NUMEC

Nuclear Materials and Equipment Corporation Apollo, Pennsylvania 15613 Telephone 412-842-0111 Cable NUMEC

January 4, 1971

50-310

Mr. Donald J. Skovholt
Assistant Director for Reactor Operations
Division of Reactor Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Regulatory File Cy.

Dear Mr. Skovholt:

1. Pursuant to 10CFR Part 50.82, the ARCO Radiation Process Center respectfully requests the Commission to terminate Facility License Number R-72, which authorizes the Department of Forest and Waters of the Commonwealth of Pennsylvania and the Nuclear Materials and Equipment Corporation (NUMEC) to possess, but not to operate, the reactor facility located near Quehanna, Pennsylvania. This facility has been licensed under By-Product License Number 37-12307- [illegible] an irradiation process facility for the process irradiation of commercial products using Cobalt-60. Both the small and large sections of the former reactor pool have been converted for use of Cobalt-60 under the facility By-Product License.

2. The reactor facility has been dismantled in the following manner:

   1. The Pu(14.99 gm) - Be Neutron source, two fission chambers and the reactor core grid plate have been transferred to the Pennsylvania State University as approved in the Amendment No. 4 dated January 15, 1969;

   2. Unirradiated fuel elements containing 5.2 Kilograms of U-235 have been transferred to Brookhaven National Laboratory as approved in Amendment No. 5 dated March 5, 1969;

   3. Four cadmium-Boron carbide safety shims are in storage in the Service Area pool. These shims read 100 MR/hr. or less and will be transferred for burial to an authorized handler of radioactive waste.

   4. The control console was dismantled and the parts were transferred to the Department of Forest and Waters of the Commonwealth of Pennsylvania.

DOCKETED USAEC FEB 1 1971 REGULATORY MAIL SECTION DOCKET CLERK

9203120384 910708
PDR FOIA
BRENNAN90-558 PDR

3. Since the facility has been converted for use as an irradiation process center, is licensed by the Commission for this use and no longer possesses the capability for use as a reactor facility, the ARCO Radiation Process Center respectfully requests the Commission to terminate Facility License Number R-72. If more information is required, please feel free to call Area Code 814 263-4871.

Very truly yours,

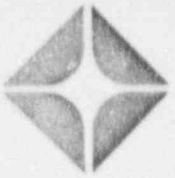
Edward K. Reitler

Edward K. Reitler, Manager
Health, Safety and Licensing

EKR/kjr

ARCO Chemical Company Division of AtlanticRichfieldCompany
ARCO Radiation Process Center
Post Office Box 115
Karthaus, Pennsylvania 16845
Telephone 814 263 4871

Regulatory File Cy.



March 23, 1971

Mr. Al Brauner
Division of Reactor Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Brauner:

The following information concerning the contamination of the facility, the disposition of the remaining inventory of reactor components, and the presence of records pursuant to the R-72 License is offered to supplement and update the letter of March 5, 1971, to Commission pursuant to Docket No. 50-310.

Under Byproduct License 37-12307-02, the ARPC is divided into two areas with respect to contamination; i.e, normally clean areas where contamination levels are maintained well below 500 dpm/100 cm^2 removable beta and contaminated areas where the limits are 100 dpm/100 cm^2 removable alpha, 5,000 cpm/60 cm^2 direct (fixed) alpha, 5,000 dpm/100 cm^2 removable beta, and 5 mRad at 2.5 cm direct (fixed) beta. Strontium-90 and cobalt-60 constitute virtually all of the contamination found in contaminated areas. The Strontium-90 activity is residual in the duct-work of the hot cells and in the low-level portion of the liquid waste system from the operations of the Martin-Marietta Company. No evidence of mixed fission product contamination nor alpha contamination has been found.

Thirty-five reactor activated assemblies were shipped to Kentucky for burial by Nuclear Engineering Company, Incorporated on March 19, 1971. Two safety shims encased in concrete within a 55 gallon drum were retained and stored due to an external radiation level in excess of 200 mR/hr. This 55 gallon drum will be additionally shielded and shipped at a later date.

No records have been found which relate either radiation/contamination levels or personnel exposures during Curtiss-Wright Reactor Operations. The records of radiation/contamination present in facility at the time of transfer to NUMEC are the earliest records which remain.

If additional information is desired, please feel free to contact either the writer or Mr. Reitler at (814) 263-4871 and (412) 842-0111, respectively.

