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PROCESS DESIGN SECTION STATUS REPORT FOR FEBRUARY 1962

By

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ABSTRACT

This report summarizes the accomplishments of the Process Design Section of the Chemical Technology Division during the month of February 1962. The five major projects discussed are Transuranium, Volatility, Power Reactor Fuel Processing, Waste Studies, and Thorium Fuel Cycle Development. A number of smaller programs are reviewed under the section on Miscellaneous Projects, and project engineering accomplishments and status are reviewed in the last section.

1.0 TRANSURANIUM PROGRAM
(W. E. Unger)

1.1 Transuranium Facility, Bldg. 7920 (B. F. Bottenfield, E. J. Breeding, G. B. Berry)

Two reviews of the Transuranium Processing Facility conceptual drawings, outline specifications, and report narrative were made in Philadelphia during February. The comments which resulted therefrom are being resolved by Catalytic Construction Company for the final issue of the report, which is anticipated by mid-March.

1.2 Mechanical Equipment Design (F. L. Hannon)

Intercell Conveyor. Modifications have been completed to the control system to combine the conveyor and port closure controls in a single operating station.

Equipment Transfer System. Detailing of the top assembly of the transfer case is approximately 15% complete. The work to date consists of three subassembly drawings of drive components mounted atop the case. Investigation of alternate locking schemes for cubicle-transfer case door assemblies is continuing. Five concepts have been prepared by E & M Division and reviewed by Chemical Technology Division.

Cell Cubicle. A new concept of cubicle lighting is being prepared for review and comments. Design of the top of the cubicle is continuing with emphasis on the disconnect panel arrangement and installation. Design of the cubicle floor pan is also continuing. Effort is being concentrated on cubicle No. 7 because available information indicates that process equipment arrangement and support problems in this cubicle are more acute.

Carrier Charging System. The operating philosophy for this area has been modified so that the carrier does not move within the confines of the transfer cubicle shielding; instead, a container is transferred from the carrier to a position beneath the charging port. This is shown on drawing D-43972, "Transfer Area Carrier Charging Concept." Drawing D-43973, "Transfer Area Cubicle A-E Portions" was prepared to clarify ORNL and Architect-Engineer design responsibilities. Preliminary layouts on the carrier, container, port closure and handling fixtures were begun.

1.3 Transuranium Equipment Design (W. D. Burch, O. O. Yarbro)

Flowsheets. The following equipment flowsheets for Cells 4, 6, and 7 have been revised and issued:

E-52057 TRU Equipment Flowsheet, Cell No. 4
E-52059 TRU Equipment Flowsheet, Cell No. 6
E-52060 TRU Equipment Flowsheet, Cell No. 7

Further revisions to these flowsheets will be made as required by future modifications in the chemical flowsheets. Work on engineering flowsheets is currently in progress with an estimated two months required for completion.

Equipment Design. Design of service lines to the cubicle and pit areas is continuing; the following drawings of service plugs and associated lines were completed and issued as check prints:

E-52160 Tank Pit Service Plug
E-52176 Service Plug to Cubicle Steel and Concrete Details
E-52177 Layout of Lines Through Service Plug to Cubicle

Drawings of the cubicle to pit interconnecting line bundle are approximately 75% complete, and work is progressing on service lines to the cubicle equipment rack.

1.4 Transuranium Flowsheet Studies (J. E. Bigelow)

Studies on the Transuranium second cycle solvent extraction system using 2-ethylhexyl phenyl phosphonic acid (phenonic acid) were made on the ORACLE. In the first column, berkelium and heavier elements are separated from americium and curium. When an acid scrub is used with a feed concentration of 0.5 M HCl, an increase in contactor performance is achieved. Calculated separations for a 1.25 M HCl scrub in the 16-stage, 70% efficient mixer-settler are 99.99% Bk recovery and a 1.9×10^7 Cm D.F. At 1.44 M HCl scrub the Bk recovery is 99.9% with a curium D.F. of 6.9×10^8. Flow ratios assumed were feed:scrub:extractant::1:1:2.

Calculations were then made on berkelium-californium separation in a second contactor. The results showed that 95% berkelium recovery with a californium D.F. of 100 could be obtained in 22 stages of 70% efficiency. This performance might have been improved by using back wash of reduced acidity in the upper part of the contactor, but the performance is so poor that partitioning of Bk-Cf in the 2-ethylhexyl phenyl phosphonic acid system should probably be dropped from consideration.

Neodymium and europium were nominated as stand-ins for curium and berkelium, respectively, to study the performance of pulse columns in that separation. Predictions were made for Unit Operations on the distribution of these two elements under various conditions of 2-ethylhexyl phenyl phosphonic acid extraction and scrubbing. The extraction behavior of these two rare earths match the corresponding actinides so well that great confidence can be placed in the design of a column utilizing results derived from them, except for radiation effects.

1.5 Solvent Extraction Facility, Bldg. 4507 (F. L. Peishel, W. R. Whitson)

Design of the sample transfer cubicle, large equipment removal cubicle, and mixer-settler motor drives, all to be located in the penthouse of Bldg. 4507, were started in the E & M Division. Work is proceeding on the mixer-settler design, and check prints will be issued in March.

Work orders amounting to $11,650 were written to E & M for the design of the makeup area and operating area equipment and piping. Work orders in the amount of $14,750 were written to the Instrumentation and Controls Division to cover the cost of purchasing and fabricating the instrumentation required for the Cell 4 Transuranium Development work. Purchase of the extraction feed pump and pumps for the makeup area was initiated.

A Critical Path Schedule is in preparation to establish logical design and fabrication procedures and to indicate on a current basis the actual over-all status of the program. It is hoped that this scheduling will also aid in shortening the time required to achieve cold operation in Cell 4 by indicating where bottlenecks exist, or are likely to occur, and allow remedial steps to be taken immediately.

2.0 VOLATILITY PROGRAM
(R. P. Milford)

2.1 Assistance to Unit Operations

A quotation for two 1/4-in. x 48-in. x 84- to 96-in. plates of Alloy 79-4 was received from Special Metals, Inc., New Hartford, New York. Their price was $7.80/lb ($4,095 for an estimated 525 lbs) plus an additional $750 for spectrographic standards. They will only agree to supply this material on the two-plate basis as opposed to the one-plate ordered, with only standard ultrasonic and visual inspection, without a mechanical properties guarantee and with air annealing as opposed to the hydrogen anneal requested. Despite the exceptions and the high unit price, this proposal seems to be more desirable than purchasing the 6500 lb minimum order requirement from Carpenter Steel at $2.46/lb. Delivery from Special Metals would be seven to eight weeks after receipt of order.

2.2 Assistance from BMI

A letter report, BMI-X-192, "Corrosion Investigation of HyMu 80, INOR-8 and L-nickel Under Fluorination Conditions and Under Air Oxidation Conditions" (February 26, 1962), was received during the period. The principal results from the memo were reported last month.

