DESCRIPTION	
1	1	ASSEMBLY		
1	2	BASKET		SK-2-52567 PN 2
1	3	CHUTE		SK-2-52568 PN 3
36	4	BASKET SPACER	ROD 1/4 DIA	GLASS
3	5	RETAINING RING	5100-150-M (TRUARC)	VALDES KOHINOOR INC
2	6	DOWEL PIN		SK-2-52569 PN 6
3	7	TIE ROD		SK-2-52569 PN 7
3	8	TOP ROD INSULATOR		SK-2-52569 PN 8
3	9	BOTTOM ROD INSULATOR		SK-2-52569 PN 9
3	10	RETAINING RING	5100-175-M (TRUARC)	VALDES KOHINOOR INC
2	11	PIN INSULATOR		SK-2-52569 PN 11
2	12	RETAINING RING	5100-125-M (TRUARC)	VALDES KOHINOOR INC
3	13	WASHER	2-1/400 x 1-1/16 ID x 1/4 THICK	ASTM A240 TYPE 304
3	14	CAP SCREW	HEX SCH 1/4-20 UNC-2A x 3/4 L	AN 1 B18.3
3	15	LOCK WASHER	HELICAL SPRING 1/4 REGULAR	AN 1 B27.1

GENERAL NOTES:
1. ALL PARTS AND MATERIALS SHALL BE AS SPECIFIED OR BUYER APPROVED EQUAL

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
+ - - - - -
SURFACE ROUGHNESS IN ACCORDANCE
WITH ANSI B 46.1 1962

REV	DATE	BY	CHKD	APPD	DESCRIPTION
1	10/1/62	W. J. WOODWARD			ASSEMBLY PROTOTYPE
2	10/1/62	W. J. WOODWARD			ELECTROLYTIC DISSOLVER

U S ATOMIC ENERGY COMMISSION
RICHLAND OPERATIONS OFFICE
AUTOMATION INDUSTRIES INC
VITRO ENGINEERING DIVISION

BASKET AND CHUTE
ASSEMBLY PROTOTYPE
ELECTROLYTIC DISSOLVER

NOT RECD
NONE
202-A
SK-2-52566
2500

- GENERAL NOTES**
1. ALL PARTS AND MATERIALS SHALL BE AS SPECIFIED OR BUYER APPROVED EQUAL.
 2. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
 3. ALL MACHINED SURFACES SHALL BE 125 UNLESS OTHERWISE SPECIFIED.
 4. DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED IN ACCORDANCE WITH ANSI Y14.5.
 5. WELD SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.0.
 6. WELDING OF NIOBIUM SHALL BE IN ACCORDANCE WITH AWS 9355.
 7. THE DIMENSIONS FOR THE 260 DIA HOLES ARE ONLY THE APPROXIMATE LOCATION OF THESE HOLES. ACTUAL LOCATION SHALL BE THRU THE CLOSEST 218 DIA HOLE AS SHOWN IN DETAIL E, 26 PLACES ON SURFACES 1, 2, 4, 5 AND 7.

② BASKET SCALE: 1/2 0 1 2 IN

MATL NIOBIUM
ASTM B 393 TYPE 1
REACTOR GRADE

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMALS ANGLES
± 1/32 ± .010 ± 0°-30°
SURFACE ROUGHNESS IN ACCORDANCE
WITH ANSI B 46.1 1962

REV	DATE	DESCRIPTION	BY	CHKD	APPD
1	10/1/77	ISSUED FOR FABRICATION	W. J. BERRY	W. J. BERRY	W. J. BERRY
2	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
3	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
4	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
5	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
6	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
7	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
8	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
9	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY
10	10/1/77	REVISED TO SHOW CHANGES	W. J. BERRY	W. J. BERRY	W. J. BERRY