Very truly yours,

ARCO RADIATION PROCESS CENTER

Henry J. Bicehouse

Henry J. Bicehouse, Supervisor
Health and Safety

HJB:mr
cc: E. K. Reitler, Jr.

9106130309 71PP

1.0 Introduction

This information is provided in support of the ARCO Radiation Process Center's request for termination of the Facility License No. R-72. This facility has been licensed under By-Product License Number 37-12307-02 as an irradiation process facility for cobalt-60 irradiation of commercial products.

2.0 Disassembly and Conversion of the Reactor Facility Prior to this Request

2.1 The plutonium (14.99 gm)-beryllium source, two fission chambers and the reactor core grid plate were transferred to the Pennsylvania State University. This transfer was approved in Amendment No. 4 dated January 15, 1969.

2.2 Unirradiated fuel elements containing 5.2 kilograms of uranium-235 were transferred to Brookhaven National Laboratory. Amendment No. 5 dated March 5, 1969, authorized this transfer.

2.3 The control console was dismantled and the parts were given to the Department of Forests and Waters of the Commonwealth of Pennsylvania.

2.4 Amendment No. 4 to Facility License No. R-72 authorized the use of the former reactor pool as the location of a cobalt-60 irradiator originally licensed under By-Product License No. 37-04456-08 and currently under By-Product License No. 37-12307-02 as amended.

2.5 The ARCO Radiation Process Center possesses no special nuclear material nor any irradiated fuel assemblies in the facility pursuant to the R-72 license.

3.0 Procedures for Removal of Remaining Reactor Parts

3.1 Inventory of remaining reactor parts

3.1.1 Four (4) safety shim rods with outside dimensions 2.25 x 0.875 inches of laminated construction consisting of a 0.065 inch stainless steel outer shell, a 0.032 inch cadmium inner shell and the remaining cavity filled with boron carbide crystals to produce a minimum density of 1.5 gm/cm^3.

3.1.2 Three core access elements with dimensions of 3 x 3 inches x 28½ inches for the cavitated portion with an overall length of 34 inches including nose piece.

3.1.3 Twenty-six reflector elements, which are also 3 x 3 inches x 28½ inches for the cavitated portion with an overall length of 34 inches including nose piece.

3.1.4 Four "mock-up" fuel rods containing no special nuclear material measuring 3 x 3 inches x 28½ inches with 42 inches of aluminum connector of approximately 2 inches in outside diameter. These assemblies are reported to have been used in one experiment and then stored. The cavitated portions are constructed of aluminum, but the central volume is a void.

3.2 Radiation and contamination levels of the remaining reactor parts

3.2.1 The four safety shims show external radiation readings ranging from 14 milliroentgens per hour on the ends to 100 milliroentgens per hour in the center of the vertical plane, (readings taken at approximately one (1) inch from the surface). There is no measurable removable contamination on the accessible surfaces.

3.2.2 The three core access elements show no removable contamination on the accessible surfaces. One of these subassemblies reads 12 milliroentgens per hour gamma and 8 milliroentgens per hour apparent beta as a maximum near the center of the vertical plane to a minimum of 2 milliroentgens per hour. The second subassembly ranges from less than 1 milliroentgen per hour to a maximum of 3 milliroentgens per hour gamma with virtually no measurable beta. The third subassembly reads less than 1 milliroentgen per hour for both beta and gamma.

3.2.3 The reflector elements ranged from 2 to 40 milliroentgens per hour gamma and from less than 1 to approximately 12 milliroentgens per hour beta. No removable contamination was measured on accessible surfaces.

3.2.4 The four "mock-up" fuel rods showed approximately equal activation with ranges of 2 to 10 milliroentgens per hour gamma. Neither any fixed beta nor removable contamination were present on these assemblies.