The first half of an experiment to study the corrosion of several experimental alloys under hydrofluorination conditions was also completed during the period. A 37.0-50.5-1.25 mole % LiF-NaF-BeF_2 salt was used at 650°C without Zircaloy dissolution to provide accelerated test conditions. The results of the tests and compositions of experimental alloys are shown in Table 1.

Metallographic Examinations. The Group 3 fluorinator corrosion test rods have been sectioned, and micrometer measurements have been completed on the Group 4 rods. Results from these examinations will be reported later. Sixteen pieces of 3/8-in. NPS Schedule 40 INOR-8 pipe were shipped to BMI during the period for metallographic examinations. These were originally an instrument line and a thermocouple well which showed excessive corrosion at their lower ends; the lines were removed from the VPP hydrofluorinator prior to the start of hot runs.

Table 1. Tentative Accelerated Corrosion Test Results of Experimental Alloys During Hydrofluorination

Conditions:
Salt - 37.0-50.5-12.5 mole % LiF-NaF-BeF_2
Temperature - 650°C; Run Time - 93 hr[a]
No Zircaloy dissolution

Metal Description		Penetration Rates, mils/month (based on weight loss) Vapor	Interface	Liquid
INOR-8		7	23[b]	5
HyMu 80		6	4	10
Alloy No.	Composition, wt %			
1	90 Ni, 10 Mo	4	24	5
2	85 Ni, 10 Mo, 5 Fe	6	17	11
8	71 Ni, 4 Mo, 3 Al, 18 Co, 3 Ti	6	8	12
15	86 Ni, 14 Al	Not weighed because of severe		
25	84 Ni, 13 Al, 3 Si	swelling and penetration.		

[a] 93 hr run instead of 100 hr planned because of penetration of HF sparge tube and thermocouple well.

[b] All interface specimens showed preferential attack (necking-down) at interface.

3.0 POWER REACTOR FUEL PROCESSING
(E. L. Nicholson)

3.1 Darex Pilot Plant Design (E. L. Nicholson)

Liaison with Chemical Development on the Darex solids problem and on setting up corrosion tests to evaluate the proposed Darex dissolvent for highly enriched fuel, 5 M HNO_3, 2 M HCl, 0.01 M HBF_4, 0.04 M $Al(NO_3)_3$, 0.005 M NaB_4O_7, was continued.

Heat balances were prepared for the various ICPP Darex flowsheets as an aid in checking the continuous flowsheets and to ensure ample heat transfer areas to handle batch Darex processes.

The system response study by Unit Operations is continuing. Additional liquid-vapor equilibrium data which were needed for the feed evaporation step were obtained by the MIT Practice School group. These data made possible, for the first time, a rational equilibrium diagram to be constructed for the nitric acid in the chloride stripper column. It appears from this preliminary equilibrium diagram analysis that an integral reboiler chloride stripper column is feasible which would permit elimination of the external feed evaporator. Preliminary sketches were prepared of a possible control system hookup for this concept.

3.2 Soluble Neutron Poisons for Criticality Control (J. P. Nichols)

A study to provide a basis for the use of soluble neutron poisons as the primary means of criticality control in a shielded radiochemical facility was begun. The study is to be concerned with the required concentrations of soluble poisons, instrumentative and procedural safeguards for assuring soluble poison content, stability of poisons in solution, decontamination of poisons from fissile materials, the economics of use of soluble poisons, and the effects of accidental water moderated nuclear excursions in a shielded radiochemical facility. The MODRIC neutron diffusion code is being used to calculate the concentrations of B, Cd, Gd, or Sm required to effectively poison solutions of U^{235}, U^{233}, Pu^{239}, U^{235}-U^{238}, and U^{235}-Th^{232} in light water.

3.3 Mechanical Processing of Fuels (W. F. Schaffer, Jr.)

Chop and Leach Program. The major effort in February was the installation of the conveyor and leacher in Cell 4 of Bldg. 4501; piping and electrical are also in progress. New permanent gags were made to replace the test gags used up to this time. A new larger control console was built and installed to replace the original unit which was made obsolete by the new control circuits. Other minor modifications were made to the shear.

Work was started on a series of flowsheets for the chop-leach process. The first flowsheet will be prepared for the Consolidated Edison fuel; flowsheets for Commonwealth Edison, Yankee Atomic, and PRDC fuel will be made later.

3.4 Nuclear Safety Review Article (E. L. Nicholson)

An article entitled "Safety in Fuel Canal Storage" was prepared for Nuclear Safety magazine.

4.0 WASTE STUDIES
(J. O. Blomeke)

4.1 Additions to Plant Waste System (F. N. Browder, F. E. Harrington)

The Engineering and Mechanical Division received directive CL-255 from the AEC authorizing complete design and construction of the Melton Valley low- and intermediate-level waste collection systems, the intermediate-level evaporator and the waste storage tanks.

Several preliminary layout and piping drawings of the Melton Valley intermediate-level waste transfer station were reviewed in detail, and agreement was reached among members of the design committee on the several changes required. Structural and heating and ventilation drawings for the intermediate-level waste evaporator and the high-level waste storage tanks are being prepared by Paducah. Six unnumbered preliminary drawings from Paducah were reviewed but no comments on them were made as yet. Paducah is being urged to send preliminary drawings to ORNL for review in early stages of design to expedite the design job.

A letter dated February 8, 1962, "Hazard Evaluation for Waste Evaporator Facility," was issued to J. A. Murray, Project Engineer. This letter is intended to serve as a guide to T. M. Sims of the Operations Division, who was assigned to draft the Hazard Evaluation Report.

4.2 Pot Calcination Hot Cell Facility (H. O. Weeren)

Drawings of the evaporator pot (E-45972) and the line heater (C-46048) have been completed and approved for construction. The equipment layout and process flowsheets are nearing completion.

Present plans call for the process equipment to be assembled on a rack in the cell mockup on the third floor of Bldg. 4505 during the month of April. The equipment will be cold tested there and modified if necessary. When Cell 1 in Bldg. 4507 becomes available, the equipment in the mockup will be disassembled into about three subassemblies and reassembled in the processing cell. This is necessary to get the equipment into Cell 1, since the total unit will not go through the cell door.

A solution of fission products obtained from other operations in Bldg. 4507 will be available to "spike" synthetic waste solutions. This solution will be stored in two-liter cans and charged to the feed level tank (T-56) as required. The proposed procedure is as follows: The stopper will be removed from the two-liter can, a stopper with a dip leg will be screwed on, and the stopper will be connected to the appropriate lines. Sufficient air pressure will be applied to force the desired quantity of solution from the can to T-56. The amount transferred will be determined by the rise in level in T-56.