REFERENCE DRAWINGS
NEXT USED ON SK 2 52566

COMMENTS
CHECK PRT ISSUE NO 2 11/1/77

DRAWING STATUS
0

U S ATOMIC ENERGY COMMISSION
RICHLAND OPERATIONS OFFICE
AUTOMATION INDUSTRIES INC.
VITRO ENGINEERING DIVISION

BASKET AND CHUTE DETAILS
PROTOTYPE
ELECTROLYTIC DISSOLVER

PROJ NO CE 917 PROJ TITLE ELEC SOLVT C
D 550LVER FOR FRTT E RM, BRS
SCALE SHOWN
NOT REQD
NONE
202A
2500
SK-2-52567

VIEW C-C SCALE: 1/2 0 1 2 IN

SECTION B-B SCALE: 1/2 0 1 2 IN

SECTION A-A SCALE: 1/2 0 1 2 IN

SECTION D-D SCALE: 1/4 0 1/2 1 IN
TYP 3 PLACES

- GENERAL NOTES:**
1. ALL PARTS AND MATERIALS SHALL BE AS SPECIFIED OR BUYER APPROVED EQUIV.
 2. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
 3. ALL MACHINED SURFACES SHALL BE $125 \sqrt{16}$ UNLESS OTHERWISE SPECIFIED.
 4. DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED IN ACCORDANCE WITH ANSI Y14.5.
 5. WELD SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.0.
 6. NONDESTRUCTIVE TESTING SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.2.
 7. WELDING SHALL BE IN ACCORDANCE WITH AWS A2.3.
 8. NONDESTRUCTIVE TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SECTION VIII, DIVISION 1, ASME BOILER AND PRESSURE VESSEL CODE.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
FRACTIONS DECIMALS ANGLES
 $\pm .010 \pm .030$
SURFACE ROUGHNESS IN ACCORDANCE
WITH ANSI B46.1-1962

DATE	BY	CHKD	APP'D	DESCRIPTION
12/1/72	W. J. Wood	W. J. Wood	W. J. Wood	DESIGN
12/1/72	W. J. Wood	W. J. Wood	W. J. Wood	REVISION
12/1/72	W. J. Wood	W. J. Wood	W. J. Wood	REVISION
12/1/72	W. J. Wood	W. J. Wood	W. J. Wood	REVISION
12/1/72	W. J. Wood	W. J. Wood	W. J. Wood	REVISION

U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES, INC. VITRO ENGINEERING DIVISION	
BASKET AND CHUTE DETAILS PROTOTYPE ELECTROLYTIC DISSOLVER	
SCALE SHOWN NOT RECD	FIG. NO. 202-A
DATE 12/1/72	REV. NO. 2500
SK-2-52568

PN	A	B
9	$\frac{13}{32}$	$\frac{1}{16}$
10	$\frac{11}{16}$	$\frac{3}{16}$

PN	A	B
9	$\frac{13}{32}$	$1\frac{1}{16}$
10	$\frac{11}{16}$	$1\frac{3}{16}$

10 SCREW INSULATOR
MATL: ASTM D 709 TYPE IV GRADE G3

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES	
TOLERANCES ON	
FRACTIONS	DECIMALS ANGLES
$\pm 1/32$	$\pm .010 \quad \pm 0^{\circ} 30'$

SURFACE ROUGHNESS IN ACCORDANCE WITH ANSI B46.1 1982

[illegible]

