TECHNICAL INFORMATION FILE

DECLASSIFIED

HW-39872

Page 1

This document consists of
~~7/20~~ pages. ~~Copy 4 of~~
~~41 copies. Series A~~

DISTRIBUTION

1. F. W. Albaugh	22. E. W. O'Rourke
2. R. H. Beaton	23. O. H. Pilkey
3. C. R. Bergdahl	24. A. M. Platt
4. J. L. Boyd/H. D. Tibbals	25. H. L. Pringle
5. W. G. Browne	26. W. H. Reas
6. H. A. Carlberg	27. E. L. Reed
7. W. J. Dowis	28. R. B. Richards
8. J. B. Fecht	29. C. A. Rohrmann
9. W. F. Garetson/C. F. Gabel	30. H. P. Shaw
10. A. B. Greninger	31. O. V. Smiset
11. W. M. Harty	32. R. E. Smith
12. T. W. Hauff	33. J. H. Warren
13. O. F. Hill	34. J. L. Weeks
14. R. T. Jaska	35. F. W. Woodfield
15. C. E. Kent/D. R. Gustavson	36. Extra
16. P. D. Lee	37. Extra
17. J. O. Ludlow/T. V. Lane	38. Extra
18. C. A. Lyneis	39. Extra
19. W. K. MacCready	40. 300 Files
20. J. S. McMahon	41. Yellow File
21. P. R. McMurray	

December 12, 1955

H. P. Shaw, Manager
Process Engineering
762 Building, 700 Area

A PUREX PROCESS ONE CYCLE PLANT STUDY

The second of a series of studies of new integrated separations plants has been completed and the results summarized in the attached report. Certain novel process, equipment, and building features have been selected in the bases of the study and will require development and demonstration effort of approximately one and a half to three years duration depending upon the availability of manpower and money. The preliminary scope is considered feasible. It is believed that a more detailed study would not significantly change the project costs and schedules. The capacity selected was rather arbitrary and within reasonable limits the capital investment should not be significantly influenced by capacity changes.

JB Fecht

Head, Separations Design & Development
Design Section
ENGINEERING DEPARTMENT

JB Fecht:jes

~~This document is restricted under the Atomic Energy Act of 1954. Its transmission or the release of its contents in any manner is unauthorized and is prohibited.~~

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 2

A PUREX PROCESS ONE CYCLE PLANT STUDY

By

J. B. Fecht
R. T. Jaske
T. V. Lane
J. O. Ludlow

December 12, 1955

PROCESS ENGINEERING SUB-SECTION
DESIGN SECTION - ENGINEERING DEPARTMENT
GENERAL ELECTRIC COMPANY
HANFORD ATOMIC PRODUCTS OPERATION

HANFORD ATOMIC PRODUCTS OPERATION
DESIGN SECTION INTERNAL REPORT

This document contains information of a preliminary nature prepared primarily for the use of the Design Section and is subject to revision on further checking or collection of additional data.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 3

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	5
II. PURPOSE	5
III. SUMMARY	5
IV. DISCUSSION	6
A. Bases of Study	7
1. Production Rate	7
2. Slugs Processed	7
3. Use of Existing Facilities	7
4. Period of Operation	8
5. Product	8
6. Flowsheet	8
7. Capacity Factor and Plant Flexibility	8
8. Dissolution of Slugs	8
9. Analytical Control	8
10. Timing and Escalation	9
11. Construction Contractor	9
12. Development Program	9
B. Process Description	9
1. General	9
2. Dissolution	9
3. Acid Recovery and Off-Gas Treatment	10
4. Partition Cycle	10
5. Second Pu Cycle	11
6. Waste Treatment	11
7. Organic Treatment	11
8. Rework	12
C. Plant Description	12
1. Site	12
2. Process Building	14
a. General	14
b. Input Feed Handling	15
c. Product Removal Cell	15
d. Crane and Associated Services	16
e. Miscellaneous Supporting Facilities	16
f. Service Facilities	17
3. Equipment & Piping	17
4. Chemical Tank Farm and UNH Storage Facility	19
5. Control and Analytical Lab	19
6. Waste Facilities	20

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 4

	<u>Page</u>
D. Costs	20
1. Project Costs	20
2. Operating Costs	20
E. Timing	20
1. Design	20
2. Procurement and Construction	24
F. Development Items	24
1. General Intent	24
2. Process Features Requiring Development	24
a. Dissolution	24
b. Off-Gas Treatment and Iodine Removal	24
c. Zirconium-Niobium-Ruthenium	25
d. Waste Condensate Treatment	25
e. Organic Treatment	25
3. Mechanical Features Requiring Development	25
a. Slug Handling and Charging	25
b. "In-Line" Pumps	26
c. Process Connectors	26
d. Flexible Jumpers	26
e. In-Line Samplers and Radiation Instrumentation	26
f. Column Concatenation and Multiple Operation	26
g. Pulse Generators	27
h. Coalescers	27
V. ACKNOWLEDGEMENTS	27
VI. BIBLIOGRAPHY	28
VII. APPENDIX	29

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 5

A PUREX PROCESS ONE CYCLE PLANT STUDY

I. INTRODUCTION

In keeping with the announced goals for production at Hanford, a series of separations plant studies is being conducted with the objective of providing an insight into worthwhile design development goals both process and plant-wise. These studies will provide a basis for evaluation of research and development programs, with all cost estimates and other supporting information standardized, both in presentation and detail. These developments are vital to the future of separations plant planning in order that proper emphasis be placed on the most economic production facility for HAPO, should production planning require an additional major facility. This report is the second of a series, reporting on the design developments under way. (1)

II. PURPOSE

The purposes of this document are to present the results of the second separations plant design study directed toward a new solvent extraction plant and to summarize process, plant, and equipment changes which should be developed to achieve the significant capital and operating cost reductions indicated.

III. SUMMARY

Significant reduction in capital and operating cost can be accomplished in a plant utilizing the idealized Purex process detailed in this report. A period of one and a half to three years would be required to proof test development items needed. This would result in a plant on-stream date of April, 1962. For the flowsheet and plant layout assumed, a plant having an assured capacity of 360 tons of uranium feed per month can be obtained for an investment of approximately \$49,850,000. This capital cost is \$35,000,000 to \$45,000,000 less than the cost of duplicating existing type designs of the Purex Plant and \$2,150,000 less than the interim type plant studied as the first case. (1) The estimated annual production cost (exclusive of amortization charges) is \$4,622,000 approximately fifty per cent of that estimated for the Purex Plant.

The flowsheet, building, and equipment contained in this facility are based on the assumption that an active development program would be carried out in support of the scope and final design effort. To meet the scheduled start-up date the development program should start immediately. The success of these developments would dictate the degree of optimism permissible.

(1) HW-38881, "A Purex Two-Cycle Plant Study", JB Fecht, RT Jaske, TV Lane, JO Ludlow, September 15, 1955.

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 6

Suitable allowances for escalation and contingencies (\$6,000,000 and \$9,013,000 respectively) have been included in the capital cost estimate. These are computed in the same manner for each of the studies in this series, but will require review should a project develop.

The use of exterior vaults containing large tanks in order to provide operating flexibility increases the cost of the project by about \$850,000. Since these desirable features were not a part of the first study, a more strict comparison should be based on a capital investment of \$49,000,000.

IV. DISCUSSION

The preliminary scope of a new integrated separations facility is described on the following drawings, copies of which are included in the appendix of this report. This list is followed by a detailed review of features not evident on the drawings.

DRAWING LIST FOR A PUREX PROCESS ONE CYCLE PLANT STUDY

Process Drawings

SK-2-1925	Material Balance (Secret)
SK-2-1980	Schematic Flow Sheet
SK-2-1910	Process Flow Sketch - Head End Section
SK-2-1923	Process Flow Sketch - Partition Cycle
SK-2-1924	Process Flow Sketch - Second Pu Cycle
SK-2-1922	Process Flow Sketch - Uranium Concentration
SK-2-1933	Process Flow Sketch - Waste Section
SK-2-1936	Process Flow Sketch - Organic Treatment

Vessel Drawings

SK-2-1920	Continuous Solvent Recovery
SK-2-1921	Dissolver Off-Gas Cooler
SK-2-1926	Concentrator
SK-2-1927	Condenser
SK-2-1928	Cooler
SK-2-1929	Concentrator Assembly
SK-2-1934	Waste Concentrator Tower
SK-2-1935	Continuous Dissolver
SK-2-1956	1A Concatenated Column Package
SK-2-1958	2AX, 2AS & 2B Column Package
SK-2-1978	1B-1C Column Package
SK-2-2635	Dual Silver Reactor

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 7

Service Equipment Drawings

SK-2-1947 Dissolver Charging System
SK-2-1970 Proposed Gilmont Sampler

Plant Arrangement Drawings

SK-2-1968 General Area Plot Plan
SK-2-1969 New Separations Plant Building Arrangement
SK-2-1990 Architectural & Process Arrangement - Plan at Operating Gallery Level
SK-2-1993 Architectural & Process Arrangement - Sections
SK-2-1997 Process Equipment Arrangement
SK-2-1998 Architectural & Process Arrangement - Plans at Lower Levels
SK-2-2002 Outside Process Facilities

The bases used in developing the study, a description of the process and plant and requirements for development and demonstration work are described in the following paragraphs.

A. Bases of Study

The following assumptions were made to establish the bases for this study.

1. Production Rate

Instantaneous design rate - 15 TU/day

Nominal rate based on plant operating efficiency of 80% (operating efficiency 90% and mechanical efficiency 90%).

2. Slugs Processed

Aluminum jacketed, natural uranium slugs would be processed. Pile irradiation would result in a slug history of a maximum of 1000 MWD/TU and 7.5 MW/T. Slugs would be cooled a minimum of 120 days prior to processing.*

3. Use of Existing Facilities

An entirely new separation area would be provided except for utilities which are considered to be adequate in view of the anticipated shutdown of the T and TBP Plants.

*An entire new study would need to be made if shorter cooling or higher power levels were proposed since solvent treatment and off-gas treatment proposed are based on 120 day cooling and 7.5 MW/TU power level.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 8

4. Period of Operation

The separations facility would be built for long range operation with production starting in April, 1962.

5. Products

Uranium - Aqueous uranyl nitrate solution, 60% UNH.

Plutonium - Aqueous plutonyl nitrate solution, 55-75 grams/liter.

6. Flowsheet

An idealized flowsheet of the Purex Process shown on SK-2-1925 would be used. This is based on Reference (2).

7. Capacity Factor and Plant Flexibility

Production capacity in excess of the above stated instantaneous design rate would not be provided within the plant for this study. Actual production capacity increases would be obtained solely by improvement of overall plant operating efficiency and/or future installation of equipment of higher capacity.

Flexibility for conversion of process would be provided only in the sense that existing process equipment could be removed and other equipment installed. Space has been allocated for mechanical dejacketing of slugs.

8. Dissolution of Slugs

It is assumed that equipment for mechanically dejacketing slugs will be developed and that the process for continuous dissolution of slugs will prove feasible.

9. Analytical Control

A new laboratory of sufficient size to provide for complete analytical control of the new facility would not be provided as it is expected that ample laboratory space will be available subsequent to the shut-down of the T and TBP Plants.

(2) HW-37210, "Simplified Study Flowsheet For Uranium Processing", AM Platt

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 9

10. Timing & Escalation

The on-stream date of April, 1962, for the idealized Purex process separations facility will be compatible with proposed reactor megawatt commitments of that date, although some temporary dislocation in scheduling may occur. The development lead time represents the single uncertain factor, one and a half to three years being estimated to prove out suggested process improvements. This period could be considerably reduced should sufficient priority be established on the basis of a project.

11. Construction Contractor

The construction of the 202 Building would be by a CPFF contractor and the supporting facilities by lump sum contractors.

12. Development Program

The cost of development and demonstration work required to assure process and equipment performances as desired would not be borne by the project. It is assumed that the data required for design scope could be obtained by July 1, 1958.

B. Process Description

1. General

The basic flowsheet used for this separations plant study is an adaptation of the basic Purex flowsheet. The goal of this plant study was to reduce the process and the associated equipment to as simplified a form as possible. The decontamination required by specification is assumed to be met by using repeated scrubbing of the uranium and plutonium organic solution instead of using repetitive cycles. By this means only one LC type column is required, only one uranium concentrator is required, and only one set of storage tanks for concentrated solution is required. There is a further savings in chemical cost and in the cost for water and steam because of the reduction in cycles.

2. Dissolution

This study is based on the utilization of mechanically dejacketed slugs. Equipment for dejacketing the slugs has not been developed to final form at this time. After dejacketing the slugs are continuously charged into a dissolver. Control of the nitric acid concentration in the dissolver solution is accomplished in the dissolver itself. The prepared feed stock is then pumped to an outside feed storage tank.

The process used for the dissolving of dejacketed slugs as proposed for the New Separations Plant Study is incompletely developed at the

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 10

present time. Preliminary information obtained at ORNL (3,4) and at HAPC (5,6,7,8) indicate the general feasibility of continuous dissolution.

Because of the lack of complete data regarding the conditions of dissolving it should be realized that the exact flowsheet required will be developed as a result of studies now in process. The dissolver as designed, however, is believed to be sufficiently flexible to allow any foreseeable flowsheet changes for optimum operation.