4.3 Pot Calcination Pilot Plant (J. M. Holmes, E. J. Frederick)

Agreement was reached between ORNL and the Idaho Chemical Processing Plant on the unresolved questions pertaining to the Pot Calcination Pilot Plant flowsheet during a meeting in Idaho on February 6 and 7. The flowsheet changes were made at Idaho and an approved flowsheet was issued. It was estimated that these changes would delay the completion of equipment design about 10 weeks. Major changes agreed upon are as follows:

1. Non-absorbed gases from the calciner condenser will be introduced below the evaporator liquid level to permit contact with the evaporator liquid for ruthenium scrubbing. However, a valved vent line to the evaporator vapor head will also be installed for use in the event of vapor locking. Provision will be made to feed the condensate directly back to the evaporator, bypassing the condensate tank.

2. The evaporator head was enlarged to provide for a 300-gal batch of feed to permit operation using the batch flowsheet.

3. A liquid seal pot will be installed on the calciner emergency off-gas line.

4. Vertical condensers will be used. A two-stage air lift will be used to feed condensate from the fractionator condenser to a head tank from which it will be metered to the evaporator.

5. A steam bleed will be used to provide condensate in the calciner condenser for absorption of the oxides of nitrogen during periods of low vapor flow.

6. The ORNL continuous evaporator instrumentation was accepted but it was agreed that other control systems may be tested during cold startup.

7. A small sampling condenser will be installed on the evaporator vapor stream to provide condensate for the conductivity.

8. Provision will be made for feeding glass making additives to the waste in the concentrated feed tank. Oxygen will also be added to the nitric oxide gas formed by the reaction between the waste and additives in order to convert it to absorbable NO_2 gas. Absorption will occur in the pot calciner condenser.

9. It was agreed that type 304L stainless steel will be used for pot fabrication.

The Purex Waste Calcination Process material balance flowsheets have been completed in preliminary form and are being rechecked prior to formal issue.

The joining of the two dissimilar metals, stainless steel and titanium, by welding has been ruled out because of corrosion potential for use in the ICPP Pilot Plant. As a possible substitute, a mechanical joint, prepared by tandem extrusion at Nuclear Metals, Concord, Massachusetts, is being investigated. Nuclear Metals has exposed such a test joint to Thorex dissolver solution for approximately 160 hrs with no apparent attack. ICPP is currently reviewing data on the joint and, if proved satisfactory, will negotiate for the preparation of a number of joints which will probably be corrosion-tested by ORNL.

Preliminary information has been obtained from the Unit Operations Section for the design of a pump test loop for the calcination process. It is expected that actual design will begin some time in March.

4.4 Liaison with Health Physics Division (F. E. Harrington)

An engineering assistance liaison with the Health Physics Division was established to provide engineering design and process and economic feasibility data on several Health Physics waste disposal programs. Under this program, F. E. Harrington, and later H. O. Weeren, will work directly with E. G. Struxness of Health Physics. Processes to be considered first are waste disposal by rock strata hydrofracturing and by storage in salt strata.

5.0 THORIUM FUEL CYCLE STUDIES
(A. R. Irvine)

5.1 Thorium Fuel Cycle Development Facility (A. R. Irvine)

Design criteria for the proposed facility were completed and issued as ORNL-TM-149. Giffels and Rossetti, Inc., of Detroit, Michigan, were selected as the Architect-Engineer for the conceptual and subsequent designs. A construction project data sheet was prepared for the increased scope of the facility.

5.2 Th-U^{233} Fuel Rod Facility (B. B. Klima, E. M. Shank, F. Sneider)

The design of the BNL-Kilorod Facility to be installed in Cell 4 of Bldg. 3019 is proceeding at an accelerated pace. The name of the facility was officially changed from the BNL-Kilorod Facility to the Thorium-Uranium^{233} Fuel Rod Facility, Bldg 3019, since the facility will probably be used for other programs as well.

Design was originally scheduled to be finished February 15; however, present estimates indicate that design completion will be delayed until the end of March. Most of the drawings for the process equipment are nearing final approval. The drawings for the uranium tank, evaporator tray dumper, and crucible dumper have been released by the design section of E & M for final review and approval.

The design of the vessel off-gas system filter is essentially complete, with the drawing of the attendant piping and instrumentation already released for fabrication.

It was determined that a 3-in. off-gas line passing through Cell 4 would have to be removed, since it interfered with the equipment inside the third floor cubicle. The design of an alternate routing for this line to permit its removal from the cell has been made and released for fabrication.

Safety reviews for the program were held in February.

Negotiations were carried out with the low bidders for the calciner to ensure that an adequate adaptation of the standard unit can be made before the order is placed. These negotiations were satisfactory and the order is now ready to be placed.

6.0 MISCELLANEOUS PROJECTS

6.1 Assistance to Reactor Division

Processing studies and cost estimates of conceptual facilities for processing the fuel from the AHBR and MSGR conceptual reactors were continued under the assistance program with the Reactor Division.

AHBR Study (F. E. Harrington). Three of the building drawings for this study, estimate, and report have been revised and submitted to the drafting room. These drawing revisions expand the required building to provide for remote crane maintenance areas and to increase the area available for services and utilities.

MSCR Study (W. L. Carter, R. P. Milford). By way of review, the Process Design Section has been requested to provide a preliminary design and cost estimate for two plants to process irradiated fused salt fuel from the conceptual Molten Salt Converter Reactor (MSCR), a 2500 Mwt (1000 Mwe) system. The reactor would contain 1780 cu ft of salt to be processed in one case at a 12-cu-ft/day rate and in the other case at a rate of 1.2-cu-ft/day. Thus far, process flowsheets, building layout plans and sections, and equipment flowsheets for both plants have been prepared and, except for the process flowsheets, which are complete, the drawings are in the check print stage.

Probably the most difficult problem associated with the design of these alternative plants is that of removing fission-product heat during the required fuel cooling storage period. Table 2 is a summary of the heat evolution rates for both plants during pre-fluorination, Pa^{233} decay, and interim waste storage. Originally, it was planned to use a design similar to that postulated for the MSRE drain-and-fill tank to remove heat from the salt during the pre-fluorination and Pa^{233} decay storage periods. This system involves the use of triple-walled bayonets submerged in the salt. Water is introduced into the center of each bayonet, is vaporized, and is ejected into a steam dome through the center annulus. An air gap is provided in the outer annulus to control thermal stresses. Cost estimates made by the Y-12 Shops for fabrication of the MSRE vessel were based on 200 man-hours/bayonet. Thirty-two such bayonets are required in the MSRE tank and 290 would be required in the worst case in the MSCR Chemical Plant (12-cu-ft/day processing rate). Because of the extremely large number of bayonets which would be required for the pre-fluorination and Pa^{233} decay storage vessels, the

Table 2. Average Total Heat Release

	Salt Processing Rate			
	1.2 ft^3/day		12 ft^3/day	
Storage Type	MW	Days Cooled*	MW	Days Cooled*
Pre-fluorination	0.05	6	1.5	25
Pa^{233} Decay	0.38	132	3.8	175
Interim Waste	0.98	1006	10.9	1020
Total	1.41	1144	16.2	1220

* Days in each type of storage.

over-all cost of storage vessels based on this design, even with the labor cost of bayonets reduced to 125 man-hours/bayonet, still appeared excessive.

