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ABSTRACT

This report summarizes and reviews the efforts accomplished in the Process Design Section of the Chemical Technology Division during the month of July 1961. The four major projects discussed are Transuranium, Volatility, Power Reactor Fuel Processing, and Waste Studies. A number of small programs are reviewed under the section on Miscellaneous Projects.

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1.0 TRANSURANIUM PROGRAM
(W. E. Unger)

1.1 Transuranium Laboratory, 7511 (B. F. Bottenfield, E. J. Breeding, G. B. Berry)

During July several meetings were held with ORNL management to discuss a revised philosophy for the design of the Transuranium Laboratory. As a result of these discussions the architect-engineer will be asked to proceed with new layouts for a bank of twelve cells, each 7 ft wide by 18 ft deep by 22 ft high. The cells will be shielded with 6 ft of magnetite concrete on the front and end faces and 5-1/2 ft on the rear face. Each cell will be separated from adjacent cells by a 2 ft magnetite concrete curtain wall. The cells will be partially lined with Hastelloy C or stainless steel; the remainder of each cell will be coated with an epoxy resin reinforced with fiberglass cloth.

Three additional laboratories have been added to the design criteria to provide more space for analytical services, and for chemical process development for both the enlarged cell bank and the newly proposed Transuranium Research Laboratory to be located in Bethel Valley.

The cell cubicles will be semi-permanently installed in the cells and three sides will be common with the cell surfaces. Equipment removal from the cubicles will be accomplished as previously planned by means of an alpha tight transfer into a cask through the cubicle roof. The process tankage, including the waste processing and off-gas handling systems, will be located within the bulk cell shielding, behind and below the cell processing cubicles.

In other respects the detailed design criteria have been modified only to a minor extent; however, the new layout has resulted in an increase of 40-50% in the gross building area and volume, and a proportionate increase in services and utilities.

Current plans are to discuss the revised criteria with the architect-engineer about August 10 and to have a revised conceptual design and cost estimate completed about November 1, 1961.

1.2 Special Mechanical Equipment Design (F. L. Hannon)

The fabrication of the intercell conveyor mockup was completed; it has now been moved to the cell mockup in Building 4505 for developmental testing. Equipment for "around-the-clock" cycling was added and a design has been completed for a chain length simulator to demonstrate conditions germane to greater chain length required in the revised Transuranium Facility layout.

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Design modifications on the port closure are in progress which will facilitate automatic, rather than manual, actuation of this equipment. Alternate cell cubicle design concepts have been prepared for evaluation. Detail design of mockup equipment for the equipment removal carrier is in progress.

Alternate concepts of an intercell conveyor are under consideration as well as certain modifications to the present design. A concept has been prepared of a modified canister to accommodate the Transuranium targets for intercubicle transfer.

1.3 Process Equipment Studies (W. D. Burch, J. E. Bigelow, O. O. Yarbro)

Equipment Layout and Flowsheet Changes. Changes in the design of the tank pit were made to conform to the revised cell design discussed in Section 1.1. In conjunction with these changes, the cell numbering system was reversed necessitating extensive changes in previously issued flowsheets and layout drawings. Main line chemical processing will now be performed in cells 5 through 8; cells 9 and 10 are now designated for special chemical separations.

A flowsheet for the in-cell portions of the waste system was drawn to provide the Architect-Engineer with information on this system consistent with the present cell design.

Processing Equipment Cost Estimate. A cost estimate of the processing equipment is in preparation. Detailed breakdowns of the equipment and piping show that the plant will contain approximately 75 tanks, 14 metering pumps, 115 in-cell process valves, 66 sampling points, 1350 service disconnects, and 1750 process disconnects.

1.4 Summary of UCRL Visit (J. P. Nichols)

A visit was made to UCRL during the second week of July to observe equipment and techniques used in processing an irradiated curium capsule which contained approximately 40 μg of californium. The detailed results of the trip are reported in ORNL CF-61-7-89. The processing run was very successful; the Cm, Bk, Cf, and Es-Fm fractions were isolated by ion exchange with little difficulty.