Solution flows from the dissolver under specific gravity control through an in-line cooler and is elevated by pump to a centrifuge. Two centrifuges are used in order to allow continuous operation while allowing clean out by batch means of each centrifuge. Product adjustment is accomplished by adding sodium nitrite into the centrifuge catch tank.

3. Acid Recovery and Off-Gas Treatment

The off-gas treatment is also accomplished with a minimum of equipment by utilizing a conventional vertical fin tube gas cooler for the recovery of nitric acid which is returned to the dissolver. The off-gas from the cooler flows through a conventional heater-silver reactor-filter system for removal of iodine and particulate matter. The off-gas is transferred via a steam jet to the stack for disposal.

4. Partition Cycle

The partition cycle 1A column is characterized by being concatenated, by having an elongated scrub section, and by having external coalescing units to minimize aqueous carry over by the organic extractant. Essentially, all the decontamination is achieved in this column. Feed stock from the outside feed storage tank is introduced to the feed point of the 1A column and is extracted using 30% TBP in a conventional fashion. Directly above the feed point the organic solution is contacted by a dilute nitric acid scrub for the removal of zirconium-niobium. The organic solution is then cascaded to the second 1A column scrub section where it is scrubbed by strong nitric acid for the removal of ruthenium,

-
- (3) CF-55-2-117, "Continuous Normal Uranium Dissolution", FL Culler, February 17, 1955.
 - (4) CF-55-3-190, "Status Report, Chemical Technical Division, Unit Operation Section," WK Eister, March, 1955. (Verbal information AM Platt, Chemical Development Sub-Section.)
 - (5) HW-30838, "Application of the Mercury Catalyzed Aluminum Technique to the Redox Process", MH Curtis, JL Bradford, MK Harmon, December 11, 1953.
 - (6) HW-32316, "Pilot-Plant Studies of Mercury - Catalyzed Dissolving Aluminum Jacket Fuel Elements", JL Bradford, KL Adler, July 1, 1954.
 - (7) HW-32823, "Proposed Alternate Dissolving Flowsheets for Redox Plant", MH Curtis, MK Harmon, August 13, 1954.
 - (8) HW-33297, "The Progress Report Chemical Development Unit - September, 1954", FW Woodfield, September 30, 1954.

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 11

[REDACTED]

the high acid raffinate being introduced into the extraction section to augment the salting strength at this point. The organic solution then is cascaded to the third LA column scrub section where it is scrubbed under dilute acid conditions for further removal of zirconium-niobium and other fission products. External coalescing units are used between the scrub sections to minimize aqueous carry over by the organic extractant. The LB or partition column is conventional except that since no further provisions are made for the removal of plutonium from the uranium an additional burden is placed on the LB column in providing specification uranium. The LC column and its operation, the LCU concentrator and its operation are conventional. UNH product solution is batch received, sampled, pumped to an outside storage facility and can then be transferred to the UO_3 Plant.

5. Second Plutonium Cycle

The LBP stream leaving the LB column is oxidized using sodium nitrite and nitric acid in the 2AF tank and pumped to the plutonium concentration cycle. This cycle is of conventional reflux type and produces a 50-75 gm/liter product for sampling and shipment.

6. Waste Treatment

The LAW solution is cascaded continuously into a waste evaporator where its volume is reduced to a suitable small quantity for storing under conditions similar to the original Purex scope. NO_2 gas or sodium nitrite may be introduced into the concentrator to depress ruthenium volatilization. This waste is received in a batch receiver, transferred to a neutralizer where it is sampled, neutralized with caustic, and transferred to underground storage. The overheads from this concentrator are deentrained from fission product activity by passing through dry bubble cap plates and is contacted in the dephlegmator section countercurrently by the 2AW solution. A partial condenser refluxes part of the overhead vapors to adjust the strength of the recovered nitric acid. Overheads are condensed and sent to crib. The liquid down flow in this dephlegmator section is not allowed to return to the concentrator but is removed, cooled and pumped to outside storage. This recovered acid is used in the dissolver section. It will be noted that since large outside storage tanks are provided for prepared feed stock and for acid recovered from waste the dissolver section can operate independently from the balance of the plant.

7. Organic Treatment

Spent organic from the LC column (LCW) must be treated before it is returned to the solvent extraction battery. This is accomplished in the organic treatment facility. Organic is received in a continuous treatment tank consisting essentially of a vessel containing a shrouded turbine agitator located in a draft tube. Suitable orifices

[REDACTED]

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 12

above and below the turbine are provided to regulate the ratio of aqueous to organic circulating through the shrouded turbine. The outer vessel is of sufficient size relative to turbine size so that discrete aqueous and organic phases separate in the outer vessel. Sodium carbonate solution is used as the aqueous treatment agent. The organic mixture is pumped continuously to a second treatment tank identical to the first. Aqueous solution from the first treatment tank is removed periodically to an organic wash receiver and jettied to crib. Fresh carbonate solution can be added to the second treatment tank, be removed from there and transferred to the first treatment tank, thus providing countercurrent treatment; or alternately, fresh carbonate can be used for each treatment step. The organic from the second treatment tank is continuously pumped to a large surge tank. All of the organic treatment facilities are located outside of the canyon building in a vault-type structure.

8. Rework

Product uranium solution not up to specification in the UNH sample tank is transferred to the UNH rework tank which also receives acid wastes from the neutralizer if they contain excessive amounts of uranium and plutonium. The UNH solutions in the rework tank are transferred to the outside feed storage tank containing prepared feed stock.

Plutonium rework is accomplished by introducing 2BP plutonium solution into the centrifuge catch tanks.

C. Plant Description

1. Site

Selection of the site is made on a similar basis as the previous study (1), which in turn was evolved from HW-37319 (9). The assumptions made are as follows:

1. Bismuth phosphate processes will not be operated
2. The uranium recovery plant will be shut down
3. Purex capacity will be raised to goal levels
4. The 200-W Area will continue to be a more desirable area for cribbing of wastes.

The shutdown of T Plant and U Plant would release the utilities capacity currently assigned to these functions. While Phase III Redox expansion might reduce some of this potential, for the purposes of this study it will be assumed that sufficient capacity will remain without requiring utilities renovation beyond service connections. This makes a 200-W

(1) HW-38881, JB Fecht, et al.

(9) HW-37319, "Future Separations Capacity", AB Greninger, July 1, 1955.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 13

location especially attractive in view of the present high level of service activity carried on at this location.

In addition, it is likely that Purex raw water needs may ultimately consume half of the available system supply. Since a 50-50 water flow between areas is the only way to achieve system flows over 20,000 GPM, it is especially desirable to divide the load in order to use the existing system without further renovation. However, an extensive substitution of water cooling towers as an alternative to swamping would eliminate raw water supply as a factor.

In the past, some credit toward diversification has been realized by dual area operation. Should this feature continue to prove desirable, the construction of this plant in 200-W will balance the production load between 200-E and 200-W Areas.

The plant is located on the same site as used for the previous study since the building arrangement is very similar. Drawing SK-2-1969, Building Arrangement, shows details of this layout. The following installations will be made as part of the plant (except the 222 Bldg.):

<u>Building</u>	<u>Name</u>	<u>Function</u>
202	Process Building	(a) Storage-Dissolution-Separation Waste Treatment and Solvent Recovery (b) Make-Up-Service-and Operations Functions
211	Chemical Tank Farm	Bulk Storage of Liquid Chemicals
203	Uranium Holdup Vault	Sampling, Holding and Rework Tanks
291	Fan House and Stack	Building and Process Air and Vent Exhaust
241	Waste Tank Farm	Storage For High Salt Radioactive Waste
241	Miscellaneous Facilities	Waste and Product Transfer Lines, Diversion Boxes, etc.
222*	Analytical and Control Laboratory	Routine Analysis of Process

The small size of the process building achieved by process simplification and careful integration of components allows use of a site which might be too small for a plant styled on conventional lines.

*This facility although shown on the plot plan is not included in the cost estimate.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 14

2. Process Building

a. General

The arrangement of the process building is shown on drawings SK-2-1990-1993-1997-1998-and-2002, in the appendix. The process is arranged in two lines with a cross trench at a right angle. The abbreviated number of vessels limited the choice to either one or two lines, the latter being selected as a more efficient usage of wall area and building volume. All equipment is installed for remote maintenance using conventional techniques.

The area above the cells contains the craneway, but the crane rides on the parapet wall in order to reduce the span. The control cab cantilevers from the main girders. Because of the span (81 feet), trusses are required for the roof. Due to experience with contamination at Redox, a false ceiling of perforated, corrugated metal will be used; the area then serves a dual purpose of providing an inlet air plenum and crawl space for lamp replacement.

In order to economize on concrete and space usage, the shops have been placed at a low level, serviced by elevators and an inclined ramp. In general, every effort has been taken to utilize excavation and concrete to provide minimum wall and projected areas.

The addition of outside vaults adds an indeterminate factor in analyzing building costs. The added flexibility obtained from large 50,000 gallon holdup tanks in the process does increase the plant cost. If these were not included, the structure cost might be \$850,000 lower as the four organic tanks can be placed in the building cheaper than outside, all other things being considered. In any event these factors are relatively minor and do not upset the trend. The space relationships are listed below:

	<u>Purex</u>	<u>202 (HW-38881)</u>	<u>202 (This Study)</u>
Building Length	1005'	340'	340'
Building Width	117'-6"	179'	154'
Process Area Length	863'-6"	200'	200'
Process Area Width	61'-6"	105'	81'
Cell Length	810'	385'	285'
Cell Height	45'	28'	28'
Cell Width	14'	14'	14'
Trench Width	10'	10'	10'
Height Above Foundation	104'-6"	92'	92'
Process Area Volume	5,049,000 Ft. ³	3,360,000 Ft. ³	2,918,000 Ft. ³
Service Area Volume	1,114,000 Ft. ³	952,000 Ft. ³	872,000 Ft. ³
Building Volume	6,163,000 Ft. ³	4,312,000 Ft. ³	3,790,000 Ft. ³
Projected Area	108,000 Ft. ²	72,000 Ft. ²	64,000 Ft. ²
Concrete Yardage* (Process Area Only)	68,600 Yd. ³	21,000 Yd. ³	18,700 Yd. ³

*Includes Cells, Covers, Operating, Sample and Misc. Galleries

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 15

[REDACTED]

There are no cells in the usual sense, the equipment being distributed for best usage of space and piping. And designations made are on a nominal basis, the actual cell geometry being defined by structural piping and ventilation considerations.

b. Input Feed Handling

The scheduling of process car shipments, use of the crane, and other related problems make it imperative to adopt some improved metal handling technique. Any system used must conform to the following objectives:

1. Effectively divorce train scheduling from process operations
2. Provide lag storage for added flexibility
3. Charge slugs directly to the dissolver
4. Be reasonably foolproof and capable of remote disassembly

Several methods are under study; in each, a slug bucket unloading and storage facility similar to the 100-A bucket handling systems is used. One method of charging slugs to the dissolver is illustrated in SK-2-1947, Dissolver Charging System.

c. Product Removal Cell

The product removal (PR) room and the PR vault are located adjacent to the Pu cell. Functionally, the facilities will resemble Purex closely, consisting of two plutonium sampler tanks and a vacuum transfer tank. Access to the process cell will be provided in order to perform contact maintenance.

In the scoping stage a detailed study would be made to simplify and streamline the can loading and handling technique in order to reduce equipment costs.

[REDACTED]

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 16

d. Crane and Associated Services

The crane concept for this process building is essentially the same as the previous process cranes which have been constructed, but with some variation in detail. Since the cell equipment height is twenty-six feet or less, no slave crane will be required to remove tower packages. The hook capacity will be based on the cover block weight, as all major pieces of equipment breakdown into pieces of 10 tons or less. Nominally 40 tons and 10 tons have been selected as main hook capacities, but other sizes, or perhaps a single hook in the 30 ton range might be adequate. The auxiliary hoists for jumpers and wrenches would be the same as Purex.

The crane cab and auxiliary electrical gear will be cantilevered from the main crane girders. The parapet wall will be constructed of high density, mineral aggregate concrete in order to reduce cab shielding requirements.

Cab ventilation will follow the Purex design with 10 changes per hour. Blowers will be provided for forced-filtered ventilation of the switchgear and motor generator sets.

Drawing SK-2-1993, Architectural and Process Arrangement Sections, illustrates the proposed crane installation. Drawing SK-2-1990, Architectural and Process Arrangement, Plan, shows the area served by the main crane, the maintenance facilities serviced by the crane, and other pertinent features. An auxiliary monorail will be required to move the parts of the slug loading hoist into and out of final position since the main crane hooks cannot reach this item. Further study of this item in the scoping phase may indicate that one of the auxiliary hoists, if increased in size may be able to reach this equipment.

e. Miscellaneous Supporting Facilities

1. Galleries

Galleries are located on both sides of the process area. They are designated as follows: (See SK-2-1993)

Electrical and Miscellaneous Gallery
Sample Gallery
Operating and Pipe Gallery
Crane Cab Gallery

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 17

The crane cab gallery is on one side only. The regulated shop and the product removal room are located opposite the electrical and miscellaneous gallery.