The possibility of recovering the heat generated during storage has also been considered. As indicated in Table 2, the fission-product heat in the 12-cu-ft/day plant represents approximately 0.64% of the thermal output of the reactor. Although 16 megawatts appears at first glance to be an excessive amount of heat to waste, a 12-cu-ft/day plant will probably never be used except in conjunction with several large-scale power plants, and consequently would involve too small a fraction of the over-all heat output to consider in this design.

Except the first one, which receives 10-min-cooled fuel, all of the pre-fluorination storage tanks and the Pa^{233} storage tanks will be located in water-jacketed thimbles. Heat would be transferred by radiation from each storage tank to the thimble. The waste storage tanks would be located within thimbles submerged in a canal for combined shielding and heat removal. Again heat is removed by radiation from the tanks to the thimble. Because of the high heat evolution rate in the 10-min-cooled pre-fluorination fuel storage tank, a more complicated heat removal method will be required. Presently, the MSRE water-cooled, submerged bayonet design is being compared with the dual NaK-cooled ART dump tank.

6.2 HRLEL Hazards Evaluation (J. P. Nichols)

Assistance is being given to the Metals and Ceramics Division in the preparation of a Hazards Evaluation Report for the High Radiation Level Examination Laboratory.

The quantities of radioactive and hazardous materials to be handled in this facility and the properties of the HRLEL ventilation systems have been obtained and summarized. The HRLEL shielding has been evaluated using the PHOEBE code for determination of fission product sources, SDC for determination of gamma attenuation and RENUPAK for determination of neutron attenuation. An ORACLE program has been written for determination of transient pressures and temperatures, due to a fire, which will exist in a cell.

6.3 HRLAL Design Assistance (W. R. Winsbro)

The bid opening date for the prime construction contract portion of HRLAL construction is still scheduled for March 1, 1962. An Addendum No. 2, dated February 21, 1962, to the construction contract drawings and specifications was prepared and issued during the period of this report. As was the case for Addendum No. 1, the primary purpose of Addendum No. 2 was to answer and clarify pertinent inquiries received from vendors and contractors who are in the process of submitting and assembling bids.

6.4 CANE Project (J. W. Landry)

Additional preliminary data concerning the Project Gnome detonation zone have been obtained from the heat recovery experiment. Preliminary estimates indicate temperatures of 700°C exist in some parts of the zone. However, the cavity had cooled too long to allow meaningful heat recovery work by the time drilling was completed. During attempts to drill into the cavity from above, about 115,000 gal of water partly saturated with salt and 25,000 gal of fresh water were injected into the hole. This water was heated to boiling, but pressures were too low for the planned heat recovery experiment. Air was subsequently pumped in to generate a pressure of 40 psi. This permitted tests to be conducted on the corrosion of equipment for conducting steam to the surface and the functioning of the equipment to decontaminate gases from the cavity. The 40 psi pressure added was considerably below the extimated 200 lbs needed for power recovery. Measurements made in the tunnel showed that the pressure pumped into the cavity leaked into the tunnel, probably through the same path that venting followed immediately after the detonation.

The neutron wheel was recovered December 16 and analysis was started December 17. There was a neutron flux of 3×10^8 n/cm^2/ev over the 10 ev to 1 kv range for which the experiment was designed. No neutrons slower than 10 ev reached the wheel, possibly because the pipe collapsed early. Several resonances in uranium have been detected up to 66 ev and one has been detected in gold at about 60 ev.

At surface zero (the sequenced sampler location), the peak velocity and displacement were 5.35 ft/sec and 5.0 ft, respectively. The permanent displacement was 18 in. The initial upward peak acceleration was 25 G and then a rebound peak acceleration over-ranged the gage. Three periods of free-fall with durations of 0.9, 0.4, and 0.2 sec were observed 15 meters beneath surface zero. At Sandia trailer park (the sampler instrument location), the initial peak vertical acceleration was 1.7 G. Spalling occurred with a free-fall duration of 0.13 sec followed by a rebound peak acceleration of 4 G's or more.

Contents of the sequenced sampler vessels were analyzed for tritium and krypton. Apparently no nuclear detonation products are present in the samples. It is believed that the sampling pipe parted about 600 ft below the sampler; it parted in the rock close to the top of the underlying salt formation. Air rushed into the evacuated pipe in both directions. The air moving down the pipe met and stopped the nuclear detonation products and the air moving up the pipe carried pebbles, from outside the break, onto the filters and identified the position of the break. No samples of this air were obtained in the sequenced sampler because this air did not reach the earth's surface before the equipment at the earth's surface began breaking up. At this time an acceleration switch in the sequenced sampler operated valves which sealed the sequenced sampler vessels.

6.5 Eurochemic Assistance Program (E. M. Shank)

One transmittal letter listing 22 documents and five miscellaneous items was sent. One Eurochemic-originated document was retyped and sent to reproduction.

6.6 Saline Water Project (F. E. Harrington)

A letter dated February 12, 1962, "Some Comments on OSW Saline Water Conversion Yardstick," was issued to K. A. Kraus. The general conclusion was that the total operating cost per stream day would exceed 3.6×10^{-4} T.P.I. (total plant investment) and 2.8×10^{-4} T.P.I. for a 10^5 gal/day and 10^7 gal/day plant, respectively.

6.7 Cask Drop Tests (L. B. Shappert)

In order to provide scale-up data for the design of large fuel shipping casks, drop tests using small mockup carriers are being performed. These tests are deemed necessary since data for making calculations of impact performance of casks is nearly nonexistent. Such data are needed to make calculations for large casks to provide assurance that casks will conform to the pertinent sections of Federal Regulations CFR Title 10, Part 72.

The object of these tests is to determine experimentally the effect of dropping model casks in particular attitudes from various heights onto a solid unyielding surface and to correlate the results so that the structural integrity of larger shipping casks may be predicted.

Originally, eight steel-jacketed, lead-filled casks were built. The pertinent data on these are as shown in Table 3. Casks 1 through 5 and 6 and 7 have the same length to outer diameter ratio. Identical casks dropped from identical heights are used to indicate the reproducibility of the results.

To date, identical casks Nos. 2 and 3 have been dropped on their sides from various heights. At first, little instrumentation was put on the casks dropped 4 ft or less. The casks were, however, coated with a brittle lacquer in order to determine the position and direction of the high stresses. Cracks were produced in the lacquer when the strain in the metal shells exceeded 0.012 in./in. This apparently did not occur at drop heights below 15 in., except possibly along the line of impact, at which point the lacquer was chipped off when the cask struck the drop pad. The flat which was produced along the line of impact appeared to be about 2-3 in. wide after the 4-ft drops. The maximum deformation thus appears to be about 1/8 in. for an 18-in.-dia cask.

Table 3.