Some of the equipment developed and tested at UCRL is applicable to the ORNL transuranium work. Items which should be of particular utility are an automatic fraction collector, an absolute filter tester, and a remote pipetter. Glove box confligration tests which have been performed at Berkeley indicate that a Berkeley box with an air purge rate of less than 10 cfm will not support

petroleum ether combustion for more than approximately 20 sec and that the alpha containment is not lost during the combustion period.

Correlation of UCRL information on the irradiation conditions and spectrum of the californium product indicates that the Cf-254 from the HFIR irradiations will be approximately a factor of 10 below the present TrU design level. This can possibly result in a decrease of the TrU cell wall thickness by 6 to 9 in., an increase in the permissible californium loading in a target rod, a factor of 10 lower neutron activation, and perhaps omission of the TrU charcoal beds.

1.5 Experimental Shielding Program (J. P. Nichols)

The Lid Tank Shielding Facility (LTSF) experimental measurements for the TrU cell windows were completed. The Neutron Physics Division will correlate the results and suggest arrangements of window materials which will approximate the shield effectiveness of the magnetite cell wall.

LTSF measurements on prototype TrU magnetite concrete slabs are planned for September, 1961. It is anticipated that by that time the E & M Division will have developed a magnetite concrete of suitable cost, boron content, water retention, and mechanical properties.

1.6 Ion Exchange Facility, Bldg. 4507 (B. B. Klima, F. L. Peishel)

The alpha-tight TrU Ion Exchange Facility will be set up in Cell 3, Building 4507, following completion of the Pa-U program (see Sect. 5.6). It will be used to test the separation of americium and curium from rare earths and fission products using ion exchange techniques. The equipment used in this facility will be assembled and tested, first in the Building 4507 cell mockup on the third floor of Building 4505.

Design work has been started on the equipment and the revised flowsheets.

2.0 VOLATILITY PROGRAM
(R. P. Milford)

2.1 Volatility Pilot Plant Service

INOR-8 Procurement. The purchase order for INOR-8 for the MSRE and the VPP has still not been placed but should be placed about August 11, 1961. Our requisition for pipe and tubing was held up pending a change in specifications; however, it should be advertised for bid about August 11. Our requisition for plate and sheet was issued July 27, 1961, and was being held for an additional specification as of August 8. Procurement of any of our requirements apart from the MSRE order appears unlikely.

2.2 Volatility Economic Studies (W. E. Dunn)

An economic study of the Volatility process at full scale plant conditions has been started. The design basis for the hypothetical plant is 500 kg U per year as U-Zr alloy fuel containing 0.94 wt % U, or 53 metric tons of fuel per year. Preliminary material and energy balances have been prepared based upon 300 operating days per year and a 35-hr run cycle. Tentative flowsheets will be issued and revised until the design becomes more finalized; then processing costs will be estimated. The feasibility of F_2 recycle is currently under consideration as a possible flowsheet modification. It was assumed that the expected life-time of a hydrofluorinator-fluorinator pair is 1.35 yr, after which operations would be transferred to another pair.

A study was made of the cost of two salt mixtures: 37.5 mol % LiF--37.5 NaF--25 ZrF_4, on a once-through and on a recycle basis, and 37 LiF--50.5 NaF--12.5 BeF_2 on a once-through basis. Relative costs were 14:10:1.9; therefore, the use of the former mixture on a recycle basis was assumed for use in the conceptual plant because of the lower cost.

2.3 Assistance from BMI and Metallurgy Division

Oxide Hydrofluorination Corrosion Studies at BMI. A memo on the corrosion of Hastelloy X under oxide-hydrofluorination conditions will be issued by BMI about August 11. The memo on HyMu 80 fluorinator corrosion is being prepared. In a letter dated July 17, 1961, BMI was also requested to study the corrosion of HyMu 80 (16-5-80 wt% Mo-Fe-Ni, nominal) in 37.5-37.5-25 mole % NaF-LiF-ZrF_4 at 650°C while dissolving Zircaloy-2 with HF. They will also study the resistance of HyMu 80 to oxidation in air in both the untreated and "chromized" and "aluminized" conditions.