3.3 Pursuant to Department of Transportation Title 49, Part 173.90 (C) and Atomic Energy Commission Title 10, Part 71.4 (P), the following classification is made for each item of paragraphs 3.1 and 3.2;

Nomenclature	Possible Radionuclides	Approximate Maximum Activity	Transport Group
	^{60}Co, ^{113M}Cd, ^{109}Cd, ^{57}Co, ^{55}Fe, ^{14}C, ^{59}Ni, ^{63}Ni		
Safety Shim #1	"	160 mCi	III Type A
" " #2	"	"	" "
" " #3	"	"	" "
" " #4	"	"	" "
	^{55}Fe, ^{65}Zn, ^{35}S, ^{14}C		
Reflector #1	"	100 mCi	IV Type A
" #2	"	"	" "
" #3	"	"	" "
" #4	"	50 mCi	" "
" #5	"	"	" "
" #6	"	25 mCi	" "
" #7	"	"	" "
" #8	"	30 mCi	" "
" #9	"	"	" "
" #10	"	25 mCi	" "
" #11	"	50 mCi	" "
" #12	"	100 mCi	" "
" #13	"	"	" "
" #14	"	"	" "
" #15	"	70 mCi	" "
" #16	"	"	" "
" #17	"	80 mCi	" "
" #18	"	70 mCi	" "
" #19	"	25 mCi	" "
" #20	"	30 mCi	" "
" #21	"	70 mCi	" "
" #22	"	"	" "
" #23	"	100 mCi	" "
" #24	"	80 mCi	" "
" #25	"	25 mCi	" "
" #26	"	30 mCi	" "
Mock-Up Fuel Rod A	^{55}Fe, ^{65}Zn, ^{35}S	$\lesssim$10 mCi	" "
" " " " B	"	"	" "
" " " " C	"	"	" "
" " " " D	"	"	" "
Core Access Element #1	^{55}Fe, ^{65}Zn, ^{35}S	"	" "
" " " #2	"	$\lesssim$5 MCi	" "
" " " #3	"	Virtually No Activity ($\lesssim$1)	" "

Note: These calculations are based on the following assumptions:

(1) Gamma emitting radionuclide of 0.50 MeV;

(2) Highest measured external field (usually at center of activated portion) extended over entire surface of the cavitated portion of the assembly; and

(3) The external fields were primarily the result of activation products within the encapsulating material originating in trace contaminants.

Since these estimates of total activi - were based on basically conservative assumptions, the safety hazard of these materials should be considerably less than the calculated activity would indicate.

3.4 These subassemblies shall be packed in 55 gallon drums, suitably labeled, and transferred to a licensed radioactive waste disposal firm for authorized disposal. The containers will be packed to maintain less than 200 milliroentgens per hour at contact and less than 10 milliroentgens per hour at a meter.

4.0 Radioactive Waste Treatment System

4.1 The liquid waste treatment plant is described in Paragraph 7.1.2 (see attachment) of the Application For By-Product License No. 37-12307-02. Contamination and radiation levels within this system are the result of the activities of several by-product licenses as well as those from the R-72 License.

4.2 Since this system is currently licensed and regulated under By-Product License No. 37-12307-C2, termination of the R-72 License should in no way endanger the health and safety of the general public.

5.0 ARCO Radiation Process Center Operations

5.1 By-Product Liceuse No. 37-12307-02 authorizes the use of the former reactor pool as a cobalt-60 irradiation process system described as the ARCO small and large pool irradiators in the application for this license.

5.2 Radiation and contamination levels are licensed and regulated by By-Product License No. 37-12307-02 and termination of the R-72 license would in no way endanger the health and safety of the general public.

inner cover put on, the top cavity filled with concrete, and the outer drum cover put on.

7.1.2 Liquid Wastes

A liquid waste treatment plant is available for disposal of both low level and high level liquid wastes. The plant for treatment of these wastes is housed in a separate building about 50 feet from the main building.

Figure 7.2 shows that wastes flow to the treatment plant by way of two collection systems. The low level waste system originates in areas of potential radioactive liquid wastes contamination such as the radiochemistry laboratory drains and the fume hoods in the decontamination room. Drains from areas of unlikely, but possible, radioactive contamination lead to a "suspect" waste system and originate from such places as the change room showers, pool area and the personnel decontamination sink in the change room. Each system may be terminated in either of two 3000-gallon underground tanks. When one tank in one system is full, the other tank in the same system may receive drainage.