Cask No.	Weight, lbs	O.D. Nom., in.	Outer Shell Thickness, in.	I.D. of Void, in.	Inner Shell Thickness, in.	Length, in.
1, 4, 5	~2,725	18	0.312	10.25	0.250	36
2, 3	~2,725	18	0.312	9.564	0.593	36
6	~11,760	30.0	0.50	18.0	0.375	60
7	~11,760	30.0	0.375	18.0	0.375	60
8	~3,750	31.25	0.375	26.625	0.188	34.5

In subsequent drops, strain gages have been placed in the high stress areas and in the cask cavity. Accelerometers have been placed on top of the cask to record the number of G's deceleration to which a particular point of the cask is subjected. In the latest drops, as many as 12 strain gages and two accelerometers have been used on the casks. Compressometers have been placed in the cavity to measure the maximum deformation produced in the cavity on impact.

Drop heights of 6 and 7.85 ft on casks 2 and 3, respectively, have produced the maximum and permanent cavity deflections shown in Table 4.

Table 4.

	Drop Height, ft	Gage No.					
		1	2	3	4	5	6
Max. deformation, in.	6	0.161	0.126	0.132	0.118	0.105	0.047
Perm. deformation, in.	6	0.050	0.061	0.099	0.073	0.062	0.011
Max. deformation, in.	7.85	0.130	0.158	0.173	0.160	0.123	0.104
Perm. deformation, in.	7.85	0.053	0.058	0.059	0.059	0.047	0.029
Distance from left end of cask, in.		4	8	12	18	22	26

Apparently the end plates materially strengthened the ends of the cask in the 6-ft drop.

Some slight permanent deformation has been recorded at almost every point at which strain gages were placed, but mostly around the area of impact. Table 5 describes the results of the drops 1 through 3 which were run on February 23, 1962. In every case, the permanent strain recorded in drop 2 was less than that recorded in drop 1. This is due to the fact that the same cask and strain gages were used in both drops and the metal had already been strained to some extent in the first drop. The highest permanent strain was recorded close to the line of impact. Strain gages 2 and 6 were directly opposite each other through the center of the cask. In almost every case the maximum and permanent strains recorded by these two gages were nearly equal.

6.8 Alpha Laboratory, Room 211, Bldg. 3019 (E. L. Nicholson, P. L. Robertson)

Testing of the ventilation system for the new alpha laboratory showed that the number of air changes per hour and the pressure difference between the room and the building corridor was inadequate. The ventilation for this room is provided by the Bldg. 3019 analytical laboratory ventilation duct. The large number of open front hoods in the analytical laboratory and the location of Room 211 at the end of the duct farthest from the fan was the cause of this inadequacy. Thus, it was decided to ventilate Room 211 to the 3019 pilot plant cell off-gas duct where ample capacity and vacuum is available. The connection to this duct is to also provide for future ventilation of the 3019 basement area. Design of the new ductwork was started.

6.9 IWW Carrier Design (A. M. Rom)

The hazards evaluation study for the IWW Carrier was completed and is being summarized in an ORNL-TM memo. A copy of the memo will be sent to Hanford and to the Idaho Chemical Processing Plant for their approval in regard to handling of the carrier at each site. Following completion of the hazards evaluation, a request for Bureau of Explosives approval was sent to the ORNL Traffic Department.

Work Order A-93789-30 to fabricate the IWW carrier at Y-12 was issued.

6.10 Analytical Charger Design (F. E. Harrington)

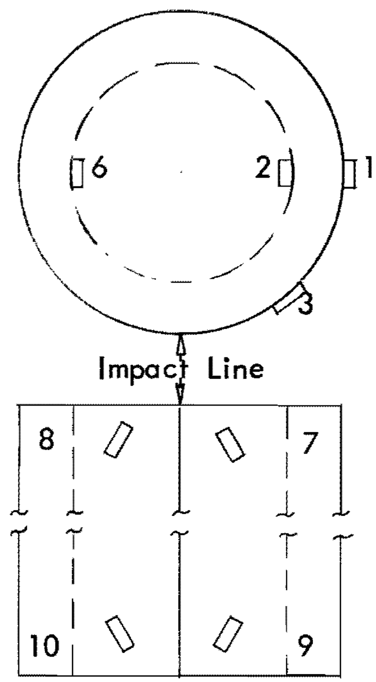
In transporting radioactive samples from Bldg. 4507 to Bldg. 3019, the analytical carrier frequently becomes contaminated, since it must enter the HRLAL storage cell to be unloaded. This problem has been solved by others by fabricating a top drawer charger to receive samples from the transport carriers at 3019 so that the carriers never enter the cell. This top drawer charger never leaves 3019 and the transport carriers never enter the unloading cell. A new charger is required, since the existing one can only handle single sample bottles, whereas the 4507-3019 carrier handles a tray of sample bottles.

Design of a new multi-sample charger and the required changes to the sample tray are in progress. The new system will be relatively complex because of the requirements to transfer the sample can in both directions between the carrier and

Table 5. Maximum and Permenent Strain in Micro in./in. at Various Positions on Test Cask

Drop No.*	Gage Number 1	2	3	6	7	8	9	10	Accelerometer, G
1 Maximum	140	2050	370	760	940		800	1600	1100
2 Maximum	280	2075	330	2280	490		640	1090	470
3 Maximum	600	3000	1040	2900	2350	1040	940	660	1475
1 Permanent	50	720	370	760	565		490	1350	
2 Permanent	0	410	200	560	280		320	820	
3 Permanent	140	1040	780	840	2020	440	520	90	

* Drop 1 - 6 ft; drop 2 - 6 ft; drop 3 - 7.85 ft.



Position of Strain Gages

charger, to raise the sample can from the cell cavity while 3019 charger is in the unloading cell, and to continue to sample as at present at 4505.

6.11 Filter for Bldg. 3505 Canal (F. E. Harrington)

Job Order A-01619-11 was issued to install a filter circuit on the Bldg. 3505 canal to clean up the water. Extremely poor visibility of the canal water has handicapped efforts to ship BNL fuel to Savannah River. The installation has begun and should be completed early in March.

6.12 General Water Requirements for a Radiochemical Plant (F. E. Harrington)

A survey of the water requirements for a radiochemical processing plant processing 6 tons/day of uranium has been initiated.

7.0 PROJECT ENGINEERING

7.1 Process Design Section Drafting Room Status (J. H. Manney)

A list of the 54 drawings started during February 1962 is given in Table 6. In addition, 41 drawings started earlier proceeded to the check print stage and 17 to approved status. In February, 3 sketches and 170 illustrations were prepared.