In a letter to A. F. Johnson, UCNC, dated July 27, 1961, the Carpenter Steel Company quoted a base price of $2.46 per pound of 1/4-, 3/8-, and 1/2-in. HyMu 80 plate based on a minimum order of 6500 pounds with extras for splitting the ingot among the various plate thicknesses. This compares to approximate prices of $3.00 and $1.70 per pound for INOR-8 and L-nickel, respectively. Thus far, a price for HyMu 80 pipe and tubing has not been forthcoming from Carpenter, so a preliminary requisition was issued directed to Superior Tube, Carpenter's Alloy Tube Division, and Allegheny-Ludlum. The latter company manufactures 4-79 Moly Permalloy, which apparently is identical to HyMu 80.

Fluorination Corrosion Studies. A letter report from F. W. Fink dated June 30, 1961, on the corrosion of INOR-8 under fluorination conditions was

received during the period. A run to check the corrosion resistance of L-nickel to 27.5-27.5-45 mole % $NaF-LiF-ZrF_4$ at 500°C with periodic additions of UF_4 and in the presence of F_2 was started on August 9, 1961. This run should give a basis for extrapolating BMI's INOR-8 and HyMu 80 fluorination corrosion results to VPP fluorination conditions.

VPP MK-1 INOR-8 Hydrofluorinator Corrosion Examination. Wax replication of selected regions in the 24-in.-dia top cylinder of this vessel has been completed. Impressions, approximately 2 in. in diameter, were obtained by B. F. Crump, Jr., in a descending spiral, clockwise pattern starting at the top of the unit. Table 1 gives the results of this work.

The maximum depth of pitting proved to be the 8-mil pit located in the middle vapor region of the vessel and initially discovered by gamma radiography. Considering the pitting attack and the bulk metal losses, as previously determined by ultrasonic thickness measurements,[1] maximum wall thickness loss rates on the hydrofluorinator to date are 20 mils/mo, based on 765 hr of molten salt residence time and 0.06 mils/hr, based on 338.5 hr of HF exposure time. These losses occurred in the middle vapor region of the vessel approximately at and below the elevation of the barren salt inlet line and about 180° circumferentially from the inlet. Rough calculations indicate that the barren salt stream can impinge upon the hydrofluorinator wall during transfer and this may well be a factor in the high vapor region losses in the vessel.

VPP MK-III L-Nickel Fluorinator Corrosion Examinations. Visual inspection of the fluorinator using the unaided eye and the "Omniscope" disclosed an almost continuous yellow-green deposit covering the vapor contact regions. The thickest deposits occurred in the middle neck of the vessel which joins the top and bottom cylinders. X-ray diffraction analysis proved that greater than 90% of the deposit is NiF_2, and wet chemical analysis showed that the most predominant minor impurities were probably chromium, tin, and zirconium fluorides. The neck of the fluorinator has sustained the maximum bulk metal losses, based on Vidigage data. Using recently corrected process history data, and excluding pitting attack, the vessel has sustained maximum metal loss rates of 28 mils/mo, based on 694 hr of salt residence time and 0.9 mils/hr, based on 30.9 hr of F_2 exposure time.

The walls in the salt contact region of the fluorinator appeared exceptionally clean. Close examination using the interior periscope suggested an etched appearance.

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[1] A. P. Litman, Monthly Progress Report, p. 1 (July 12, 1961).