There are two pumps for each system: one in each system operates when required, with the second used as a standby. When a tank is full, the contents are mixed by circulation through the pump and back to the tank. A sample is then taken from the sampling cock on the pressure side of the pump and an analysis made for radioactivity content:

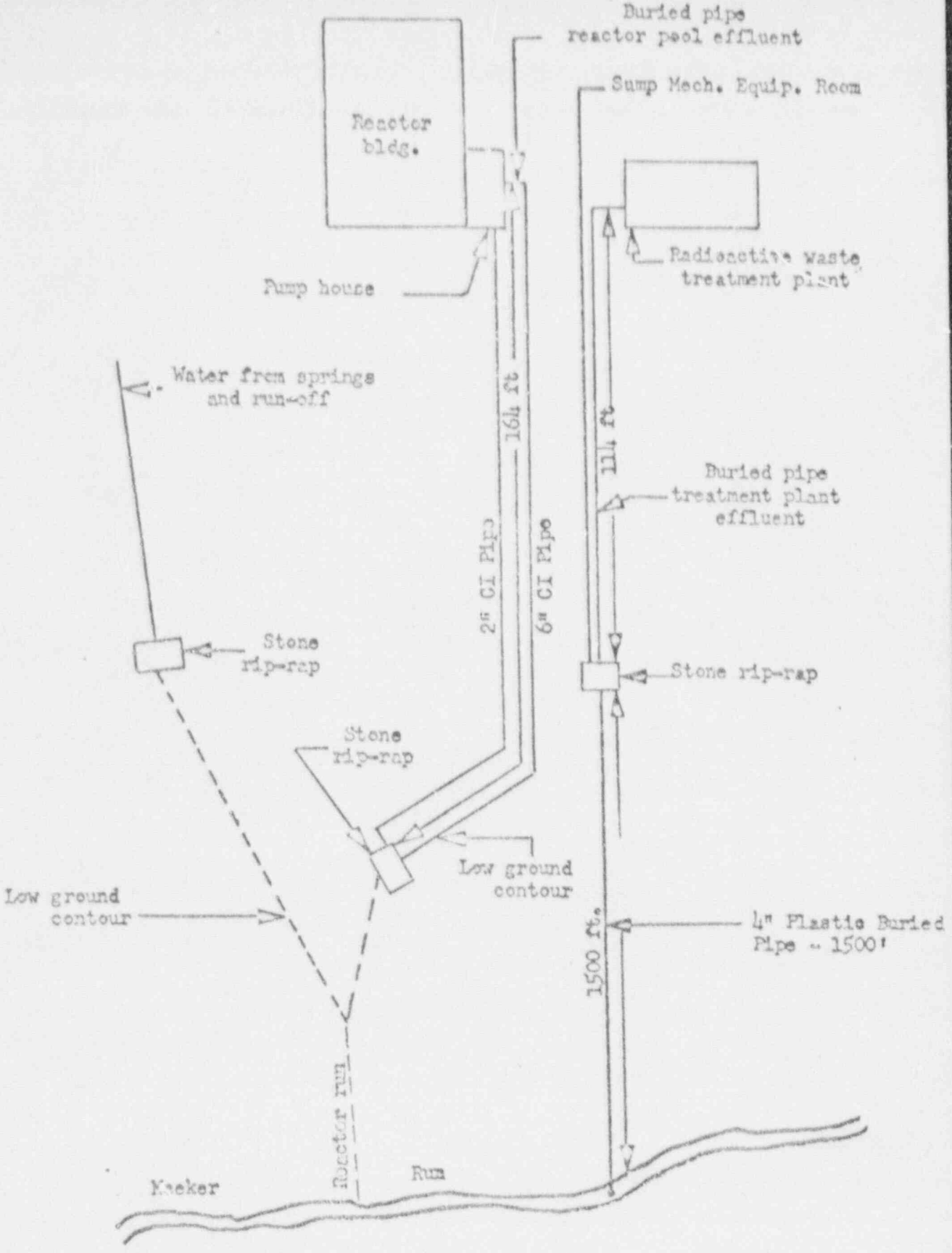


Fig. 7.1 Waste Treatment Runoff

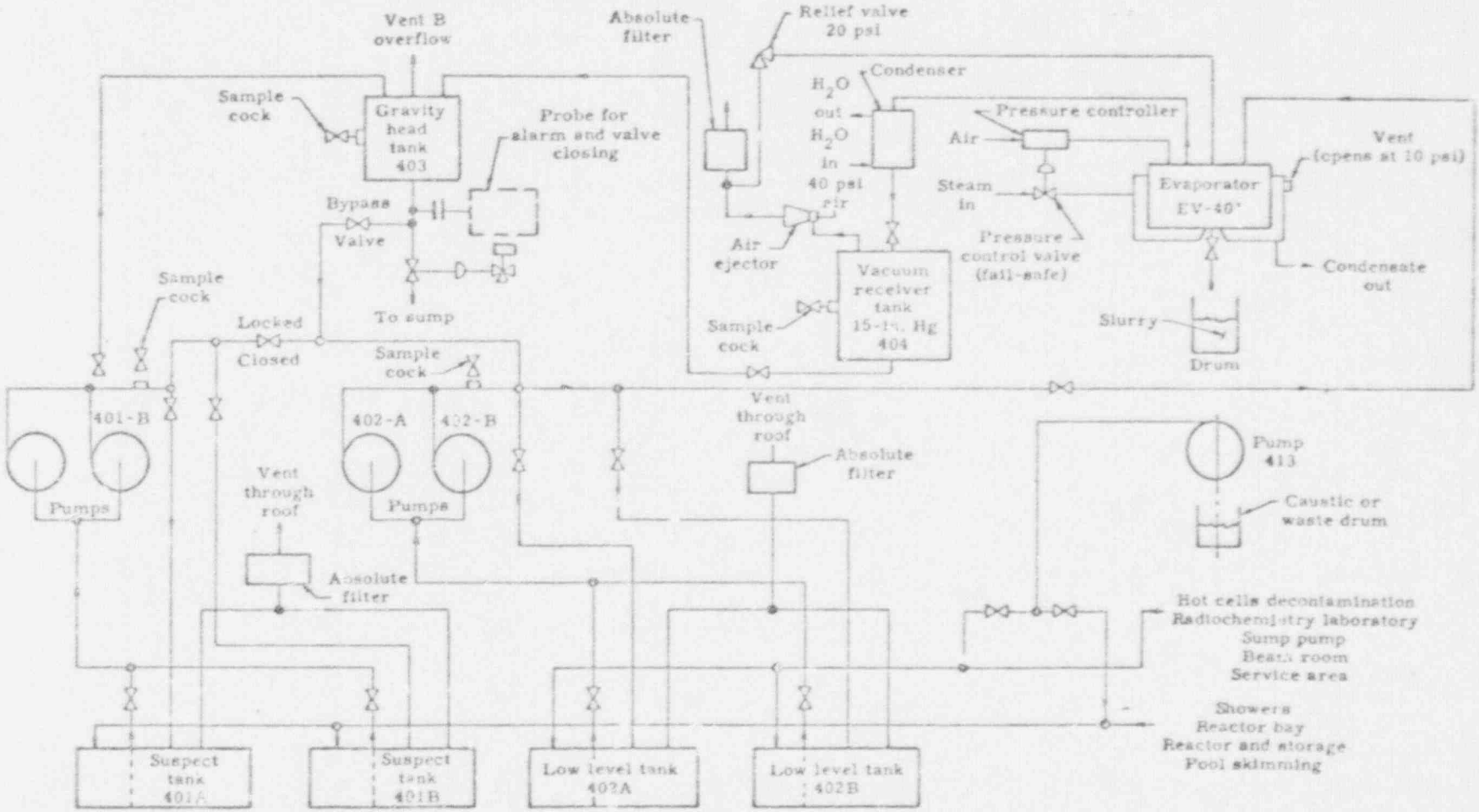


Figure 7.2 Waste Treatment Plant

(1) Low Level Liquid Wastes

If the activity concentration is below the maximum permissible level for release, the contents of the tank are pumped out for disposal directly to the stream. If the activity concentration is above the permissible level, the contents of the tank are diluted until they are below the permissible level or treated as high level liquid waste.

(2) High Level Liquid Wastes

High level liquid wastes are those liquid wastes which cannot be diluted to below permissible levels practically. High level liquid wastes are pumped to an evaporator where the liquid is vacuum evaporated to provide a condensate of sufficiently low level contamination for discharge to the stream. The high level residual sludge remaining in the evaporator is drained into 55-gallon pre-loaded with Flor-Co drums which are shipped offsite for ultimate disposal as solid radioactive waste (Figure 7.3).

The water vapor from the evaporator passes through a heat exchanger-type condenser, and the condensate flows into the 100-gallon vacuum receiver tank and is then transferred to the 1000-gallon gravity head tank where it is analyzed for activity concentration. If the activity is below permissible levels, it can be treated as low level liquid waste. If the activity is above permissible levels and cannot be diluted, it can again be put through the evaporator.

A station has been provided for the addition of caustic to any storage tank for acid neutralization. This station may also be used for the transfer of radioactive waste solutions from other laboratories to one of the storage tanks.

Each group of two storage tanks is vented above roof level through absolute type filters.