2. Piping

Process cell piping is the conventional Purex-type: prefabricated sections, remote connectors and kick plates. All liquid connections below liquid level will use remote flanges. Long transfers will be made via piping in the pipe trench. A suitable number of lines will be carried to a convenient terminal point to permit future outside connections if process extensions are necessary.

3. Safety and Housekeeping

Gains made in Purex design will be incorporated. These include water fog protection and electronic fire detectors, built in house type vacuum system, improved breathing air system, protective coatings where applicable, and an extensive cell spray system.

f. Service Facilities

Service Areas

The service portions of the building are located in continuous annexes which adjoin the crane gallery and dissolver sides of the process cell area. A continuous annex also adjoins the end of the process cell area. Generally the size of the facilities is about the same as in the first study.

Utilities and Ventilation

No significant change in the utilities and ventilation systems from those used in the initial study (1) has been made for this study. Therefore, discussion of this subject has been omitted for purposes of brevity.

3. Equipment and Piping

The general arrangement of cell equipment is shown on the two cell layout drawings SK-2-1997 and SK-2-2002.

(1) HW-38881, JB Fecht, et al.

DECLASSIFIED

██████████

DECLASSIFIED

HW-39872
Page 18

Significant departures from current practice are incorporated in the layout, the single continuous dissolver vessel (SK-2-1935), being the primary item. Process liquid connections below static liquid level will be made with remote flanges in order to extend gasket life. The liquid cooler (SK-2-1928) will be of shell and tube construction.

The cooler will discharge to an "in-line" pump. These units will probably be canned rotor units of the Chempump variety currently being tested. All liquid connections will be flanged.

Off gas lines will be equipped with a new type of remote connector usable with large lines. (See SK-7-600 in Ref. 1). Gas will be cooled in a shell and tube cooler unit (SK-2-1921) and pass on to the silver reactor.

Both the condenser-vessel vent and the dissolver off gas vent systems will use stacked, double silver reactors (SK-2-2635). These units will be operated conventionally, the second series unit being back-up for the first. Discharge gas will be filtered in fibrous glass filters and discharged to the exhaust stack. York mesh will be added ahead of the fibrous glass to assist in deentrainment.

Centrifuges of conventional type will be used. They will discharge to the centrifuge catch tank. Centrifuge slurry will be transferred to the slurry tank and jetted to waste.

Aqueous feed will be continuously made up in the centrifuge catch tank and sent to the feed storage tank outside. Feed will be pumped to the LA column. This column consists of three concatenated sections as shown in SK-2-1956. Feed points are located to provide about fifteen feet of extraction section and sixty feet of scrub section.

Decontaminated U and Pu in the organic will be cascaded to the partition column package consisting of LBS-LBX and LC. This package is preassembled to reduce the number of connectors to a minimum. Drawing SK-2-1978 illustrates the component arrangement. The LBS column in the package will have a beaver tail to provide safe geometry in the event of concentration of Pu aqueous solution at the LBS feed point. A separate small pulser will be synchronized to amplify the pulse in the LBS column. The balance of the package (LBX and LC) and the LA package will be pulsed from one large pulse generator. The tops of each column will be continuously bled to the utility tank, in order to eliminate air and consequent pulse loss. The aqueous from the LBS column goes to a conventional 2AF tank.

██████████

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 19

The LCU concentrator is shown on SK-2-1929. It is intended that the assembly be built up of standard parts to minimize sparing. This unit consists of a special dunnage, a standardized cooler, two right and two left hand standardized unit concentrators, and a standardized tower. The individual units are shown on SK-2-1926, SK-2-1927, SK-2-1928, and SK-2-1930.

With the exception of pumps, pulse generators, jets, controls, and the 2B receiver all Pu equipment will be contained in a single package consisting of the 2AX-2AS-2B columns. As practiced in Purex, all Pu equipment and piping will be critically safe for all concentrations. Access to the cell will be through the top of the process cell or the PR room. All equipment and piping will follow the philosophy presented in the initial study (1) of providing optional contact maintenance or remote disassembly through the use of flexible jumpers with standard connectors and field run tolerances on nozzle location. Drawing SK-2-1958 shows details of the 2AX-2AS-2B column package.

The waste concentrator is made up of standardized pieces of equipment, some interchangeable for use in the LCU concentrator. This unit will consist of a custom dunnage, standard cooler condenser, and concentrator units and a custom tower. (SK-2-1934)

The organic equipment consists of three 5,000 gallon treatment tanks and one 10,000 gallon treated organic storage tank, all located in the outside vault. The treatment tanks will accommodate the turbine type contactor shown on SK-2-1920. The facility will use flexible jumpers and be arranged for access for contact maintenance. Make up organic will be prepared in the chemical tank farm.

4. Chemical Tank Farm and UNH Storage Facility

The location of these facilities are shown on the Plot Plan SK-2-1968 and since no change has been required in these facilities from the initial study (1), discussion of these items have been omitted for purposes of brevity.

5. Control and Analytical Laboratory

Concurrent with development of idealized processes, improvements in continuous sampling and monitoring should minimize the need for this facility. Since the bases assume T Plant laboratory available, sufficient laboratory capacity for the reduced sampling load is currently available. However, should these developments fail to materialize, a separate facility, similar to the Purex analytical laboratory but smaller, would be required and would cost about one million dollars.

(1) HW-38881, JB Fecht, et al.

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 20

6. Waste Facilities

The general arrangement of waste facilities is shown on the plot plan SK-2-1968. The waste facility requirements for this study are not considered significantly different than those presented in the initial study (1) and therefore are omitted for purposes of brevity.

D. Costs

1. Project Costs

As shown in Table I the estimated total project cost for the new facility is \$49,863,000 excluding the analytical laboratory. This cost includes \$1,030,000 for spare equipment and \$6,009,000 for escalation over 1955 construction prices computed to the peak of activity in winter of 1960-61. An additional sum of \$9,013,000 for construction and design contingencies is included.

A maximum of lump sum sub-contracting is anticipated which may lower the total figure for the 202 construction. However, the lack of sufficient detail does not permit an exact evaluation at this stage of development.

2. Operating Costs

As shown in Table II, it is estimated that the total annual operating cost of the new separations facility during the first years of operation would be \$7,122,000 based on 360 TU/mo. rate (average). These costs include labor escalation under the new operation contract plus 6% for the 1961-62 operating period.

The total cost is composed of manufacturing cost \$3,784,000, labor and material escalation \$418,000, contingency \$420,000, and amortization of \$2,500,000 annually based on twenty year straight line depreciation.

E. Timing

1. Design

A one and a half to three year development period is assumed in view of the lack of proven technical data on much of the scope of the proposed plant. The development program should begin immediately in order to meet the scheduled plant start-up date. Figure I shows the interrelation of pertinent schedule items, and includes a scope period of eight months followed by a design period of 20 months.

(1) HW-38881, JB Fecht, et al.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 21

TABLE I
PROJECT COST ESTIMATE
A PUREX PROCESS ONE CYCLE PLANT STUDY

(Based on a cost estimate by C. F. Gabel (10))

<u>Item</u>	<u>Amount, \$</u>
<u>CPFF CONTRACTOR:</u>	
Area Clean-Up & RMU Services	\$ 153,000
Temporary Construction	950,000
Process Building:	
Structure	3,470,000
Services	2,901,000
Spare Parts	1,030,000
Process Equipment	8,933,000
Tools, Communication, etc.	130,000
<u>FIXED PRICE CONTRACTOR:</u>	
Waste Tank Farm	1,980,000
211 Tank Facility	658,000
291 Facility	943,000
Proc. Lines to 224-U	170,000
203 Stor. Vault	700,000
Misc. Area Facilities	97,000
Utility Add'ns. & Extensions	568,000
All Other Outside Proc. Lines	878,000
Sub-Total	\$23,615,000
Other Direct Costs (5-21-5%)	2,526,000
Payroll Burden (5%)	428,000
Total Direct Costs	\$26,569,000
CPFF Indirect (17% of Labor)	1,528,000
CPFF Fee (3% of Labor)	269,000
Reserve for Close Out (2% CPFF)	351,000
Constr. Field Supv. (5% of Total)	1,328,000
Sub-Total	\$30,045,000
General Overhead (3%)	901,000
Escalation (20%) 4 yrs. at 5%	6,009,000
Contingencies (30%)*	9,013,000
Misc. Work Orders	170,000
Start Up Costs	225,000
	\$46,363,000
Design	\$ 3,500,000
Estimated Project Cost	\$49,863,000

*Includes all contingencies normally found in a Project Proposal estimate but does not include deviations from the bases of the study (Section IV-A) or other major process and facility changes.

(10) Letter, "New Separations Plant DO-A-00025, Alternate Facility No. 2" RT Jaske from CF Gabel, Estimating and Unit Cost Unit, November 16, 1955.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 22

TABLE II
ANNUAL PRODUCTION COSTS
A PUREX PROCESS ONE CYCLE PLANT STUDY

Direct Labor*	\$ 518,000 ✓
Indirect Labor*	258,000 ✓
Shop Tools & Supplies	60,000 ✓
Maintenance	934,000 ✓
Rent, Light & Heat	16,000 ✓
Laundry	17,000 ✓
Freight, HWRR	50,000 ✓
Electricity	4,000
Other Services	30,000 ✓
Water, Steam & Sewerage	218,000 ✓
Radiation Monitoring	106,000 ✓
Plant Engineering	29,000 ✓
Process Unit. Mfg.	70,000 ✓
Analytical	200,000
Direct Materials	661,000
Sub-Total, Direct Mfg. Cost	\$3,171,000
Waste Storage	50,000
Process Assistance	87,000
General Administration	476,000
Sub-Total, Mfg. Cost	\$3,784,000
Labor Costs Escalation*	147,000
Material Costs Escalation**	271,000
	\$4,202,000
10% Contingency	420,000
Total Annual Production Cost	\$4,622,000
Amortization of Plant - 20 Yr. Basis	2,500,000
Total Annual Operating Cost	\$7,122,000
Rounded	\$7,150,000

*Labor costs include increases up to and including 1960 according to 1955 agreement. Escalation is 6% to bring labor costs to 1962 level. Based on 3% per year escalation.

**Material costs escalation is 21% to bring material costs to 1962 level. Based on 3% per year escalation.

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 23

FIGURE I
COMPOSITE ENGINEERING SCHEDULE
A PUREX PROCESS ONE CYCLE PLANT STUDY

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 24

Assistance by architect-engineer is anticipated, but no fixed breakdown of responsibilities is made at this time as the proportion assumed by General Electric will be governed by conditions at the time.

2. Procurement and Construction

As shown in Figure I, procurement and construction would require 32 months with CPFF work starting 12 months after start of design scope. The plant based on CPFF construction of the process building would be accepted by Manufacturing October, 1961, or 44 months after the start of design scope, and on stream by April, 1962, or 51 months after design scope. Should time permit taking full advantage of lump sum contracting, a final on stream date of November, 1962, is predicted.

F. Development Items

1. General Intent

In the development of this plant design, a number of assumptions regarding the plant capacity and mode of operation were made based on limited or indirectly related data. This is in conformity with the purposes of this series of studies which include the establishment of worthwhile overall design development goals.

2. Process Features Requiring Development

a. Dissolution

No similar process is now in production operation. Data for this study are only indirectly applicable, being based on work at other sites. The following unknowns require resolution:

1. Data on continuous dissolution rates per unit metal heel are not known.
2. The regulation and control of feed rates and their effect on composition of dissolver solution and off gas are unknown.

b. Off Gas Treatment and Iodine Removal

Due to the short period of time, no complete study of the efficiency or economy of various iodine removal systems has been made, pending receipt of better data. The large amount of work currently going forward should provide a firm basis by the time the other process unknowns are investigated.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 25

c. Zirconium-Niobium-Ruthenium

Decontamination in a solvent extraction separations plant as a general rule is limited by zirconium-niobium and ruthenium removal, depending on the solvent extraction conditions. Research and development work is being directed towards optimizing methods for removal of these fission products by solvent extraction means. It is possible that the plant as outlined herein would accommodate the changing flowsheets that may be desirable to provide maximum decontamination. Such changes might include multiple scrub sections perhaps using scavenging chemicals. Sizable changes in equipment resulting from these studies would require re-evaluation of plant cost.

d. Waste Condensate Treatment

The waste section of the present proposal envisions cribbing condensate from the 1A waste after it has been boiled in a concentrator, deentrained by dry plate separators, and stripped of acid in an acid stripper tower. Data are not available at present as to whether this treatment will provide condensate of sufficiently low activity to allow cribbing. It is possible that either equipment development or auxiliary treatment such as scavenging may be necessary in order to secure sufficiently low activity for cribbing. This should be demonstrated before the necessity arises for reducing this proposal to actuality.

e. Organic Treatment

The organic treatment used is expected to be operated with contact maintenance--based on 120 day cooling for the decay of iodine. However, contact maintenance in this area might not be possible due to build up of other fission products (zirconium-niobium-ruthenium). The treatment unit proposed on this flowsheet is the unit developed at Savannah River Separations Pilot Plant and to date has not had extensive "hot" testing. Some data will be available from Savannah River regarding performance of this unit. However, a test facility should be set up at Hanford and operated.