A breakdown of drafting time during February by cost accounts is as follows:

Account No.	Man-hours	% of Total	Account No.	Man-hours	% of Total
3370-1	56.0	3.1	3370-108	442.0	24.3
3370-20	128.0	7.1	3370-113	32.0	1.8
3370-21	16.0	0.9	3370-117	14.0	0.8
3370-22	92.0	5.1	3370-123	42.0	2.3
3370-30	81.0	4.5	3370-132	4.0	0.2
3370-33	115.0	6.3	3370-134	4.0	0.2
3370-34	132.0	7.3	3370-135	408.5	22.5
3370-72	70.0	3.9	4435-72	137.0	7.5
3370-107	40.0	2.2	Total	1813.5	100.0%

There were 53.5 hours of overtime worked in February, 3% of total effort.

7.2 Engineering Department Assistance

A summary of drawings prepared during February in the Engineering Department is given in Table 7.

7.3 Material Purchase Status

Table 8 gives a listing of all outstanding purchase requisitions (except instruments) as of March 1, 1962.

7.4 Work Order Status

Table 9 presents a listing of all outstanding work orders as of March 1, 1962, for which the Process Design Section is responsible.

H. E. Goeller, Chief
Process Design Section
Chemical Technology Division

HEG:mep
Attachments: Tables 6 through 9

Table 6. Summary of Drawings Started in the PDS Drafting Room During February 1962

Job No.	Drawing No.	Rev.	Title	Date Started
504	D-45762	3	IWW Carrier, Assembly	2/7/62
	D-45763	3	IWW Carrier, Subassembly and Details of Tank	2/7/62
	D-45764	2	IWW Carrier, Tank Details	2/7/62
	D-45765	2	IWW Carrier, Subassembly and Details of Top Section	2/7/62
	D-45766	1	IWW Carrier, Subassembly and Details of Bottom Section	2/7/62
	D-45962		PRFP Super D Carrier	2/7/62
	D-45965		PRFP Super D Carrier, Details	2/7/62
	D-45966		PRFP Super D Carrier, Skid Assembly	2/7/62
	D-45974	2	IWW Carrier, Yoke and Base Plate for IWW Carrier	2/7/62
	C-46053		PRFP Super D Carrier, Uranium Shield Details	2/13/62
604	E-46054	1	ICPP Proposed Hot Pilot Plant Pot Calciner Process, Process Flowsheet	2/2/62
	E-46055		Waste Dis. Dev. Pot Calcination F.S., High Sulfate, Purex Waste, Continuous Operation Sheet 1 of 2	2/1/62
	E-46056		Waste Dis. Dev. Pot Calcination F.S., High Sulfate, Purex Waste, Batch Operation Sheet 2 of 2	2/1/62
701	D-45956	1	TRU Development, Proposed Location and Layout for TRU Cell Mockup	2/21/62
	E-46007		TRU Process Facility, Model for Cells 7 and 8, Plan Views	2/23/62
	E-46008		TRU Process Facility, Model for Cells 7 and 8, Sect. & Dets., Sheet #1	2/23/62
	E-46009		TRU Process Facility, Model for Cells 7 and 8, Sect. & Dets., Sheet #2	2/23/62
	E-46010		TRU Process Facility, Chemical Storage Tanks, Process Tank Pits	2/8/62
	E-46041		TRU Process Facility, Chem. Storage Tanks, Proc. Tank Pits, Plan View	2/13/62
	D-46042		TRU Process Facility, Layout of Removable Tank Supports	2/5/62

(Continued)

Table 6, Continued

Job No.	Drawing No.	Rev.	Title	Date Started
701, cont'd	D-46043		TRU Process Facility, Layout of Removable Tank Supports, Details	2/5/62
	D-52160		TRU Process Plant, Typical Tank Pit Service Plug	2/26/62
	E-52176		TRU Process Plant, Service Plug & Lines to Cubicles, Assembly	2/27/62
702	D-34310	2	10 ml Shielded Sample Carrier	2/2/62
	E-45802		TRU Dev. Am-Cm Recovery Eng. Flowsheet 1 of 4	2/7/62
	E-45803		TRU Dev. Am-Cm Recovery Eng. Flowsheet 2 of 4	2/7/62
	E-45804		TRU Dev. Am-Cm Recovery Eng. Flowsheet 3 of 4	2/7/62
	E-45805		TRU Dev. Am-Cm Recovery Eng. Flowsheet 4 of 4	2/2/62
	E-45809		TRU Dev., Identification & Gen. Loc. of Sleeves & Service in Cell 4	2/12/62
3370-20	D-46075		PRFP Add. Ventilation for Lab 211, Plan & Sections	2/21/62
	D-46076		PRFP Add. Ventilation for Lab 211, Elevations	2/26/62
	D-46077		PRFP Add. Ventilation for Lab 211, Elevations & Details, Sheet #2	2/27/62
3370-22	C-46062		PRFP Sample Can Coupling Device	2/13/62
	D-46065		PRFP High Level Analytical Facility Charging Carrier	2/16/62
	D-46066		PRFP High Level Analytical Facility Charging Carrier, Details	2/23/62
3370-30	D-45773		Pot Calciner Experiment Flowsheet, Sheet #1	2/20/62
	D-45793		Pot Calciner Experiment Flowsheet, Sheet #2	2/20/62
	D-46028		Waste Dis. Dev., Loading Station for Feed Carrier	2/8/62
	D-46033		Waste Dis. Dev., Cell 1 Piping Arrangement, Sheet #1	2/7/62
	D-46035		Waste Dis. Dev., Loading Station for Feed Carrier, Details	2/8/62
	D-46036		Waste Dis. Dev., Cell 1 Piping Arrgt., Elev. A-A, Sheet #2	2/7/62
	D-46037		Waste Dis. Dev., Cell 1 Piping Arrgt., Elev. B-B, Sheet #3	2/7/62

(Continued)

Table 6, Continued

Job. No.	Drawing No.	Rev.	Title	Date Started
3370-72	D-46072		Existing Structural Facilities for Proposed Storage Area, Plans	2/15/62
	D-46073		Existing Structural Facilities for Proposed Storage Area, Elevation	2/19/62
	D-46074		Proposed Storage Building	2/21/62
3370-107	E-46063		PRFP Chop-Leach Process Flowsheet	2/14/62
3370-123	D-46049		Pa-U Program, Dissolver Assembly (As Built)	2/2/62
	D-46057		Pa-U Program, Dissolver Details (As Built)	2/1/62
3370-134	C-46058		Low-level Pilot Plant Cone for Clarifier	2/5/62
3370-135	D-45967		Th Fuel Cycle Dev. Lab., Layout C-1, 1st Floor Plan	2/28/62
	D-45968		Th Fuel Cycle Dev. Lab., Layout C-1, 2nd Floor Plan	2/28/62
	D-45969		Th Fuel Cycle Dev. Lab., Layout C-1, 3rd Floor Plan	2/28/62
	D-45970		Th Fuel Cycle Dev. Lab., Layout C-1, Longitudinal Section	2/28/62
	D-45971		Th Fuel Cycle Dev. Lab., Layout C-1, Basement Plan	2/28/62
	D-46051		Th-U^{233} Fuel Rod Facility Filter Assembly & Details	2/14/62
	D-46060	1	Th-U^{233} Fuel Rod Facility Vessel Off-gas Piping	2/9/62
	C-46070		Th-U^{233} Fuel Rod Facility Vessel Off-gas Filter Support Pad	2/14/62
	C-46071		Th-U^{233} Fuel Rod Facility Vessel Off-gas Filter Assembly, Filling Testing and Installation Procedure	2/19/62
	D-46078		Th-U^{233} Fuel Rod Facility Relocation BT Storage Tank Off-gas Line	2/26/62
4435-72	E-46046		Chem. Plant for Two 1000 Mw_e AHBR Layouts, Plant A & B	2/15/62