Table 1. Depth of Pitting Attack in the MK-I INOR-8 Hydrofluorinator Vapor Region

Distance Down from Top Head to Cylinder Weld, in.	Pit Depth, mils
3	0.5
6	0.5
9	5.5
12	0.5
15	0.5
18	0.5
21	0.5
24	0.5
27	0.5
30	2.0
33	0.5
36	8.0, 2.0, 3.5
39	0.5
42	0.5
45	4.5
48	0.5
51	3.5
54	3.8
57	0.5
60	0.5
63	0.5
66	0.5
69	0.5

VPP Group IV Fluorination Test Specimens. A fourth group of test specimens have been positioned in the MK-III fluorinator for exposure during additional nonirradiated uranium-bearing (TU) runs. Table 2 further describes these 1/4-in.-dia rod-type specimens and gives their location. Base line dimensional data was obtained on the specimens prior to test placement.

Memo and Report Status. Estimated completion dates for both the VPP corrosion CF memo and the Electrochemical Society VPP corrosion paper is August 31.

Table 2. Group IV VPP Fluorinator Corrosion Test Specimens

Specimen No.	Nozzle Location	Composition Description
44	N	L-Nickel and Inco 61 weld metal
45	O	L-Nickel and Inco 41 weld metal
47-A	P	HyMu 80*
27	R	Ni - 90% Fe - 10%
57	L	Inconel
48	M	INOR-8

*New and previously exposed sections.

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

3.1 ORNL-Idaho Liaison (E. L. Nicholson)

Engineering assistance to Idaho was limited to studies on the tri-laurylamine (TLA) solvent extraction system for final plutonium decontamination and cleanup since it is being considered as an alternative plant addition to the more completely developed anion exchange system. Engineering information on pulse column performance and system physical properties was collected and forwarded to Idaho. Drawings of the Immi contactor to be used for mixer-settler flooding studies on the TLA system were also transmitted, as well as information on the design of the Building 4507 plutonium load-out facilities and the ORNL plutonium shipping bottles and shipping containers.

Arrangements were started to obtain HAPO Purex plant IBP solution for spiking TLA process feed solutions to demonstrate fission product decontamination at full activity level in Cell 2, Building 4507.

3.2 Petrolite Subcontract Studies (E. L. Nicholson)

The testing of the Petrolite electrostatic solvent de-entrainment unit at ORNL under the supervision of Petrolite personnel in Building 3550 was completed late last month. The cold tests clearly indicated removal of entrained aqueous material down to typical values of 0.001 to 0.002% entrainment for a Purex IAP stream, and less than 0.001% for a 6% TBP IAP stream from the Immi mixer-settler. Aqueous entrainment in the organic effluent from the treater unit with the electric power off were 0.02% and 0.0095%, respectively. Thus, entrainment removal factors of approximately 10 to 20 were obtained by use of this device.

A laboratory batch countercurrent extract was tested for activity removal by a very small scale electrostatic precipitator. The test was unsuccessful because the solvent flow was insufficient to prevent a substantial temperature increase of the solvent which solubilized the entrained aqueous phase.

Future testing is planned this fall in connection with hot cell work with the Immi mixer-settler in Cell 1, Building 4507.

Attempts to remove cruds at various points in a simulated solvent recovery system have been inconclusive to date in tests at Petrolite's Houston laboratory because the degraded solvent spike appears to be so highly degraded that any beneficial effects of electrostatic removal of cruds is completely obscured by the very high zirconium retention index of the solvent feed and washed product. This will be investigated here to see if an unradioactive simulated plant solvent can be made that will perform normally during the washing procedure.

3.3 Pu-Al Fuel Processing Program (E. J. Frederick, A. R. Irvine)

Process. As explained in previous reports the Pu-Al fuel anion exchange processing program to be done in Cell 1, Building 4507, has been modified at AEC request to permit recovery of the Am-Cm content of this fuel. Changes and additions to the equipment to permit the Am-Cm separation and storage are now in progress.

Design has now been completed on the process changes necessitated by the conversion to a two-step process. Cooling coils and thermowells have been installed in T-6, T-9, and T-9A to provide adequate heat transfer and temperature monitoring of these tanks during interim product holdup.