3. Mechanical Features Requiring Development

In conformance with process objectives, considerable mechanical development is required. Both basic development and design checks are necessary to implement the process.

a. Slug Handling and Charging

Auxiliary dissolver charging combined with lag slug storage is indicated. The exact system to be employed, and the prototype testing remain to be accomplished.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 26

b. "In-Line" Pumps

The cost savings in this proposal, to the extent of one to two million dollars, are highly contingent on the development of a canned rotor pump. Recent experience at the hot semiworks shows good promise, with eventual success in sight.

c. Process Connectors

While mechanically satisfactory, the present type is highly dependent on high gasket performance. Further development of radiation resistant gaskets and mechanical arrangement are necessary to insure good couplings, particularly below static liquid level. The proposed design, recognizing this limitation, utilizes remote flanges for the latter service.

Use of large remote flanges for pipes sizes from 8" upward has always been minimized due to alignment and gasket problems. The proposed plant requires many more of this type in both gas and liquid service. Further development of several large size remote connectors (such as shown on SK-7-600 in Ref. 1) is essential for realization of objectives, although conventional flanges could be used if time were short.

d. Flexible Jumpers

In order to relax tolerances in vessel fabrication, intensive development of flexible jumpers is required. At the present time a low radiation (10 rad/hr.) design is practical. Realization of reduced plant cost and contact maintenance depend on general acceptance of this concept. Tests should be planned on this basis. As in connector design the problem lies partly in concept and partly in materials.

e. In-Line Samplers and Radiation Instrumentation

The proposed design places high dependence on satisfactory development of in-line instrumentation. The high cost of laboratory operation and construction is adequate incentive for vigorous effort in this field. Should this design revert to completely manual sampler operation, more tanks and building space in addition to the laboratory will be required.

f. Column Concatenation and Multiple Operation

The recent revisions to the Purex HA column point out the desirability of extending column size beyond the structural limitations of the shielding envelope. Aside from the use

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 27

of different contactors, the best route remaining is concatenation. Other sites have successfully demonstrated this on small diameter, but final acceptance will be contingent on further demonstration using large diameter prototype units.

In the same category is the use of column packages and multiple usage of pulse generators. The proposed plant has only three pulse generators. The 1A-1BX-and 1C group of columns is pulsed from a single unit, as are the 2AX-2AS & 2B group. Further demonstration of the practicability of this arrangement await full scale tests and auxiliary development of a venting system which will continuously bleed vapors without excessive recycle of process solutions.

g. Pulse Generators

In support of column integration and concatenation, larger and more reliable pulsers become an essential development item. Packings require continuous evaluation, and as in the case of connectors, new materials and ideas should be tested. Hydraulic pulsers show promise of cost and size reduction without sacrifice of flexibility.

h. Coalescers

The problem of aqueous carry over in process streams is receiving attention at this time. Preliminary data indicate that a satisfactory unit is close to attainment. Continuing work on this item is both essential and valuable to the success of the proposed plant.

V. ACKNOWLEDGEMENTS

The basic flowsheets and pertinent extraction column data were furnished by the Chemical Development Sub-Section of the Separations Technology Section. The project cost estimates were prepared by the Estimating and Unit Costs Unit of the Project Section. Design schedules were supplied by the Design Planning Unit of the Design Section. The procurement and construction schedules were developed with the assistance of the Project Section. Operating costs were developed with the assistance of the Manufacturing Department.

Separations Design & Development
Design Section
ENGINEERING DEPARTMENT

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 28

VI. BIBLIOGRAPHY

- (1) HW-38881, "A Purex Two-Cycle Plant Study", JB Fecht, RT Jaske, TV Lane, JO Ludlow, September 15, 1955.
- (2) HW-37210, "Simplified Study Flowsheet for Uranium Processing", AM Platt.
- (3) CF-55-2-117, "Continuous Normal Uranium Dissolution", FL Culler, February 17, 1955.
- (4) CF-55-3-190, "Status Report, Chemical Technical Division, Unit Operations Section", WK Eister, March, 1955. (Verbal information AM Platt, Chemical Development Sub-Section).
- (5) HW-30838, "Application of the Mercury Catalyzed Aluminum Technique to the Redox Process", MH Curtis, JL Bradford, MK Harmon, December 11, 1953.
- (6) HW-32316, "Pilot-Plant Studies of Mercury - Catalyzed Dissolving of Aluminum Jacket Fuel Elements", JL Bradford, KL Adler, July 1, 1954.
- (7) HW-32823, "Proposed Alternate Dissolving Flowsheets for Redox Plant", MH Curtis, MK Harmon, August 13, 1954.
- (8) HW-33297, "The Progress Report Chemical Development Unit--September, 1954", FW Woodfield, September 30, 1954.
- (9) HW-37319, "Future Separations Capacity", AB Greninger, July 1, 1955.
- (10) Letter, "New Separations Plant DO-A-00025, Alternate Facility No. 2", RT Jaske from CF Gabel, Estimating and Unit Cost Unit, November 16, 1955.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 29

VII. APPENDIX: NOTES FOR ESTIMATING PURPOSES

1. 202 BUILDING

A. Structure & Auxiliaries

The main processing building will be of reinforced concrete construction as shown on drawings H-2-1990 and H-2-1993. The building will contain two parallel rows of process equipment. A mechanical charging system and a slug storage system similar to the 100 areas will be used for fuel charging. See drawing H-2-1947. A single track railroad tunnel and a crane maintenance platform will be provided; the equipment being similar to Purex. A regulated shop and decontamination facility, also similar to Purex will be provided.

The PR load out facility will be located adjacent to the regulated shop and contact maintained line. It is anticipated that some simplification in PR handling equipment can be developed. A 6 x 6 foot elevator will serve the PR and regulated shop facilities.

The service and office areas will be of transite and steel construction. Floors will be poured concrete and the interior partitions Hauserman. The service area will be of multiple story construction with shops in the basement, control room and change room overhead, topped with lunch room and offices on the third level.

B. Process Equipment

The information below supplements flow sketch drawings SK-2-1910-1923-1924-1922-1933-1936.

1. Process Cell Equipment

Equipment will be of two classes of construction. The "hot lines" comprising dissolving-waste-and decontamination cycle, will be Class I construction using standard 200 Area definition. The second plutonium cycle will have standard shop tolerances and use flexible jumpers. In general, 304L stainless steel will be used with 308L rod. Weld craters will be removed on boil up vessels only.

a. Vessels

1. Dissolver - One Class I vessel per SK-2-1935.
2. Silver Reactors - These vessels to be of new design consisting of two sections 4'-6" diameter x 8 feet each capped by a heater of Purex size. Total height 20 feet. SK-2-2635
3. Gas Cooler - The dissolver off-gas cooler will consist of a vertical tube unit similar in appearance to the Purex tower. See SK-2-1921.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 30

4. Tanks

- a. 5000 gallon - 8 required - standard type for remote maintenance. Out of tolerance tanks to be used in organic facility.
- b. 2500 gallon - 2 required - construction as above but with reduced capacity.
- c. 2AF tank - 1 required - construction as Purex, size dictated by location of 2 agitators and 1 pump.
- d. 36000 gallon - 2 required - used in exterior vault for dissolver solution and acid storage.

5. Pulse Columns - The columns will be similar to Purex in basic construction but will be grouped into packages for reduction of connectors and inter-column flanged joints.

Package #1	Packed Ht.	Diameter
Column 1AX	12' scrub - 12' extract	20"
1ALS	15'*	20"
1AS	15'*	20"

Package #2

1BX	18'	20"
1BS	12'	8"
1C	15'	24"

Package #3**

2A	25'	7"
2B	18'	7"

Add 1 foot to heights for feed tee, and 2 feet for disengaging sections. In estimating, allowance for large 8" to 12" pairs of connecting piping between columns should be considered.

- 6. Liquid Coolers - A liquid cooler consisting of shell and tube bundle, about 3" diameter by 9 feet long will be used. Remote 2" flanged connectors will be used for process streams and 4" nozzles for water connections. See drawing SK-2-1928.
- 7. Concentrators - Two concentrating units will be made up of special towers and standard boilers, and condensers. Boiler to be as SK-2-1926, condenser as SK-2-1927 and towers as SK-2-1929 and SK-2-1934.
 - a. ICU Conc. 1 tower - 4 boiler sections - 1 condenser

* These lengths were changed to 24' subsequent to issuing these notes for estimating.

** Package #3 now includes 2AX-20', 2AS-20' and 2B-18'.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 31

- b. Waste Conc. & 1 tower - 4 boiler sections - 1
Acid Recovery condenser

8. Filters - 2 required - The filters consist of fibrous glass packing exactly as Purex # FA-1. York mesh will be added as a deentraining section.

b. Pumps

Pumps will be divided into two types depending on "in line" or tank service. Tank pumps will be standard as Purex. "In line" pumps will be a new enclosed type similar to canned rotor pumps.

1. In Line Pumps - 7 required - Each having remote flanged inlet and outlet, power connections, microphone and temperature connections. 1 1/2 HP - 75' head.

2. Standard Tank Pumps

8 required	25 GPM - 1 1/2 HP 75' Head
1 required	25 GPM - 1 1/2 HP 75' Head (Short)
4 required	200 GPM - 7 1/2 HP 75' Head

c. Agitators

Standard type agitators will be required as follows:

2 required	50 HP	Outside Storage Tanks
4 required	25 HP	STD Tank (5000 Gal.)
3 required	15 HP	STD Tank (5000 Gal.)
1 required	2 HP	Short Tank (2AF)
2 required	15 HP	Small Tank (2500 Gal.)

d. Centrifuges

Two centrifuges will be required. Both will be identical to Purex liquid, solid units with addition of extra take-off connections to facilitate arrangement.

e. Pulse Generators

Three pulse generators will be used. These units will be similar in concept to Purex, but because greater pulse energy is required, one will be substantially larger. A factor of ten in rating would be about correct. One each small size will be used for the 2A-2B package and the LBS column.

f. Instrumentation and Electrical

Instrumentation and electrical equipment would be typical of that provided for Purex plants. A single graphic panel would be located in the control room.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 32

g. Piping

Included below are some comments on piping which may assist in the cost estimate. Since the actual runs have not been measured, at best these are educated guesses.

1. Through concrete--about 45% Purex based on the reduction in process steps, smaller pipe sizes due to shorter runs, and generally more economical arrangement. All lines to be stainless other than electrical.

2. Cell Jumpers

Rigid and flexible jumpers will be used depending on the radiation intensity to be expected in the cells and oils. Flexible jumpers would be used in radiation fields less than 10 Rad per hour.

Rigid type jumpers will be fabricated to high tolerance as Purex.

Flexible jumpers will be fabricated using modified remote female connectors and a flexible hose covered with stainless braid. Hose material will be Teflon for process jumpers and rubber for instrument, electrical, and steam lines.

a. Rigid Type*

Process-Steam-Water-Air

2"	135
4"	65
Sampler	15
Inst.	115
Electrical Power	20
	<u>350</u>

b. Flexible Type*

Process-Steam-Water-Air

2"	20
4"	12
Sampler	5
Inst.	15
Electrical Power	8
	<u>60</u>

* Shown as 2" and 4" - Actually 1/2, 1 and 3 will be used also.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 33

3. Remote Flange Type

16-2" remote flanged liquid lines will be used for vessel and pump connections below the liquid level. Each flange will be of 3 bolt style about 12" in diameter with one locating stud.

11-large remote liquid and gas vessel connections ranging from 6" to 12" will be provided. Connectors will be either remote flange, or a new connector style adaptable to any size pipe.

4. Hot Pipe Trench

Hot pipe trench piping will be installed similar to that in Purex. Stainless steel will be used throughout.

<u>Pipe Size</u>	<u>Length Incl Spares</u>
1"	5800
2"	4800
3"	3000
4"	1800
6"	450

h. Jets

Jets will be provided for usual functions of vessel venting, liquid transfer and sump drainage.

<u>Quantity</u>	<u>Fluid</u>	<u>Capacity</u>	<u>Motive Power</u>
4	Process Fluid	10 GPM	Steam
10	"	25 GPM	"
13	"	75 GPM	"
2	"	2 GPM	"
2	Off Gases	500 #1 hr.	"
1	"	1000 #1 hr.	"

2. Organic Treatment Equipment

a. Tanks

Three @ 10' x 10' - 5000 gallon - To have standard flanged pipe connections but remote flange for treatment units.

One @ 15' x 15' - 15000 gallon - as above

b. Decanters

Two @ 4'x 5' - 500 gallon - Same construction as Purex.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 34

c. Pumps

Two @ 28 GPM - 2 HP - 75 feet head.

d. Jets

Air operated - two 50 GPM and four 75 GPM.

e. Agitators

Four required - 25 HP - includes two of the special mixers shown on SK-2-1920.

3. Other Non-Cell Equipment

a. Pulse Generator Variable Speed Controllers

Control Systems similar to those used for the Purex pulsers will be used.

b. Chemical Preparation

A total of 12 tanks and a demineralized water unit plus auxiliary pumps, agitators, instruments, electrical, and piping will be required.