(Continued)

Table 6, Continued

Job. No.	Drawing No.	Rev.	Title	Date Started
4435-72, cont'd	E-46047		Chem. Plant for Two 1000 Mw_e AHBR Canyon Area Plants A & B	2/6/62
	E-46059		Molten Salt Converter Reactor Equip. Flowsheet Fluoride Volatility Plant	2/6/62
	E-46067		Molten Salt Converter Reactor Fluoride Volatility Chem. Plant 12 ft^3/day, Plans	2/13/62
	E-46068		Molten Salt Converter Reactor Fluoride Volatility Chem. Plant 12 ft^3/day, Plans 1 of 2	2/23/62
	E-46069		Molten Salt Converter Reactor Fluoride Volatility Chem. Plant 12 ft^3/day, Sections	2/14/62

Table 7. Summary of Drawing Progress in Engineering Department for Month of February 1962

Bldg. No.	W.O. No.	Dwg. No.	Rev.	Title	Transmittal Date
3019	A-93809-10	D-15208		Fuel Cell Door, Assembly	2/20/62
		D-15209		Fuel Cell Door, Detail Sheet #1	2/20/62
		D-15210		Fuel Cell Door, Detail Sheet #2	2/20/62
		D-51175		Fuel Rod, Assembly and Details	2/6/62
		D-51176		Subassembly A, Vibrator Chuck	2/1/62
		D-51177		Vibrator Chuck, Detail Sheet #1	2/1/62
		D-51178		Vibrator Chuck, Detail Sheet #2	2/1/62
		D-51179		Vibrator Chuck, Detail Sheet #3	2/1/62
		D-51180		Subassembly B, Rod Filler Tube	2/1/62
		D-51181		Rod Filler Tube, Detail Sheet #1	2/1/62
		D-51182		Rod Filler Tube, Detail Sheet #2	2/1/62
		D-51183		Rod Filler Tube, Detail Sheet #3	2/1/62
		D-51184		Rod Filler Tube, Detail Sheet #4	2/1/62
		D-51185		Rod Filler Tube, Detail Sheet #5	2/1/62
		D-51186		Subassembly C, Vibrator Frame	2/1/62
		D-51187		Vibrator Frame, Detail Sheet #1	2/1/62
		D-51188		Vibrator Frame, Detail Sheet #2	2/1/62
		D-51189		Vibrator Assembly	2/1/62
		D-51190		Lead Glass Window	2/6/62
		D-51204		By-pass Valve	2/6/62
		D-51205		By-pass, Detail Sheet #1	2/6/62
4500	A-70579-17	D-51028		Splitting Die Insert Assembly	2/1/62
		D-51029		Splitting Die Insert Details	2/1/62

(Continued)

Table 7, Continued

Bldg. No.	W.O. No.	Dwg. No.	Rev.	Title	Transmittal Date
4507	A-50194-11	D-42993		IWW Carrier Fire Shield	2/21/62
7920	A-70442-11	D-43862	3	Cell Cubicle Installation	2/19/62
		D-43902		Inter-cell Conveyor Cell Bank Penetrations	2/19/62
		D-43903	1	Conveyor, Maintenance Area	2/19/62
		D-43904	1	Conveyor Installation, Transfer Area	2/19/62
		D-43905	1	Cell Cubicle Concept, A-E Portion	2/19/62

Table 8. Purchase Requisition Status, March 1, 1962

Job No.	Purchase Req. No.	Date Issued	Description
Miscellaneous			
-59	D-0014	3/29/61	U Jet and explosive valve tests
-59	D-0069	8/16/61	Field costs, Gnome test
-113	D-0104	1/8/62	One shock accelerometer
-113	D-0105	1/11/62	Two statistical shock recorders
-113	D-0108	2/1/62	Six inertia switches for accelerometer
700	D-0109	2/5/62	Cost data on glass-lined vessels
2520	D-0110	2/7/62	Cost data on Hastelloy pipe
-113	D-0111	2/7/62	Four accelerometer cable assemblies
500	D-0112	2/27/62	132 pc. 3/4-in.-dia carbon rod
Waste Calcination			
605	G-1003	6/7/61	Lockheed subcontract
605	G-1007	10/16/61	Mockup fabrication
605	G-1009	1/18/62	One 5600-watt furnace tube
605	G-1016*	2/6/62	One Moyno pump
605	G-1017	2/12/62	One 250 cfm blower
605	G-1018	1/14/62	Two limit switches
605	G-1019	2/23/62	Two 2-way and two 4-way valves
605	G-1020	2/23/62	Two-speed control valves
605	G-1021	2/23/62	Four mufflers
605	G-1022	2/23/62	Two airline mufflers
Ion Exchange Pilot Plant			
604	F-2015	1/25/62	Burwell filter frame
Volatility			
404	D-7019	6/29/61	INOR-8 pipe and tubing
404	D-7022	12/20/61	HyMu 80 plate
TRU - Solvent Extraction Facility			
702	G-7505	1/30/62	Homalite plate
702	G-7507	1/30/62	Fabricate Pyroceram MS impellers
702	G-7508	2/15/62	Two Lapp Microflo Pulsafeeders
702	G-7509	2/15/62	Three Lapp Microflo Pulsafeeders
702	G-7510	2/16/62	One diaphragm pump
BNL-Kilorod Program			
-135	G-7701	1/2/62	Furnace
-135	G-7704	2/1/62	Fiberglas insulation
-135	G-7705	2/1/62	10 qts Cement
Transuranium			
702	G-9768	11/29/61	Pyroceram coated impellers
-123	G-9774	1/30/62	d-c Motor controller
-123	G-9775	2/5/62	Kel F filter disc
-123	G-9776	2/8/62	Four manipulator fingers

* Issued and completed in February 1962.