The system has been designed to be flexible. The following operations are possible:

(1) The contents of any storage tank can be pumped to the evaporator.

(2) The contents of any storage tank can be pumped to the gravity head tank.

(3) The contents of any storage tank can be pumped to any other storage tank.

(4) The contents of the gravity head tank can be routed to any storage tank.

7.1.3 Gaseous System

Airborne radioactive particulate containment is achieved through the principle of, and design for, multiple containment. This system includes a barrier of multiple absolute filters

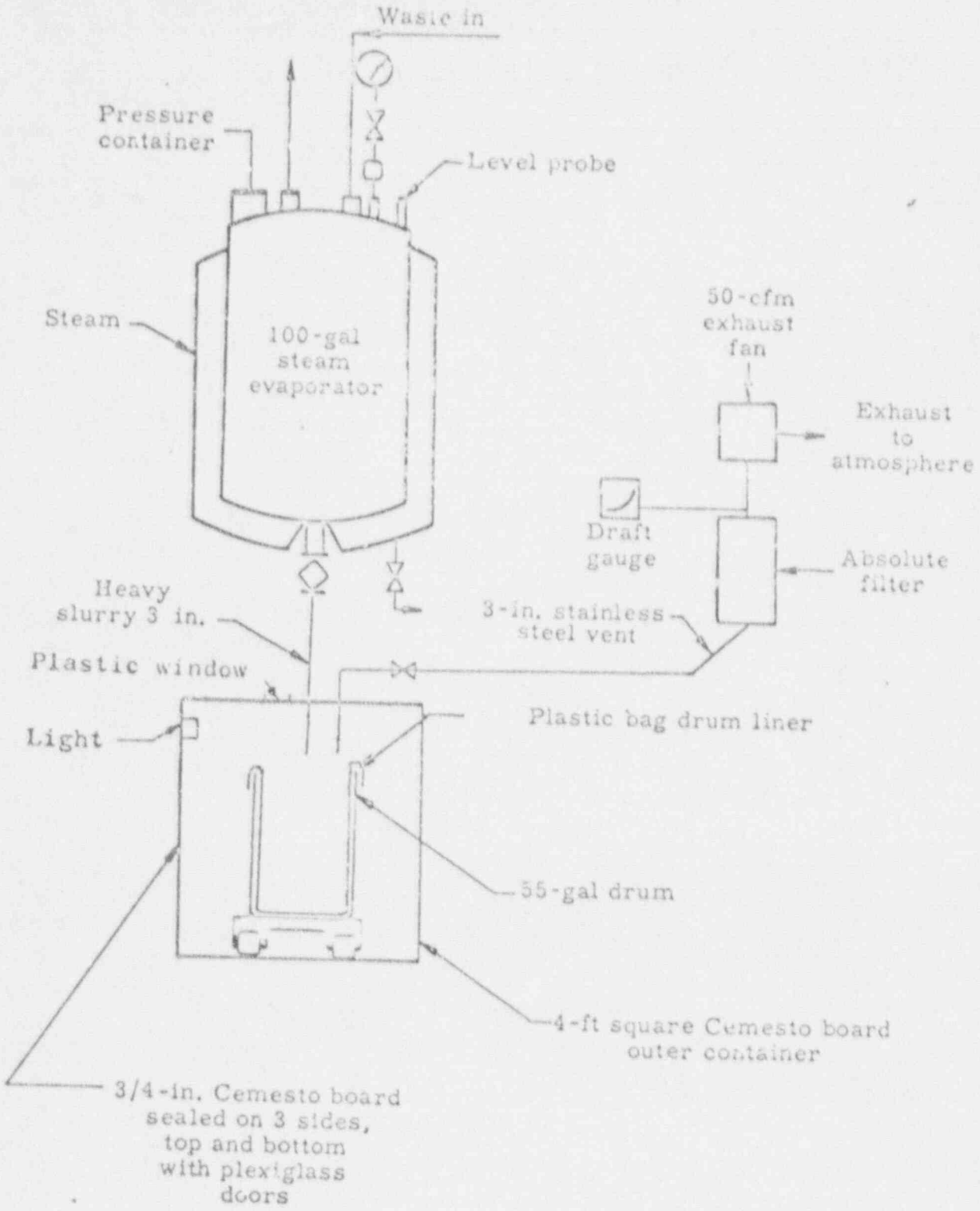


Figure 7.3 Waste Treatment--Sludge Removal