The following tanks are required:

<u>Quantity</u>	<u>Volume, gals.</u>	<u>Dia. & Height</u>	<u>Material</u>	<u>Cooling Coils</u>
2	3000 gal.	6 x 8	304L Stainless	100 ft. 2 (1 only)
4	3000 gal.	6 x 8	Carbon Stl	
3	700 gal.	5 x 5	304L Stainless	100 ft. 2 (1 only)
2	700 gal.	5 x 5	Carbon Stl	
1	200 gal.	2 x 4	304L Stainless	

The demineralized water unit which would be an ion exchange type and would have an instantaneous capacity of 50 gallons per minute. Caustic and acid tanks for regeneration would be included.

The following pumps will be required:

<u>Quantity</u>	<u>Type</u>	<u>GPM</u>	<u>Head</u>	<u>HP</u>	<u>Material</u>
1	Cent.	100	75	8	Stainless Stl.
1	Cent.	100	75	8	C. Steel
2	Cent.	10	100	1	C. Steel
1	Cent.	10	100	1	Stainless Stl.
1	Cent.	20	1850	35	Stainless Stl.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 35

The following agitators will be required:

<u>Number</u>	<u>Tank Size</u>	<u>HP</u>	<u>Material</u>
1	3000	5	Stainless Stl.
2	3000	5	Carbon Stl.
1	700	1	Stainless Stl.
2	700	2	Carbon Stl.
1	200	1/2	Stainless Stl.

Feed Filters as follows:

Each chemical add stream will have one filter similar to Purex filter F-102.

c. PR Equipment

Product removal cans and handling equipment will follow the same general pattern as Purex but efforts at simplification and cost reduction will be made.

d. PR Cans and Carriers

These to be the same as Purex for interchangeability. A total of 50 will be supplied.

e. Samplers

A total of 26 samplers will be required.

Type A (1)	16
Type B (2)	7
Type C (3)	5
	<u>28</u>

- (1) Redesigned Gilmont Sampler SK-2-1970
- (2) Purex Bayonet Sampler
- (3) Purex Gas Sampler

f. Instrumentation

Instrumentation would be similar to that for Purex. Plastic tubing such as Dekoran can be assumed if savings are evident.

Central control will be used. The graphic panel will be about 100 feet long.

g. Piping

Piping for process utilities - steam - water - air will be installed per HAPO standard practice. Line sizes and lengths would be approximately as listed.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 36

<u>Fluid</u>	<u>Line Size</u>	<u>Length</u>
High Press. Stm.	8"	400
	6"	900
	4"	3100
	3"	2200
Low Press. Stm.	10"	300
	8"	500
	6"	1000
	4"	1500
Compressed Air	2"	1400
	1 1/2"	900
	1"	900
Cooling Water	10"	500
	8"	600
	6"	1000
	3"-2"-1"	1900
Sanitary Water	4"	1300
	2"	800

Plastic piping will be used for transfer of corrosive chemicals with the exception of wash solutions.

<u>Material</u>	<u>Line Size</u>	<u>Length</u>	<u>Psig</u>
Polyvinyl Chloride	2"	1500	75
	1"	1500	75
Polyethylene	1/2"	500	75
Stainless Steel	2"	1500	75
Carbon Stl.	2"	800	75

C. Miscellaneous

1. Process Crane

An electrically-driven bridge crane similar to Purex main crane will be used in the process area. The crane will have a span of 54 feet and a total lift of 56 feet. It will have a 50 ton main hoist, a 10 ton secondary hoist, and 1/2 and 1 ton auxiliary hoists on each of the two box girders. Operation from a cantilevered, shielded cab will be accomplished by optical viewing.

2. Dissolver Charger Monorail

The dissolver tower charger cannot be reached by the main crane hooks and requires a monorail to move sections to a location where the main crane can reach. This equipment would be remotely operated from the crane cab.

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 37

3. Ventilation System

This system will consist of a divided type process air handling system similar to 100-K but nominally rated 140,000 CFM with both units running full. Normally one unit will be throttled to 20,000 CFM. In addition, a service side system of 60,000 CFM will be provided. These units will consist of pre-heaters filters, air washers, and re-heaters as conventionally considered. A 6,000 CFM recirculated refrigerated air conditioning system will serve the control room, lobby, dispatchers office, and supervisors office. Heat for air handling equipment will be recovered by means of a surface condenser from the waste cooling water stream. In addition, a by-pass heat exchanger fed by steam will supply adequate hot water to the air handling apparatus when the process is shut down. This equipment will be located in a shielded basement area underneath the service blower room.

4. Compressed Air System

One 200 SCFM water sealed wash compressor for instruments (80-85 psi) and two 500 SCFM, 125 psi, units with 4 x 12 receivers for the process system. The instrument air system will include receiver (3 x 8) air dryer, and back up connection to process system.

5. Breathing Air System

To be 200 SCFM capacity, dried, filtered, and stored at 50 psi in a 4 x 10 receiver. Fifty outlets in strategic locations in sample gallery - process cells, crane maintenance line, regulated shop, - PR facility, hot shop, railroad tunnel, solvent recovery vault and contact maintained extraction line.

6. Air Sampling System

Essentially as Purex. A central vacuum pump in sampler gallery. About 40 sample points. Utilization factor 33 1/3%.

7. HM Ionization Chambers

The standard treatment will be given. About 40 instruments will be required reading on 10 point recorders in dispatchers office.

8. Communications System

A building communication system consisting of a 75 unit automatic local exchange will be provided. Twenty-five phones on the HAPO exchange will serve this need.

9. Protective Coatings

The following potentially contaminated zones will be painted with protective coating: process cells, hot shop, decontamination cell, regulated shop, PR room, sampler galleries, pipe galleries.

DECLASSIFIED

DECLASSIFIED

HW-39872

Page 38

10. Cell Wash Down

A cell spray system with nozzles at 15 foot centers will be provided on both sides of each process cell. Additional equipment sprays will be located about as in Purex.

11. Organic Cell Fire Protection

The organic cell will be provided with a fire detection system and automatic water fog spray nozzles.

2. 291 AREA

The 291 facility will be provided to handle 140,000 CFM of canyon and gallery exhaust air. This facility is located on the plot plan.

- (a) Fibrous glass filter as Purex about 70' x 70' consisting of a 2 bed fore filter each 35' x 50' and an after filter 70' x 20'.
- (b) Concrete stack 200' tall with either free standing stainless or integral chemical brick liner.
- (c) Two Vinyl coated carbon steel exhaust fans each 70,000 CFM capacity at 11" water with a 150 HP motor. One of these to have a dual drive, consisting of a 150 HP steam turbine and 150 HP electric motor.
- (d) One stack sampling facility as Purex.
- (e) One glass filter sampling house as Purex.

3. 211 CHEMICAL STORAGE FARM

Storage facilities for nitric acid, hydrocarbon diluent, TBP, and caustic, will be provided.

<u>Capacity</u>	<u>Service</u>	<u>Material</u>
100,000 Gal.	HNO ₃	304L S. S.
100,000 Gal.	HNO ₃	304L S. S.
50,000 Gal.	NAOH	Carbon Stl.
50,000 Gal.	Demin. Water	Aluminum
65,000 Gal.	TBP Diluent	Carbon Stl.
30,000 Gal.	TBP	Carbon Stl.
1,000 Gal.	H ₂ SO ₄ *	Carbon Stl.
5,000 Gal.	TBP Mix Tank	Carbon Stl.

*For Laboratory

DECLASSIFIED

The following pumps will supplement the 211 facility:

<u>Number</u>	<u>GPM</u>	<u>Head</u>	<u>HP</u>	<u>Material</u>
2	80	100	7 1/2	Stainless Stl.
2	20	100	2	Stainless Stl.
1	80	50	3	Carbon Stl.
2	10	50	1/2	Carbon Stl.
2	80	100	7 1/2	Carbon Stl.
2	125	50	7 1/2	Carbon Stl.
1	50	100	10	Carbon Stl.
2	25	100	5	Carbon Stl.

Demineralize capacity to be 50 gal./min.

4. Recovered Uranium Storage

Recovered uranium solution will be transferred to a process vault located outside the process building (see site plan). It will resemble the WR vault at U plant, but will have three 20,000 gallon tanks for about 6 days running storage. Materials of construction, pumps, etc. will closely resemble the U plant installation except in quantity which will be adjusted to the three tank basis.

5. WASTE TANK FARM

Waste flow from the facility is about 150,000 gallons per month which can be concentrated about 3:1 depending on exposure history. The farm should resemble Purex in basic concept as follows:

- (a) Tanks to be capable of holding 2.5 gravity liquid.
- (b) Vapor handling system to consist of condenser-evaporator and barometric condenser. Drainage to be either recirculated or go to swamp.
- (c) Capacity of the farm should be about 6 million gallons.*
- (d) Direct buried, coated lines will be employed.

6. MISCELLANEOUS WASTE FACILITIES (DETAILS BY C. R. BERGDAHL)

Crib waste flows while undetermined will be about 1/2 that of Purex. Cribbs will be required for the following services:

Organic Waste	Intermittent	20' x 20'
Lab & Cell Drains	Intermittent	30 x 30
Process Condensate	Continuous*	100 GPM
Steam Condensate	Continuous*	225 GPM
Diversion Box Drains	Intermittent	20 x 20
Tank Farm Condensate	Emergency Basis	100 GPM
203 Facility Sump	To Diversion Box Crib	

Cooling (2500 GPM) will be disposed of by swamp through a 24" V. C. P. line.

*Changed after completion of estimate.

7. GENERAL AREA FACILITIES

The general area facilities will be shown on the plot plan SK-2-1968 and SK-2-1969 and consist of:

- (a) Roads and walks
- (b) Exclusion area fencing & lighting
- (c) Street lighting
- (d) Railroads
- (e) Exclusion area badge house (as 100-C)
- (f) Sanitary waste disposal for 130 people/shift
- (g) Hydrants and fire protection system
- (h) Extension and rehabilitation of 200 area burial grounds

8. ANALYTICAL AND CONTROL LABORATORY

The Purex Analytical Control laboratory can be used as a direct basis for this item. The unit will be located about 80 feet from the main building and connected with a service tunnel for handling samples and utilities. The structure is about 58 x 144 feet in size and is entirely self contained.

9. UTILITIES SERVICE

The following utilities service is required. See the plot plan for line and equipment locations.

- (a) Electrical demand 1975 KW normal
Emergency Service 200 KW (Diesel Generator)
- (b) Raw Water 2500 GPM
- (c) Filtered Water 500 GPM
- (d) Sanitary Water -- High tank and system for 150 person peak requirement.
- (e) Steam Supply -- 40,000 #/hr. for process and 10 to 30,000 for ventilation depending on operation of heat recovery system. 50,000 #/hr. is a nominal quantity which could go to 70,000 if the vent heat recovery system was not functioning.

10. Spare Equipment

The following process equipment spares should be included in the estimate:

<u>Unit</u>	<u>No. Installed</u>	<u>Spares</u>
Dissolver	1	1
Gas Cooler	1	1

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 41

(cont'd)

<u>Unit</u>	<u>No. Installed</u>	<u>Spares</u>
Liquid Cooler	1	1
Off-Gas Filters	2	1
15000 Gallon Tanks	2	1
5000 Gallon Tanks Std.	8	2
2500 Gallon Tanks Std.	2	1
2AF Tank	1	1
Silver Reactor & Heater	2	1
1A Tower Package	1	1
1B-1C Tower Package	1	1
2A-2B Tower Package	1	1
Waste Concentrator Tower	1	1
Waste Concentrator Boilers	2	1L-1R
1CU Concentrator Tower	1	--
1CU Concentrator Boilers	4	1L-1R
1CU Concentrator Condenser	1	--
1CU Concentrator Cooler	1	1
15 HP Std. Tanks	2	1
25 HP Std. Tanks	4	2
Agitators 2 HP Short Tanks	3	1
15 HP Small Tank	2	1
25 HP (long for large tanks)	2	1
1 1/2 HP Std. Tank	8	2
Pumps 1 1/2 HP Short Tank	1	1
1 1/2 HP "In Line"	7	2
7 1/2 HP Std. Tank	4	1
7 1/2 HP Deep	2	2
Condenser Vent Jet 1000 #/hr.	1	1
Dissolver Vent Jet 500 #/hr.	1	1
Vessel Vent Jet 500 #/hr.	1	--
Liquid Trans. Jets 2 GPM	2	1
Liquid Trans. Jets 10 GPM	4	2
Liquid Trans. Jets 25 GPM	10	2
Liquid Trans. Jets 75 GPM	13	3
Liquid Trans. Jets 100 GPM	4	
Pulse Generators Large	1	1
Small	2	1
Hot Rotameters	11	4
Hot Control Valves	38	20

DECLASSIFIED

DECLASSIFIED

HW-39872
Page 42

(cont'd)

<u>Unit</u>	<u>No. Installed</u>	<u>Spares</u>
Automatic Controllers	80	15
Jumpers Rigid	350	45
Flexible	60	20
Gilmont Samplers	16	1
Gas Samplers	7	1
Bayonet Samplers	5	1

DECLASSIFIED

DECLASSIFIED

NOTES

1. BASIS: 1 TON URANIUM AS PROCESSED
2. CF - VOLUME TAKEN AT WORKING TEMPERATURE AND ATMOSPHERIC PRESSURE.
3. LOSS FILTERING LOSS ARE INDICATED

RESTRICTED DATA
THIS DOCUMENT CONTAINS RESTRICTED DATA AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954. ITS TRANSMISSION OR THE DISCLOSURE OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED.