6 BOTTOM INSULATOR SCALE: 1/2" = 1" 0 1 2 IN
 MATL: LAMINATED SHEET PHENOLIC 1/4" THICK
 ASTM D 709 TYPE IV GRADE G3

5 TOP INSULATOR SCALE: 1/2" = 1" 0 1 2 IN
 MATL: LAMINATED SHEET PHENOLIC 1/4" THICK
 ASTM D 709 TYPE IV GRADE G3

SECTION E-E SCALE: 1/2" = 1" 0 1/2 1 IN

SECTION C-C SCALE: 1/2" = 1" 0 1 2 IN
 FROM DWG SK-2-52564

SECTION D-D SCALE: 1/2" = 1" 0 1/2 1 IN
 FROM DWG SK-2-52564

8 NUT SCALE: 1/2" = 1" 0 1 2 IN
 MATL: ASTM A582 TYPE 416

- GENERAL NOTES**
1. ALL PARTS AND MATERIALS SHALL BE AS SPECIFIED OR BUYERS APPROVED EQUAL.
 2. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
 3. ALL MACHINED SURFACES SHALL BE 125 UNLESS OTHERWISE SPECIFIED.
 4. DIMENSIONING AND TOLERANCING SHALL BE INTERPRETED IN ACCORDANCE WITH ANSI Y14.5.
 5. WELD SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.0.
 6. NONDESTRUCTIVE TESTING SYMBOLS SHALL BE INTERPRETED IN ACCORDANCE WITH AWS A2.2.
 7. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1.
 8. NONDESTRUCTIVE TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SECTION VIII DIVISION 1, ASME BOILER AND PRESSURE VESSEL CODE.

UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES
 TOLERANCES ON
 FRACTIONS DECIMALS ANGLES
 ± 1/32 ± .005 ± 0°30'
 SURFACE ROUGHNESS IN ACCORDANCE
 WITH ANSI B46.1 1992

REV	DATE	DESCRIPTION
1	11/11/92	ISSUED FOR CONSTRUCTION
2	11/11/92	ISSUED FOR CONSTRUCTION
3	11/11/92	ISSUED FOR CONSTRUCTION
4	11/11/92	ISSUED FOR CONSTRUCTION
5	11/11/92	ISSUED FOR CONSTRUCTION
6	11/11/92	ISSUED FOR CONSTRUCTION
7	11/11/92	ISSUED FOR CONSTRUCTION
8	11/11/92	ISSUED FOR CONSTRUCTION
9	11/11/92	ISSUED FOR CONSTRUCTION
10	11/11/92	ISSUED FOR CONSTRUCTION

U.S. ATOMIC ENERGY COMMISSION RICHMOND OPERATIONS OFFICE AUTOMATION INDUSTRIES INC. VITRO ENGINEERING DIVISION	
PROJECT TITLE ELECTROLYTIC DISSOLVER DETAILS	
SCALE NONE	PROJ NO CE 8117
DATE 11/11/92	REV NO 202-A
DRAWING NO SK-2-52570	

DRAWING ILLUSTRATING
ALTERNATIVE II

SK-2-4212 Thru SK-2-4214

SK-2-4216

SK-2-4218 Thru SK-2-4221

SK-2-4224

SK-2-4226 Thru SK-2-4229

[illegible]

CONCEPTUAL
NOT APPROVED FOR CONSTRUCTION

[illegible][illegible]

WEST ELEVATION

1
213

CONCEPTUAL
NOT APPROVED FOR CONSTRUCTION

U S ATOM C ENERGY COMMISSION RICHLAND OPERATIONS OFFICE	
AUTOMATCH INDUSTRIES INC. VITRO ENGINEERING DIVISION	
ELEVATION AND SECTION	
CE 0934	FE-FE-FE-PROCESS LG
200 A	0800
SK-2-424	

REV. NO.	DATE	DESCRIPTION	BY	CHKD
1	10/1/77	ISSUED FOR CONSTRUCTION	SY	SY
REVISIONS				
DATE	CHECKED	DATE	CHECKED	DATE
REFERENCE DRAWINGS				
DRAWING STATUS				
NEXT USED ON

SYSTEM ONE AIR FLOW DIAGRAM
NO SCALE

SYSTEM DESCRIPTION

THE OPERATIONS AREA OF THE FACILITY IS SERVED BY A RECIRCULATING AIR CONDITIONING SYSTEM INDICATED BY SYSTEM ONE AIR FLOW DIAGRAM. THE RECIRCULATING SYSTEM CONSISTS OF AIR FILTERS, PREHEAT COIL, COOLING COIL, SUPPLY FAN, REHEAT COILS AND RETURN AIR FAN.