Table 9. Work Order Status March 1, 1962

Job Number	Job Order Number	Charge Number	Engr.	Date Issued	Cost Estimate	Description	% Comple
3019C	A-93249-01	3900-40-3990-0001	WGS	6/29/60	9,100	Hot Analytical Cell and Hood Vent Filters, Titles I, II, and III	
3019C	A-93249-02	3900-40-3990-0001	WGS	6/29/60	2,600	Hot Analytical Cell and Hood Vent Filters, ORNL Participation	
3019C	A-93249-03	3900-40-3990-0001	WGS	6/29/60	1,500	Hot Analytical Cell and Hood Vent Filters, I & C Division Participation	
3019C	A-93249-04	3900-40-3990-0001	WGS	6/29/60	82,600	Hot Analytical Cell and Hood Vent Filters, Lump-sum Contract Hixon Construction Co.	
3505	A-01619-11	337053-132	FEH	2/21/62	4,113	Install Filter and Pump for Canal	
3505	A-70570-11	337053-132	HBG	7/26/61	15,000	Loading of SRP Carriers	
4507	A-01559-11	337053-133	AMR	8/31/61	1,900	Final Adjustments for 4507 Containment	
General Division Programs							
-1	A-41624-41 & 61	337065-01	PLR	7/16/59	10,000	General Equipment Repair and Storage for Re-use	
IWW Carrier							
-30	A-01621-11	337054-30	LBS	2/23/62	400	Modify STT Gondola Car for IWW Carrier	
-30	A-93789-30	3902-40-3370-0030	AMR	2/15/62	15,400	Fabricate IWW Carrier	
CANE Project							
-59	A-20475-11	337053-59	JWL	3/16/61	17,840	Fabricate Instrumentation for Gnome Sequenced Sampler	
Fuel Shipping Study							
-113	A-01570-11	337053-113	LBS	9/20/61	12,000	Assistance by B. L. Greenstreet (Y-12) on Cask Drop Tests	
-113	A-01603-11	337054-113	LBS	1/12/62	8,000	Design and Install Cask Drop Pad and Perform Drop Tests	
Pa-U Program							
-123	A-01613011	337054-123	FLP	2/8/62	1,000	Fabricate Four Castle Manipulator Rings and Boots	
BNL-Kilorod Program							
-135	A-01597-11	337053-135	BBK	12/21/61	680	Build Mockup Cell	
Volatility Program							
404	A-01533-11	337053-73	RPM	6/28/61		Assistance to BMI on VPP Corrosion Tests	
Power Reactor Fuel Processing							
503	A-70447-11	337053-133	ELN	1/16/61	100,000	Modification of Immi Equipment for Pu-Al Processing	
511	A-70579-18	337053-106	WFS	1/10/62		Design and Build Gamma Monitor System	
511	A-93174-01	337092-106	WFS		171,600	Procure 250-ton Shear from Birdsboro Corporation	
511	A-93174-03**	3902-40-3370-0106	WFS	6/2/60	3,360	Design Auxiliaries for 250-ton Shear	
Waste Program							
603	A-93534-10	3900-40-3632	FEH			Design of Waste Tank and Evaporator	
605	A-01604-11	337054-34	JOB	1/16/62	4,000	Revise Design of Pot Calcination Mechanical Mockup Equipment	
605	A-70604-11	337053-30	HOW	7/26/61	19,300	Fabricate and Install Pot Calcination Hot Cell Unit	
605	A-70604-12	337053-33	JOB	8/28/61	1,980	Fabricate Densimeter and Controlled Rate Steam Jet	
Transuranium Facility							
7920	A-01550-11	337053-108	WDB	8/8/61	2,500	Design Revision of TRU Concepts	
7920	A-01607-11	337054-108	BFB	1/25/62	1,500	Build Model of TRU Cells	
7920	A-43042-11	337053-108	BFB	2/13/62	10,000	TRU Facility Design Support and Review by E & M	
7920	A-43042-12	337053-108	BFB	2/13/62	5,000	TRU Facility Design Support & Review by I & C	
7920	A-70397-14	337053-28	BFB	12/12/60	39,500	Fabricate and Install Mockup of Intercell Conveyor	
7920	A-70489-61	337053-108	WEU	4/25/61		Architect-Engineer Design Assistance, TRU Mechanical Equipment	
7920	A-70582-01	337053-108	HBG	7/19/61		Design Assistance from K-25	
7920	A-70627-11	337053-108	EJB	12/11/61		Fabricate Three Disconnect Assemblies	

(Continued)

Table 9, Continued

Job Number	Job Order Number	Charge Number	Engr.	Date Issued	Cost Estimate	Description	% Complet
Transuranium Facility, Continued							
702	A-70397-13	337053-28	BBK	7/15/60	4,950	Design and Install Instruments for Transuranium Cell 3 Glove Box	
702	A-70397-18*	337053-28	BBK	5/26/61	5,400	Instrumentation Design and Installation, TRU SOX, 4507 Mockup	
702	A-70442-11	337053-108	BFB	8/21/61		Assignment of F. L. Hannon To CTD for TRU Mechanical Design	
702	A-70611-11	337053-108	FLP	1/8/62		Design of Two Mixer-settlers	
702	A-70611-12	337053-108	FLP	1/24/62	1,120	Design Drive for TRU Mixer-settlers, 4507	
702	A-70615-11	337053-108	FLP	2/2/62	1,120	Design Filters for Cell 4, 4507	
702	A-70617-11	337053-108	FLP	2/3/62	280	Design Service Piping Extensions	
702	A-70617-12	337053-108	FLP	2/3/62	1,850	Design Makeup Area Equipment	
702	A-70617-13	337053-108	FLP	2/3/62	1,120	Design Solution Addition Glove Box	
702	A-70617-14	337053-108	FLP	2/3/62	560	Design Pipe Sleeve Inserts	
702	A-70617-15	337053-108	FLP	2/3/62	1,400	Design Service Piping, Makeup Area	
702	A-70618-11	337053-108	FLP	1/24/62	5,600	Design Equipment Removal Cubicle, 4507	
702	A-70619-11	337053-108	FLP	1/24/62	4,480	Design Sample Removal Cubicle	
702	A-70620-11	337053-108	FLP	2/3/62	2,240	Design In-cell Service Piping	
702	A-70620-12	337053-108	FLP	2/3/62	560	Design Electrical Sleeve Inserts	
702	A-70621-11	337053-108	FLP	2/8/62	840	Design Carrier for Sample Cubicle	
702	A-70622-11	337053-108	FLP	2/3/62	1,680	Design Electrical Equipment for TRU Solvent Extraction Facility	
702	A-70623-11	337054-108	FLP	1/16/62	5,344	TRU Instrumentation Design, Solvent Extraction Facility, 4507	
702	A-70623-12	337053-108	FLP	1/16/62	9,403	Procure Instruments for TRU Solvent Extraction Facility	
702	A-70623-13	337053-108	FLP	2/21/62	5,347	Fabricate and Install Instruments for TRU Solvent Extraction Facility	

C - Work orders concerned with containment.

* - Request for close-out submitted.

** - A-93174-03 and -04 by Unit Operations Section.

DISTRIBUTION

1. E. D. Arnold
2. J. E. Bigelow
3. R. E. Blanco
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55. Laboratory Records, RC

56-67. Laboratory Records

68-69. Central Research Library

70. Document Reference Section

71-85. DTIE

86. R & D Division, ORO
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