NO.	DESCRIPTION	REV. BY	DATE	REV. BY	DATE
<p>REVISIONS</p> <p>DRWG. NO. SK-2-1925</p> <p>SCALE: AS SHOWN</p> <p>DATE: 10/19/61</p> <p>DESIGNED BY: DATE</p> <p>CHECKED BY: DATE</p> <p>APPROVED BY: DATE</p> <p>DATE: 10/19/61</p> <p>PROJECT: A-00025</p> <p>U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC</p> <p>MATERIAL BALANCE NEW SEPARATIONS PLANT STUDY (SIMPLIFIED)</p> <p>DATE: 10/19/61</p> <p>SK-2-1925</p>					

DECLASSIFIED

UNCLASSIFIED

UNCLASSIFIED

**FOR
COMMENTS**
NOT FOR CONSTRUCTION

DRAWING TITLE	
REFERENCE DRAWINGS	
NEXT USED ON	NONE
CLASSIFICATION	

CLASSIFIED

UNCLASSIFIED

HW-39872
PAGE 45

UNCLASSIFIED

REVISIONS		REV. NO.	DATE	BY
NO. SK-2-1910				
SCALE: NONE		APPROVALS		
DESIGNED BY: DATE: 6-10-56		BY	DATE	
CHECKED BY: DATE: 7-1-56		BY	DATE	
DRAWN BY: DATE: 7-11-56		BY	DATE	
MATERIAL: 3004		BY	DATE	
TOLERANCE: 00-100000		BY	DATE	
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC				
HEAD-END SECTION PROCESS FLOW SKETCH NEW SEPARATIONS PLANT STUDY ONE CYCLE PLANT				
CLASSIFICATION: NONE		SK-2-1910		

UNCLASSIFIED

HW-39872
PAGE 46

UNCLASSIFIED

FOR
COMMENTS
NOT FOR CONSTRUCTION

NOTE
1 - DESTRATINMENT DEVICE

NO.	DESCRIPTION	REV. BY	DATE	REV. BY	DATE
REVISIONS					
ORIG. NO.	SK-2-1923	REV. NO.		REV. BY	
SCALE		BY		DATE	
DESIGNED BY		CHECKED BY		DATE	
DRAWN BY		APPROVED BY		DATE	
NO. OF SHEETS	1	UNIT			
NO.	0286				
PROJECT	A-00025				
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
PARTITION CYCLE PROCESS FLOW SKETCH NEW SEPARATIONS PLANT STUDY ONE CYCLE PLANT					
CLASSIFICATION NONE					
NO. SK-2-1923					

UNCLASSIFIED

HW-39872
PAGE 47

UNCLASSIFIED

10 10 COLUMN

SPV PRODUCT ANALYZER

REVISIONS		REV	DATE
SK-2-1924			
SCALE	APPROVALS		
DATE	DATE	DATE	DATE
10-19-55	10-19-55	10-19-55	10-19-55
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC			
SECOND PU CYCLE PROCESS FLOW SKETCH NEW SEPARATIONS PLANT STUDY ONE CYCLE PLANT			
CLASSIFICATION		SK-2-1924	
NONE			

UNCLASSIFIED

UNCLASSIFIED

FOR
COMMENTS

451 P. C. (64)150(1104)

NO.	REVISIONS	REV. BY	DATE	FILE	OTHER
REVISIONS					
PAPER NO. SK-2-1922		PROJECT NO. _____ DRAWING NO. _____ SHEET NO. _____			
SCALE: _____ DATE: _____ DRAWN BY: _____ CHECKED BY: _____ APPROVED BY: _____ TITLE: _____		APPROVALS NAME _____ TITLE _____ DATE _____			
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
URANIUM CONCENTRATION PROCESS FLOW SKETCH NEW SEPARATIONS PLANT STUDY ONE CYCLE PLANT					
PAPER NO. SK-2-1922		PROJECT NO. _____ DRAWING NO. _____ SHEET NO. _____			

S. M. M. M.
10-19-68

NONE

CLASSIFIED BY SP-1 DATE 11/11

UNCLASSIFIED

HW-39872
PAGE 49

**FOR
COMMENTS**
NOT FOR CONSTRUCTION

REVISIONS		REV. NO.	DATE	BY	CHKD.
1		1	10-19-55		

APPROVALS		DATE	BY	CHKD.
DESIGNED	10-19-55	10-19-55		
CHECKED	10-19-55	10-19-55		
APPROVED	10-19-55	10-19-55		

SCALE:	UNIT:
3200	
PROJECT: A-00025	
U. S. ATOMIC ENERGY COMMISSION HAMPORE ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC	
WASTE SECTION PROCESS FLOW SKETCH NEW SEPARATIONS PLANT STUDY ONE CYCLE PLANT	
DWG. NO.	SK-2-1933

UNCLASSIFIED

UNCLASSIFIED

HW-39872
PAGE 50

FOR
COMMENTS
NOT FOR CONSTRUCTION

REVISIONS		REV.	DATE	BY	CHKD.
SK-2-1936					
SCALE:		APPROVALS			
DRAWN BY: J. J. ST.		BY	DATE	CHKD.	DATE
CHECKED BY: J. J. ST.					
DESIGNED BY: J. J. ST.					
REV. NO. 1					
DATE 9-28-66					
PROJECT NO. DO-100895					
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
ORGANIC TREATMENT PROCESS FLOW SKETCH NEW SEPARATIONS PLANT STUDY ONE CYCLE PLANT					
CLASSIFICATION		SK-2-1936			
NONE					

UNCLASSIFIED

UNCLASSIFIED

6'-0"

15° 15°

4-15° ANTI-SWIRL Baffles

SECTION "A-A"

ELEVATION

CHECK PRINT

NO.		DESCRIPTION		REV. OF		DATE		APPROV BY		DATE	
REVISIONS											
DWG. NO.		SK-2-1920				PROJECT NO.		REV.		DATE	
SCALE				APPROVALS							
DRAWN BY DATE				BY		DATE		BY		DATE	
CHECKED DATE											
DESIGNED DATE											
ENGR. DESIG. UNIT											
SUPT. NO.		9286									
PROJECT NO.		A-00025									
<p align="center"> U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC </p>											
<p align="center"> CONTINUOUS SOLVENT RECOVERY NEW SEPARATIONS PLANT STUDY </p>											
SCALE NO.		DWG. NO.		SK-2-1920				REV.		DATE	

UNCLASSIFIED

UNCLASSIFIED

HW-39872
PAGE 53

OWS OF 1\"/>

CHECK PRINT
NOT FOR CONSTRUCTION

DESCRIPTION		REV. BY	DATE	APP'D BY	DATE
REVISIONS DWS. NO. SK-2-1921					
SCALE		APPROVALS			
DESIGNED BY	DATE	BY	DATE	FOR	DATE
CHECKED BY	DATE				
DRAWN BY	DATE				
APP'D BY	DATE				
REV. BY	DATE				
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
DISSOLVER OFF-GAS COOLER NEW SEPARATIONS PLANT STUDY					
DWS. NO. SK-2-1921 CLASSIFICATION NONE		DATE SK-2-1921			

UNCLASSIFIED

UNCLASSIFIED

NOZ.	SIZE	DESCRIPTION
A	3"	CONDENSATE
B	4"	STEAM
C	4"	VENT
D	3"	INSTRUMENT
E	3"	
F	3"	LIQUID OUT

SECTION "A-A"

CHECK PRINT
NOT FOR CONSTRUCTION

REVISIONS		DATE	BY	FOR
SK-2-1926				
SCALES		APPROVALS		
ENGINEER		DATE	BY	FOR
DESIGNER		DATE	BY	FOR
CHECKER		DATE	BY	FOR
PROJECT NO. A-00012				
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC				
CONCENTRATOR NEW SEPARATIONS PLANT STUDY				
BLDG. NO.		DWG. NO. SK-2-1926		

UNCLASSIFIED

REFERENCE DRAWINGS	
NONE	

UNCLASSIFIED

SECTION 'A-A'

NOZ.	SIZE	DESCRIPTION
A	4"	WATER IN
B	4"	WATER IN
C	4"	WATER IN
D	4"	WATER OUT
E	4"	WATER OUT
F	4"	WATER OUT
G	2"	TEMP
H	16"	GAS IN
J	4"	VENT
K	4"	COND. OUT
L	3"	REFLUX
M	3"	REFLUX

CHECK PRINT

NOT FOR CONSTRUCTION

12-19-55

DESCRIPTION		REV. NO.	DATE	BY	CHKD.
REVISIONS					
FORM NO. SK-2-1927					
SCALE:		APPROVALS			
DESIGNED BY	DATE	BY	CHKD.	DATE	
ENGINEER	DATE				
DRW. NO.	UNIT				
NO.	3000				
PROPERTY NO.	A-080 E.S.				
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
CONDENSER NEW SEPARATIONS PLANT STUDY					
BLDG. NO.	FORM NO. SK-2-1927				

UNCLASSIFIED

UNCLASSIFIED

PLAN

ELEVATION

SECTION "A-A"

NOZ	SIZE	DESCRIPTION
A	2"	WATER IN
B	3"	LIQUID IN
C	3"	LIQUID OUT
D	2"	WATER OUT

NOT FOR CONSTRUCTION

REVISIONS		REV. BY	DATE	APPROV. BY	DATE
DESIG. NO. SK-2-1928		REV. 1	DATE	APPROV. BY	DATE
SCALES		APPROVALS			
SECURITY CLASS. CONFIDENTIAL		REV.	DATE	APPROV. BY	DATE
ORIGINATOR SAFEGE					
DESIGNED SAFEGE					
CHECKED SAFEGE					
DES. NO. SAFEGE					
UNIT NO. 9884					
PROJECT NO. A-00015					
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
COOLER NEW SEPARATIONS PLANT STUDY					
DESIG. NO. SK-2-1928	DESIG. NO. SK-2-1928	REV. 1	DATE	APPROV. BY	DATE

UNCLASSIFIED

UNCLASSIFIED

HW-39872
PAGE 56

$\rightarrow 27^{\circ}0'$

CHECK PRINT

NOT FOR CONSTRUCTION

<div style="text-align: right;">24</div>	
<div style="text-align: center;">REPRODUCTION DRAWING</div>	
<div style="text-align: center;">NONE</div>	<div style="text-align: center;">NONE</div>

NO.		REVISIONS		DATE OF CHANGE		APPROVED BY		FILE NUMBER	
DRAWING NO.		SK-2-1929		DATE OF ISSUE		BY		FILE NO.	
SCALE		1"=1'-0"		APPROVALS					
DESIGNED BY		C. W. BROWN		BY		FILE		DATE	
CHECKED BY		L. J. BROWN		BY		FILE		DATE	
IN CHARGE		W. H. BROWN		BY		FILE		DATE	
APPROVED BY		A-00005		BY		FILE		DATE	
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATIONS GENERAL ELECTRIC									
CONCENTRATOR ASSEMBLY NEW SEPARATIONS PLANT STUDY									
DRAWING NO.		SK-2-1929		DATE OF ISSUE		BY		FILE NO.	

UNCLASSIFIED

[illegible]

SUPPORT & HOLD DOWN GRATE

SPRAY RING

HW-39872
PAGE 57

SECTION "B-B"

TYPICAL DISTRIBUTER PIPE

SECTION "C-C"

SECTION "A-A"

41-6" O.D. BUBBLE CAPS ON 10" EQUILATERAL TRIANGULAR PITCH AS SHOWN

*2nd revision
10-14-55*

DESCRIPTION		REV. BY	DATE	REV. BY	DATE
REVISIONS					
DWG. NO. SK-2-1934					
SCALE:		APPROVALS			
DRAWN: <i>W. C. G.</i> DATE: 10-3-55		BY: _____			
CHECKED: _____ DATE: _____		FOR: _____			
DESIGN: _____		DATE: _____			
MATERIAL: _____		DATE: _____			
FABRICATE: _____		DATE: _____			
PROJECT: A-00005					
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
WASTE CONCENTRATOR TOWER NEW SEPARATIONS PLANT STUDY					
DWG. NO.		DRAWING TITLE		DATE	
NEXT USED ON		REFERENCE DRAWING		DATE	
CLASSIFICATION		NONE		DATE: 10-7-55	

UNCLASSIFIED

UNCLASSIFIED

NOZZLE
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

HW-39872
PAGE 58

NOTE
1. SEE PLAN VIEW FOR NOZZLE ORIENTATION.