THE SERVICE AND PROCESS AREAS OF THE FACILITY IS SERVED BY A DUCT THRU AIR HANDLING SYSTEM INDICATED BY 'SYSTEM TWO' AIR FLOW DIAGRAM. THE SUPPLY SYSTEM CONSISTS OF INTAKE AIR FILTERS, PREHEAT COIL, COOLING COIL AND REHEAT COILS. EITHER OF THE TWO SUPPLY FANS CAN FUNCTION AS STANDBY OR CONTINUOUS DUTY.

THE EXHAUST SYSTEM CONSISTS OF TWO SEPERATE FILTER HOUSINGS AND TWO EXHAUST PUMPS EACH UNIT IS CAPABLE OF SERVING AS STANDBY OR CONTINUOUS DUTY AS REQUIRED THE CELLS ARE PROVIDED WITH LOCAL EXHAUST FILTERS IN SERIES WITH THE CENTRAL EXHAUST FILTERS. WHEN REMOVAL OF A CELL COVER BLOCK IS REQUIRED THE EXHAUST FROM THE CANYON IS CLOSED AND THE CANYON SUPPLY AIR IS EXHAUSTED THRU THE OPEN CELL TO PREVENT FILTRATION INTO THE CANYON AREA.

THE FACES OF THE OPERATIONS, SERVICE AND PROCESS AREAS ARE PRESSURE CONTROLLED TO PROVIDE AIR FLOW FROM ZONES OF LESSER-TO-GREATER CONTAMINATION POTENTIAL.

SYSTEM TWO AIR FLOW DIAGRAM

LEGEND

- SUPPLY AIR FLOW
RETURN OR EXHAUST AIR FLOW
INFILTRATION AIR FLOW
BUTTERFLY VALVE
AUTOMATIC DAMPER

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

APPROVED FOR COMPLETION		DATE	U S ATOMIC ENERGY COMMISSION	
BY <i>W. H. G. G. G.</i>		<i>2/2/54</i>	RICHLAND OPERATIONS OFFICE	
FOR <i>W. H. G. G. G.</i>		<i>2/2/54</i>	AUTOMATION INDUSTRIES INC.	
			VITRO ENGINEERING DIVISION	

HVVAC

AIR FLOW DIAGRAM

[illegible]

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES INC. VITPO ENGINEERING DIVISION	
FLOOR PLAN WITH SECTION CHOP-LEACH PROCESS	
DATE: 10/1/68 BY: J. W. WOODS CHECKED: J. W. WOODS SCALE: 1/8"=1'-0"	PROJECT: CE 8314 SHEET: 1 OF 1 DRAWING NO.: 4735 SK-2-4218

REV. NO.	DATE	DESCRIPTION
1	10/1/68	ISSUED FOR CONSTRUCTION
2	10/1/68	REVISIONS
3	10/1/68	REVISIONS
4	10/1/68	REVISIONS
5	10/1/68	REVISIONS
6	10/1/68	REVISIONS
7	10/1/68	REVISIONS
8	10/1/68	REVISIONS
9	10/1/68	REVISIONS
10	10/1/68	REVISIONS
11	10/1/68	REVISIONS
12	10/1/68	REVISIONS
13	10/1/68	REVISIONS

PLAN SCALE NONE

SECTION A-A SCALE 1/2"=1'-0"

SECTION B-B SCALE 1/2"=1'-0"

SECTION C-C SCALE 1/2"=1'-0"