SIZE	DESCRIPTION
18"	FILL CHUTE
8"	OFF-GAS
4"	CHEM. ADD
4"	REFLUX ACID
4"	STEAM IN
4"	FRESH ACID
2"	CONCENTRATE
3"	SAMPLER
4"	SPARE JET
6"	JET OUT
3"	WF & SG
3"	DIFFERENTIAL PRESSURE

NO.	DESCRIPTION	REV. NO.	DATE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

REVISIONS		REV. NO.	DATE
DWG. NO. SK-2-1935		REV. NO.	DATE
SCALE:	APPROVALS		
DESIGNED BY	CHECKED BY	DATE	DATE
ENGINEER	DATE	DATE	DATE
UNIT	UNIT	UNIT	UNIT
NO. 3200			
PROJECT A-00015			
U. S. ATOMIC ENERGY COMMISSION			
HANFORD ATOMIC PRODUCTS OPERATION			
GENERAL ELECTRIC			
CONTINUOUS DISSOLVER			
NEW SEPARATIONS			
PLANT STUDY			
DWG. NO. SK-2-1935		REV. NO.	DATE

UNCLASSIFIED

UNCLASSIFIED

LEGEND		
NOZZLE CODE LETTER	NOZZLE FUNCTION	SIZE
A	HAS (SCRUB)	2"
B	INTERFACE DIPTUBES	3"
C	INTERFACE "CRUD" JETOUT	3"
D	VENT	2"
E	STATIC PRESS.	2 1/2" WAY
F	LOWER HAI SCRUB	2"
G	UPPER HAI SCRUB	2"
H	HAF (FEED)	2"
J	PULSE LEG	4"
K	PULSE LEG	4"
L	HAX	2"
M	HAP	3"
N	HAW INWASTE (SPARE)	3"
P	HAW INWASTE	3"
Q	TRANSFER NOZZLE	4"
R	"	4"
S	"	4"
T	"	4"
U	TO IBS COLUMN	4"
V	HAI SCRUB	3"

REVISIONS		REV. NO.	DATE	BY	CHKD.
NO. SK-2-1956					
SCALE: AS SHOWN		APPROVALS			
DRAWING DATE: 11/13/55		BY	CHKD.	DATE	
CHECKED: DATE					
REV. NO. 11340					
PROJECT NO. A-00025					
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
PROCESS EQUIP. 1-A CONCATENATED COLUMN PACKAGE					
NEW SEPARATION PLANT STUDY					
DRAWING TITLE		NO. SK-2-1956			
REFERENCE DRAWING					
NEXT USED ON					
CLASSIFICATION		NONE			

UNCLASSIFIED

Technical drawing of a mechanical assembly, likely a pump or motor, showing a top view. The drawing includes dimensions and labels for various components.

Labels:

- 2A COLUMN
- 2A5 COLUMN
- 2AX COLUMN
- 4" SCH 40 PIPE

Dimensions:

- Overall width: 13' 4"
- Overall depth: 10' 10"
- Overall approx. (bottom): 16' 10"
- Horizontal spacing between columns: 2' 6", 2' 6", 2' 6", 2' 6"
- Vertical spacing: 5' 8", 9' 4", 5' 2"
- Bottom horizontal spacing: 5' 0", 5' 0"

Other features:

- Numbered callouts (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)
- 4" SCH 40 PIPE

$$\sin \theta = 1 - 0 = 1$$

$$5646 \text{ } 9'' = 1' - 6''$$

SCALE 1" = 1'-0"

ST-41.5 21-01

HW-39872
PAGE 60

NOZZLE IDENTIFICATION	
NOZZLE	FUNCTION
A	FEED FROM TX-201
B	FAULT GENERATOR CONNECTION
C	JET OUT TO 1-AE TIC
D	2-AE COL 1-A CONTROL PRESS
E	TO ACID STRIPPER
F	FROM ORGANIC FEED TANK
G	2-A SCUB
H	2-A3 (ALTERNATE SCUB)
J	2-A5 (ALTERNATE SCUB)
K	2-B COL PRESS
L	INTERFACIAL CONTROL
M	ESSE VENT
N	TO COL 1-B
P	2-B FEED
R	TO 2-AS COLUMN (VIA PUMP)
S	TO 2-B RECEIVER

PACKING HEIGHT
IN FEED TOWER
BEARING CLINGS

CONSTRUCTION.

CHECK PRINT

NOT FOR CONSTRUCTION

REVISIONS		REV	BY	DATE
SK-2-1958				
SCALE: AS NOTED		APPROVALS		
DESIGNED BY DATE 8-22-58		BY	FOR	DATE
CHECKED BY DATE				
DRAWN BY DATE				
PROJECT 11340				
PROJECT A-00025				
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC				
2-A, 2-A5 & 2-B COLUMN PACKAGE ASSEMBLY & DETAILS				
NEW SEPARATION PLANT STUDY NO. 1				
SK-2-1958				

UNCLASSIFIED

UNCLASSIFIED

UNCLASSIFIED

CLASSIFIED BY: 10/1/77 DATE: 10/1/77

SK-2-1978

NEW SEPARATIONS PLANT STUDY

PROCESS EQUIPMENT

1 B & 1 C COLUMN

PACKAGE

GENERAL ELECTRIC

HANFORD ATOMIC PRODUCTS OPERATION

U.S. ATOMIC ENERGY COMMISSION

4-00025

9284

SCALE: 1" = 1'-0"

SK-2-1978

REVISIONS

NO.	DESCRIPTION	DATE	BY	CHKD.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

REFERENCE DRAWINGS

NO.	DESCRIPTION	DATE	BY	CHKD.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

CHECK PRINT

NOT FOR CONSTRUCTION

LEGEND	
NOTE	SIZE
1	1" = 1'-0"
2	1" = 1'-0"
3	1" = 1'-0"
4	1" = 1'-0"
5	1" = 1'-0"
6	1" = 1'-0"
7	1" = 1'-0"
8	1" = 1'-0"
9	1" = 1'-0"
10	1" = 1'-0"
11	1" = 1'-0"
12	1" = 1'-0"
13	1" = 1'-0"
14	1" = 1'-0"
15	1" = 1'-0"
16	1" = 1'-0"
17	1" = 1'-0"
18	1" = 1'-0"
19	1" = 1'-0"
20	1" = 1'-0"
21	1" = 1'-0"
22	1" = 1'-0"
23	1" = 1'-0"
24	1" = 1'-0"
25	1" = 1'-0"
26	1" = 1'-0"
27	1" = 1'-0"
28	1" = 1'-0"
29	1" = 1'-0"
30	1" = 1'-0"
31	1" = 1'-0"
32	1" = 1'-0"
33	1" = 1'-0"
34	1" = 1'-0"
35	1" = 1'-0"
36	1" = 1'-0"
37	1" = 1'-0"
38	1" = 1'-0"
39	1" = 1'-0"
40	1" = 1'-0"
41	1" = 1'-0"
42	1" = 1'-0"
43	1" = 1'-0"
44	1" = 1'-0"
45	1" = 1'-0"
46	1" = 1'-0"
47	1" = 1'-0"
48	1" = 1'-0"
49	1" = 1'-0"
50	1" = 1'-0"
51	1" = 1'-0"
52	1" = 1'-0"
53	1" = 1'-0"
54	1" = 1'-0"
55	1" = 1'-0"
56	1" = 1'-0"
57	1" = 1'-0"
58	1" = 1'-0"
59	1" = 1'-0"
60	1" = 1'-0"
61	1" = 1'-0"
62	1" = 1'-0"
63	1" = 1'-0"
64	1" = 1'-0"
65	1" = 1'-0"
66	1" = 1'-0"
67	1" = 1'-0"
68	1" = 1'-0"
69	1" = 1'-0"
70	1" = 1'-0"
71	1" = 1'-0"
72	1" = 1'-0"
73	1" = 1'-0"
74	1" = 1'-0"
75	1" = 1'-0"
76	1" = 1'-0"
77	1" = 1'-0"
78	1" = 1'-0"
79	1" = 1'-0"
80	1" = 1'-0"
81	1" = 1'-0"
82	1" = 1'-0"
83	1" = 1'-0"
84	1" = 1'-0"
85	1" = 1'-0"
86	1" = 1'-0"
87	1" = 1'-0"
88	1" = 1'-0"
89	1" = 1'-0"
90	1" = 1'-0"
91	1" = 1'-0"
92	1" = 1'-0"
93	1" = 1'-0"
94	1" = 1'-0"
95	1" = 1'-0"
96	1" = 1'-0"
97	1" = 1'-0"
98	1" = 1'-0"
99	1" = 1'-0"
100	1" = 1'-0"

UNCLASSIFIED

NOZZLES
AS

HW-39872
PAGE 62

GENERAL NOTES

1. MATERIAL SHALL BE 304-L STAINLESS STEEL AS PER SPEC (UNLESS NOTED)
NWS-8061-S SST PLATE, SHEET & STRIP
NWS-8062-S SST BAR & STRUCTURAL SHAPES
NWS-8063-S SST CASTING
NWS-8064-S SST PIPE
2. FABRICATION SHALL BE AS PER SPEC. NWS-5796.
3. ALL PIPE TO BE SCH. 40.
4. LOCATION OF ALL NOZZLES EXCEPT 10" REMOTE NOZZLES & REGENERATION NOZZLES IN PLAN & ELEVATION TO BE DETERMINED IN DETAIL DESIGN.
5. REGENERATION NOZZLES SHALL BE LOCATED IN PLAN AS CLOSE TO CENTER OF REACTOR AS IS POSSIBLE.
6. REMOTE 10" GAS OUTLET FLANGE TO CONFORM TO LOCATION OF PRESENT OUTLET FLANGE IN PLAN & ELEVATION.
7. REMOTE 10" GAS INLET FLANGE TO CONFORM TO LOCATION OF PRESENT INLET FLANGE IN PLAN. PACKING SHALL BE $\frac{1}{2}$ " INTALOX SADDLES COATED WITH SILVER NITRATE.
8. 2" SCH. 40 PIPE COIL SHALL BE CLIPPED TO SMALL & COVERED WITH "20 GA. (1.5"/SQ.FT.) STAINLESS STEEL SHEET.
9. ENTIRE VESSEL IS TO HAVE 8" THICK FIBERGLAS BLANKETING. COVER FIBERGLAS WITH "20 GA. (1.5"/SQ.FT.) STAINLESS STEEL SHEATH.
10. INTERNAL WORKING PRESSURE RANGES FROM -100" WATER TO ATMOSPHERIC PRESSURE
11. MAXIMUM OPERATING TEMPERATURE IS 450°F.

8'-0" PACKING HEIGHT

8'-0" PACKING HEIGHT

PS. GAS
127
OTE FLANGE

SCOPE

CHECK PRINT

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	REV.	DATE
REVISIONS			
DWG. NO.	SK-2-2635		
SCALE	NONE		
APPROVALS			
DESIGNED BY	J. W. C. / 9-20-53	BY	J. W. C. / 9-20-53
CHECKED BY		DATE	
DATE			
NO. 11362			
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC			
PUREX SEPARATIONS PLANT EQUIPMENT SKETCH DUAL SILVER REACTOR			
BLDG. NO.	208A	DWG. NO.	SK-2-2635

UNCLASSIFIED

CLASSIFIED

VIEW - "A" - "A"

MOST
P-0

G.E.A.R. LIMIT SWITCH
G.L.C.P. 210133A1A ~ EP

SPACKSET
7.9 INIT 1331~PB

CHAIN

SELSYN GENERATOR
G.L.C.P. 210133A1A ~ EP

COUPLING

GEAR MOTOR

GEAR BOX
IS TO 1 RATIO

FLEXIBLE COUPLING

SPACKSET
7.9 INIT 1331~PB

- 1- IRADIATED MATERIAL IS RETAINED IN THE STORAGE BUCKETS IN THE STORAGE BAYN OF PARALLEL MONORAIL STORAGE TRACKS UNTIL REQUIRED TO CHANGE THE PROCESS VESSEL.
- 2- THE MATERIAL IS THEN TRANSFERED TO THE LIFT SECTION OF THE MONORAIL SYSTEM BY THE INTERLOCKING TRANSFER SAIDE.
- 3- THE STORAGE BUCKET IS RAISED TO THE UPPER LIMITS OF THE LIFT SECTION BY TWO HYDRAULIC CYLINDERS AND THE CARRIER IS MOVED FORWARD AND LOCKED INTO POSITION AUTOMATICALLY.
- 4- THE BUCKET YOKS IS DISENGAGED FROM THE STORAGE BUCKET BY LOWERING THE LIFT SECTION APPROXIMATELY ONE INCH.
- 5- THE STORAGE BUCKET IS ROTATED 120° BY THE BUCKET DUMPER TO DEPOSIT THE MATERIAL ON THE WHITE PORTION OF THE DUMPER AND THE HYDROMOTOR VIBRATION STARTED TO VIBRATE THE MATERIAL INTO THE SKIP BUCKET.
- 6- THE MOTOR OPERATED GATE VALVE AT THE LOWER END OF THE FILLER PIPE IS OPENED.
- 7- THE SKIP HOIST RAISES THE SKIP BUCKET TO DUMPING POSITION AND THE MATERIAL FALLS INTO THE PROCESS VESSEL.
- 8- WHILE THE SKIP HOIST IS RAISING THE SKIP BUCKET TO DUMPING POSITION THE BUCKET DUMPER ROTATES THE STORAGE BUCKET TO UPRIGHT, THE BUCKET YOKS IS ENAGED AND THE STORAGE BUCKET IS RETURNED TO THE STORAGE BAYN.
- 9- THE SKIP BUCKET IN RAISING & LOWERING MASSES THE COLLIMATED RADIATION DETECTOR, WHICH INDICATES THE RADIATION LEVEL OF THE CONTAINED IN THE BUCKET PRIOR TO DUMPING AND INDICATES WHETHER OR NOT COMPLETE FLIPPING HAS BEEN ACCOMPLISHED AFTER DUMPING.

HW-39872
PAGE 63

SECTION 'B' 'B'

EQUIPMENT NOTES.

1. STORAGE BUCKET:-
THE SAME AS PRESENTLY IN USE AT 100K.
2. BUCKET YOKES:-
ESSENTIALLY THE SAME AS THOSE PRESENTLY IN USE EXCEPT OF GREATER LENGTH.
3. STORAGE BASIN MONORAIL SYSTEM:-
SIMILAR TO THAT PRESENTLY IN USE.
4. HYDRAULIC LIFT SECTION:-
ESSENTIALLY THE SAME AS THE HYDRAULIC DUMP SECTION USED IN THE PRESENT TRANSFER AREA. WATER IS USED AS THE HYDRAULIC FLUID.
5. BUCKET DUMPER:-
REVERSING GEARMOTOR OPERATED WITH AN OVER-RIDING OR FRICTION CLUTCH MECHANISM TO ALLOW STALLING OF THE DUMPER AT BOTH LIMITS, HYDROMOTOR VIBRATING MECHANISM USING WATER AS THE HYDRAULIC FLUID WITH A VARIABLE SPEED CONTROL TO ALLOW SELECTIVE VIBRATION, CLUTCH MOTION TO BE SUPPORTED ON FOUR COIL SPRINGS, THE ENTIRE DUMPER ASSEMBLY IS TO BE LOADED AND POSITIONED BY AN OVER DOWLS AND THREADED STUD SET IN THE BOTTOM OF THE STORAGE BASIN. THE BUCKET DUMPER DRIVE MECHANISM IS TO BE INTERLOCKED WITH THE SKIP HOIST DRIVE MECHANISM SO THAT THE DUMPER CAN BE OPERATED ONLY WHEN THE SKIP BUCKET IS IN THE LOWER POSITION TO RECEIVE MATERIAL.
6. SKIP HOIST:-
THE SKIP HOIST TOWER IS TO BE CONSTRUCTED IN TWO PRINCIPAL SECTIONS TO ALLOW REMOVAL OF EITHER THE UPPER OR THE LOWER SECTION FROM THE BUILDING, WHEN THE UPPER AND LOWER SECTIONS ARE IN POSITION AND READY FOR USE THE ENTIRE ASSEMBLY SHALL BE AIR TIGHT, THE LOWER SECTION OF THE SKIP HOIST TOWER IS TO BE SUPPORTED AND POSITIONED BY TWO TAUNHORNIS AND TWO YOKES NEAR THE TOP AND ONE TAPEDED TRUB AND BUCKET AT THE BOTTOM. THE UPPER SECTION IS TO BE SUPPORTED AND POSITIONED BY TWO TAUNHORNIS AND YOKES NEAR THE TOP AND BY TWO DOWELS LOCATED ON THE TOP OF THE LOWER SECTION. THE HOIST DRIVE MECHANISM IS TO BE BY REVERSING GEARMOTOR THROUGH A SLIDING SLEEVE ASSEMBLY IN THE BARNEER WALL, THE ENTIRE DRIVE MECHANISM IS TO BE MOUNTED ON A VEE WAY BE TO ALLOW THE UNIT TO BE ATTRACTED EIGHT INCHES TO SEPARATE THE TWO WALLEES BY THE SLIDING COUPLING WHEN THE SLIDING COUPLING STARTS TO SEPARATE THE SPACING ACTUATED PANE AND RATCHET BRAKE ENGAGES HOLDING THE HOISTING DRAIN FROM UNWINDING, THE DRIVE UNIT SHALL HAVE A GEARED LIMIT SWITCH TO LIMIT THE TRAVEL OF THE SKIP BUCKET IN THE UPPER AND LOWER POSITION, A SELSYM GENERATOR IS TO BE INSTALLED TO TRANSMIT THE POSITION OF THE SKIP BUCKET TO TWO DIAL POSITION INDICATORS, ONE INDICATOR TO BE LOCATED IN THE MAIN CONTROL AND ONE ADJACENT TO HYDRAULIC LIFT SECTION. THE SKIP BUCKET IS TO BE OF SUCH CAPACITY AS TO CONTAIN TWICE THE VOLUME OF THE STORAGE BUCKET.

CHECK PRINT

2.1.1.1. CONSTRUCTION

NO.		DESCRIPTION	REV. OF	APPROVED	DATE
REVISIONS			DATE	BY	DATE
DATE	SK-2-1947			REVIEWED	DATE
SCALE:	1" = 1 FOOT		APPROVALS		
DESIGNED BY	H. S. HARRIS		BY	DATE	
CHECKED BY	DATE		DATE		
REVIEWED BY	DATE				
SCALE	1" = 1 FOOT				
DATE	7-1-66				
BY	A-00015				
DATE					
BY	7-1-66				
DATE					
BY	A-00015				
DATE					
<p align="center">U. S. ATOMIC ENERGY COMMISSION HANFORD MANUFACTURING OPERATIONS GENERAL ELECTRIC</p>					
<p align="center"><u>DISSOLVER</u> <u>CHARGING SYSTEM</u></p>					
<p align="center">SEPARATION PLANT DESIGN AND DEVELOPMENT</p>					
DATE	200		DATE		
BY	A-00015		DATE		
SK-2-1947					

DECLASSIFIED

CLASSIFIED BY 206 DATE 2/24/83

UNCLASSIFIED

•PLAN • VIEW•

•ELEVATION•

HW-39872
PAGE 64

SECTION A-A

CHECK PRINT

NOT FOR CONSTRUCTION

1st revision
8-24-65

REV. NO.	DATE	DESCRIPTION
1	8-24-65	1st revision

DESCRIPTION		REV. NO.	DATE	BY	CHKD.	DATE
REVISIONS						
DWG. NO. SK-2-1970						
SCALE: 1/8" = 1'00"		APPROVALS				
DRAWN: R. J. L. / 8-24-65		BY	CHKD.	DATE	DATE	
CHECKED: DATE						
DESIGNED: DATE						
MATERIAL: UNIT						
WEIGHT: 11,840						
PROJECT: QA 000008						
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC						
PROPOSED GILMONT UNIT SAMPLER						
SEPARATION PLANT DESIGN / DEVELOPMENT						
BLDG. NO. 200	DWG. NO. SK-2-1970	DATE 8-24-65				
AREA						

UNCLASSIFIED

UNCLASSIFIED

This technical drawing depicts a military installation, possibly a radar site, with a grid system. The grid coordinates are as follows:

- Vertical (North) coordinates: N 47500, N 46500, N 45500, N 44500
- Horizontal (West) coordinates: W 75500, W 74500, W 73500, W 72500

Key features and structures shown include:

- Buildings:** RADAR, CONTROL BUILDING, COMMUNICATIONS BUILDING, and a large building complex on the right side.
- Infrastructure:** A ROAD and a RAILROAD are indicated.
- Terrain and Landmarks:** A TILE FIELD is shown, along with various contour lines and elevation markers.
- Other Features:** A 'RADAR' building is specifically labeled, and a 'CONTROL BUILDING' is also identified.

The drawing includes numerous lines, circles, and text annotations, providing a detailed view of the site's layout and infrastructure.

UNCLASSIFIED

FIN. ROOF ELEV +62'-0"

UNCLASSIFIED

NEW SEPARATION PLANT	
ARCHITECTURAL	
GENERAL ELECTRIC	
U.S. ATOMIC ENERGY COMMISSION	
HANFORD ATOMIC PRODUCTS OPERATION	
AT OPERATING GALLERY LEVEL	
PROCESS ARRANGEMENT-PLAN	
SK-2-1990	
A-00025	
9284	
NOT FOR CONSTRUCTION	

5/11/45

CHECK PRINT

NOTE
1. ALL DIMENSIONS ARE IN FEET AND INCHES.
2. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE NOTED.
3. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE NOTED.
4. ALL DIMENSIONS ARE TO OUTLINE UNLESS OTHERWISE NOTED.
5. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE NOTED.
6. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE NOTED.
7. ALL DIMENSIONS ARE TO OUTLINE UNLESS OTHERWISE NOTED.
8. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE NOTED.
9. ALL DIMENSIONS ARE TO FACE UNLESS OTHERWISE NOTED.
10. ALL DIMENSIONS ARE TO OUTLINE UNLESS OTHERWISE NOTED.

UNCLASSIFIED

NO.		DESCRIPTION	DATE OF ISSUE	DATE OF REV.	FILE NO.
REVISONS					
DWG. NO.		SK-2-1993		—	—
SCALE		1:10		APPROVALS	
DESIGNED BY		DATE 12-17-52		BY	DATE
CHECKED BY		DATE			
DRAWN BY		DATE			
INSTR. NO.		BY / FILE NO.		DATE	
NO.		9284			
PROJECT NO.		A 00025			
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC					
ARCHITECTURAL AND PROCESS ARRANGEMENT SECTIONS					
NEW SEPARATION PLANT					
NO.		SK-2-1993		NO.	
AREA					

UNCLASSIFIED

574 11/24/65

NONE

CLASSIFIED BY 1040 DATE 1/8/82

CLASSIFIED

TO PU SAMPLER
TO COL. 1 BK
TO VESSEL VENT
TO DEHUMIDIFIER
TO 1 AF TANK
FROM 2 AF TK
COND. OUT
COND. OUT
TO SAMPLER DRUM
WATER OUT
WATER OUT
WATER OUT
FROM 1 COL. SP.
TO CRIB
CONDENSATE
TO UNH SAMPLER
VESSEL VENT
FROM 1 COL. CONK. TO UNH SAMPLER

MIKE
TEMP
W/F & SPG
ELECT. PUMP
2 BA
INTERFACE
COL. PRESS
2 A SCRUB
ORGANIC FEED
INTERFACE
STEAM TO JET
ELEC. POWER TO PG
LUBE
MIKE
ELECT. PUMP
MIKE
AIR TO P.G.
STEAM IN
STEAM TO JET
INST
WATER IN
INST
INST
STEAM IN
STEAM IN
INST
W/F
WATER IN
WATER IN
WATER IN
TEMP
INST
TEMP
SAMPLE
INST W/F & SPG
ELECT. PUMP
INST TEMP & MIKE
SAMPLE
ELECT. ACTUATOR
STEAM IN

REMOTE CONTACT MAINTENANCE

WALL & FINAL DESIGN

REMOTE MAINTENANCE

HW-39872
PAGE 69

CHECK PRINT
NOT FOR CONSTRUCTION

REVISIONS	
NO.	DESCRIPTION
1	SK-2-1997
SCALE 1/4" = 1' 0"	
DATE 10-10-53	
BY 9284	
A 00025	
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC	
PROCESS EQUIPMENT ARRANGEMENT	
NEW SEPARATION PLANT STUDY	
NO. 200 AREA SK-2-1997	

UNCLASSIFIED

UNCLASSIFIED

HW-39872

PAGE 70

SECTION "E-E"

CHECK PRINT

NOT FOR CONSTRUCTION

REVISIONS		DATE	BY	CHK	APP
NO.	DESCRIPTION				
1	SK-2-1998				
SCALE: 1" = 1'-0"		APPROVALS			
DESIGNED	DATE	BY	CHK	APP	
CHECKED	DATE	BY	CHK	APP	
U. S. ATOMIC ENERGY COMMISSION					
HANFORD ATOMIC PRODUCTS OPERATION					
GENERAL ELECTRIC					
ARCHITECTURAL					
PROCESS ARRANGEMENT					
PLANS AT -4'-0" & -16'-0"					
NEW SEPARATIONS PLANT					
200					
SK-2-1998					

UNCLASSIFIED

SK-2-1998	PROCESS EQUIPMENT ARRGT.
SK-2-1998	ARCH / PROCESS SECTIONS
SK-2-1998	ARCH / PROCESS AREA PLAN & OVERALL
SK-2-1998	PROCESS TITLE
REFERENCE DRAWING	
NEXT LIST ON	
NONE	
CLASSIFICATION	

CLASSIFIED BY: 2000 DATE: 11/14/55

UNCLASSIFIED

DISSOLVER
FEED STG. TK.

ACID HOLD TK

FEED & ACID STORAGE CELL

CHECK PRINT

NOT FOR CONSTRUCTION

No.		DESCRIPTION	REV. BY	APP'D BY	FOR	DATE
		REVISIONS	DATE			
DWG. NO.	SK-2-2002					
SCALE: $\frac{1}{4}'' = 1'-0''$	APPROVALS					
DRAWN <i>20 Feb</i> DATE <i>11-10-53</i>	BY		FOR		APPR.	
CHECKED DATE						
REVIEWED DATE						
DES. ENG. RT. JASKE UNIT <i>EXPR. DEC</i>						
INSTR. NO.	9284					
PROJECT NO.	A-00025					
U. S. ATOMIC ENERGY COMMISSION HANFORD ATOMIC PRODUCTS OPERATION GENERAL ELECTRIC						
OUTSIDE PROCESS						
FACILITIES						
NEW SEPARATION PLANT						
BLDG. 200 NO. AREA	DWG. NO. SK-2-2002					

UNCLASSIFIED

CLASSIFIED BY SP-6/BJ DATE 11/10/55

END

DATE

FILMED

4/1/94