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

U.S. ATOMIC ENERGY COMMISSION RICHMOND OPERATIONS OFFICE AUTOMATION INDUSTRIES INC. VITRO ENGINEERING DIVISION		PROJECT NO. CE 834 DRAWING NO. 203A SHEET NO. 4705	
FUEL UNLOADING PLAN VIEW AND SECTIONS CHOP LEACH PROCESS		DRAWN BY: H. BOLSON CHECKED BY: J. REGD DATE: 11/28/73	
REVISIONS 1. 11/28/73 2. 12/11/73		DRAWING STATUS 0	
NEXT USED ON SK-2-4215		NONE SK-2-4219

PLAN

SECTION A-A

CONCEPTUAL
NOT APPROVED FOR CONSTRUCTION

U.S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES, INC. VITRO ENGINEERING DIVISION		PROJECT NO. CE 813 SHEET NO. 25A DRAWING NO. 4705
PLENUM REMOVAL AND PIN CHOPPING CHOP LEACH PROCESS		SCALE: NONE DATE: 11-20-73 DRAWN BY: R. OLSON CHECKED BY: J. WOODEN
REVISIONS NO. 1: NONE NO. 2: NONE NO. 3: NONE		
NEXT USED ON SK-2-421B		

13 12 11 10 9 8 7 6 5 4 3 2 1

D

C

B

A

CONCEPTUAL NOT APPROVED FOR CONSTRUCTION

U S ATOM C ENERGY COMMISSION RICHLAND OPERATIONS OFFICE	
AUTOMATION INDUSTRIES INC VIETRO ENGINEERING DIVISION	
DISASSEMBLY MACHINE CHOP LEACH PROCESS	
REV NO 1	REV NO 1
SCALE NONE	SCALE NONE
DATE 10/1/73	DATE 10/1/73
BY R B OLSON	BY R B OLSON
CHECKED G A	CHECKED G A
APPROVED G A	APPROVED G A
PROJECT NO SK-2-4221	PROJECT NO SK-2-4221
SHEET NO 1	SHEET NO 1

REV	DATE	DESCRIPTION
1	10/1/73	INITIAL DESIGN
2	10/1/73	REVISED FOR CONSTRUCTION
3	10/1/73	REVISED FOR CONSTRUCTION
4	10/1/73	REVISED FOR CONSTRUCTION
5	10/1/73	REVISED FOR CONSTRUCTION
6	10/1/73	REVISED FOR CONSTRUCTION
7	10/1/73	REVISED FOR CONSTRUCTION
8	10/1/73	REVISED FOR CONSTRUCTION
9	10/1/73	REVISED FOR CONSTRUCTION
10	10/1/73	REVISED FOR CONSTRUCTION
11	10/1/73	REVISED FOR CONSTRUCTION
12	10/1/73	REVISED FOR CONSTRUCTION
13	10/1/73	REVISED FOR CONSTRUCTION

REFERENCE DRAW NOS
NEXT USED ON SK-2-4223

DECONTAMINATION CELL

LEGEND

- FLOW DIRECTION
- CONNECTOR HEAD
- JET
- CHECK VALVE
- DIAPHRAGM OPERATED VALVE
- IN-LINE PUMP
- RESTRICTION ORIFICE

- PNEUMATIC SIGNAL
- ELECTRICAL SIGNAL
- PANEL MOUNTED INST (LOCATED IN OPERATING GALLERY)
- LOCAL INST

INSTRUMENT SYMBOLS		
1ST LETTER	2ND LETTER	3RD LETTER
C	CONTROLLER	CONTROLLER
D	DIFFERENTIAL	
F	FLOW	FACTOR
G	GRAVITY	
M	MANUAL	
P	PRESSURE	
R	RADIATION	RECORDER
S	SPECIFIC	SWITCH
T	TEMPERATURE	
V	VALVE	
W	WEIGHT	

NOTES

1. THE FOLLOWING FUNCTIONS ARE REQUIRED FOR CELL OPERATION BUT ARE NOT INDICATED

- CELL DP
- CELL HEAT DETECTOR
- CELL SUMP WF/SP G
- TANK SAMPLING LINES
- SPARING SYSTEM (JET-OUT, SAMPLING, ETC)
- CELL MIKE
- CELL WASHDOWN
- CELL SUMP JET

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

U. S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES, INC. VITRO ENGINEERING DIVISION	
PROCESS FLOW DIAGRAM CHOP-LEACH PROCESS DECONTAMINATION CELL	
SK-2-4224 2084 7000.01	1000.01 1000.01
REVISIONS 1. 11/13/73 2. 11/13/73 3. 11/13/73	
DRAWING STATUS 1. 11/13/73 2. 11/13/73 3. 11/13/73

STORAGE, DISPOSAL & LEACHING CELL

FOR LEGEND & NOTES SEE SK-2-4224

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

APPROVED FOR CONSTRUCTION DATE: 12/1/78 BY: M. EDGAR		U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATYX INDUSTRIES INC. VITRO ENGINEERING DIVISION	
PROCESS FLOW DIAGRAM CHOP LEACH PROCESS STORAGE, DISPOSAL & LEACHING CELL		CE-0934 7384 7000 01	
DRAWN BY: M. EDGAR SCALE: NONE		CHECKED BY: J. L. BROWN DATE: 12/1/78	
REVIS: 01 DATE: 12/1/78		REVIS: 01 DATE: 12/1/78	
REFERENCE DRAWINGS NEXT USED ON SK-2-4229		DRAWING STATUS NONE	
SK-2-4226		SK-2-4226

DISSOLVER CELL

FOR LEGEND & NOTES SEE SK-2-4224

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

U.S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES, INC. VITRO ENGINEERING DIVISION		DATE: 7/2/73 BY: R. CAMPBELL CHECKED: R. CAMPBELL SCALE: 1:1 SHEET: 1 OF 1	
PROCESS FLOW DIAGRAM CHOP-LEACH PROCESS DISSOLVER CELL			
CE 0934 FFF FUEL PROCESS NG 2034 1000 01		SK-2-4227	
REVISIONS 1. 7/2/73 2. 7/2/73		DRAWING STATUS NONE	
NEXT USED ON SK-2-4219		REFERENCE DRAWINGS

VESSEL IDENTIFICATION

TK-1-1 DOWNHEAT A SODIUM DECONTN TANK
TK-1-2 SOLVENT FLUSH TANK
TK-1-3 WATER FLUSH TANK
TK-1-4 ORGANIC EVAPORATOR
TK-1-5 NaOH CONCENTRATOR
E-1-6 CONDENSER
TK-1-7 SEAL POT
E-1-9 CONDENSER

DECONTAMINATION CELL

VESSEL IDENTIFICATION

TK-2-1 STORAGE TANK
E-2-2 HEAT EXCHANGER
TX-2-3 ION EXCHANGE BED
TK-2-5 4AS PLU.V TANK

STORAGE, DISPOSAL & LEACHING CELL

CONCEPTUAL

NOT APPROVED FOR CONSTRUCTION

U S ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES INC VITRO ENGINEERING DIVISION	
CELL LAYOUT ARRGT CHOP - LEACH PROCESS DECONTAMINATION STORAGE DISPOSAL & LEACHING CELLS	
CHECKED BY CAMPBELL 8/73 DRAWN BY DECON 8/73 SCALE NONE DATE 2084	SHEET NO 8404 OF 1
REVISIONS 1. 8/73 CHE KPT ISSUE NO 1	DRAWING STATUS NONE
NEXT USED ON 5K 2 4225	5K.2.4228

NOT APPROVED FOR CONSTRUCTION

										U.S. ATOMIC ENERGY COMMISSION RICHLAND OPERATIONS OFFICE AUTOMATION INDUSTRIES, INC. VIPO ENGINEERING DIVISION									
										CELL LAYOUT ARRGT CHOP-LEACH PROCESS DISSOLVER CELL									
										CE-0934 FTFL FUEL PROCESSING BLOCK NO. 202A WORK NO. 8006									
										SK-2-4229									