Modification of tank T-A6, a 1000-gallon tank from the RaLa process, for use as T-30 will be started upon completion of inspection engineering evaluation of its potential use as a process vessel. Preliminary inspection

information indicates that it will be satisfactory. Redesign of the waste holdup pit internal shielding around the 1000-gallon tank and the shielding supports have been completed. Attempts to completely seal the pit from ground water seepage have so far been unsuccessful; therefore, the deep section of the pit will be lined with stainless steel primarily to contain any spillage. A dry well will be located adjacent to the pit to alleviate potential back pressure buildup on the liner. The work inside the pit will precede actual tank installation.

Pu-Al Fuel Carrier. Major difficulties which were encountered by National Lead Company in bonding of lead to both inner and outer surfaces of a shipping cask resulted in the performing of three experiments in lead-cask filling at ORNL. The difficulty in bonding is the result of the difference in the coefficients of thermal expansion of the lead fill and the steel structure. The coefficient of thermal expansion of lead is approximately three times as great as that of steel; therefore, the volume occupied by lead decreases faster than does the volume between the inner and outer steel shells as the temperature of the steel and lead assembly drops from the melting temperature of lead (621°F) to ambient temperature. If the shells are not unyielding and can deform slightly during cooling it is possible for the walls to yield sufficiently when contraction occurs that no void or crack will be formed. In the case under study, the shells are very stable because of their cylindrical shape.

Complete filling of the shielding cavity, which is required because of heat transfer considerations rather than for gamma shielding, could theoretically be accomplished by use of a material that has a negative coefficient of thermal expansion for filling a thin annular space intentionally left between the outer shell and the bulk of the lead fill. While such a material does not exist, a 55% bismuth - 45% lead alloy does undergo a phase change after solidification and consequently increases in volume by ~ 0.2% within a period of 500 hours. One such specimen was prepared using an annulus made up of concentrically mounted six-inch and two-inch pipes, with the annular space partially filled by a lead ring. Sectioning of this piece after the free space had been filled with the bismuth-lead alloy revealed no perceptible cracks. Subsequent ultrasonic testing did reveal a lack of bonding; however, this does not appear to be a significant resistance to heat transfer.

The objective of having complete filling of the shielding cavity with lead at ambient temperature can theoretically be achieved by still another method; namely, by filling the thin annular space mentioned above with molten lead after previously installed cast lead has been chilled while the outer shell is elevated in temperature. Two experiments were carried out to test this procedure, with the exception that heating of the outer shell was omitted. Results on a large specimen indicated ~75% bonding of lead to lead in an outer ring pour and essentially no bonding on an inner ring. Sectioning of the assembly indicated metal to metal contact at most surfaces. This approach appears to be a feasible and possibly less expensive approach than the use of bismuth-lead alloy.

3.4 Assistance to Indian Visitors (E.L. Nicholson)

An intensive technical review was made of preliminary equipment flowsheets prepared by Mr. A. N. Singhal for Project Phoenix at Trombay, India.

3.5 Mechanical Processing of Fuels (W. F. Schaffer)

Shipment of SRE Core 1 Fuel. Following the completion of processing of the first shipment of fuel on July 20, the carrier was returned to Atomics International at Canoga Park, Californium, for the final fuel shipment. This shipment is scheduled to leave for Oak Ridge on August 7 and will be different from the two previous shipments in that only three intact washed fuel elements will be shipped. In addition, by mutual agreement with AI and COO, three additional canisters will be included containing six fuel rods each without end hardware plus one cut rod from which one or more fuel slugs were removed for examination. All rods, including the cut rods, were washed in butyl alcohol, dried and placed in clean canisters prior to storage at Atomics International. These cut rods are a potential hazard if some unreacted NaK is still present; however, F. L. Culler and Radiation Safety and Controls concurred that this fuel could be processed without danger to operating personnel because of safeguards built into the processing cell. A seventh canister containing samples of irradiated uranium-molybdenum fuel for non-mechanical reprocessing experiments will also be included in the final shipment.

Segmenting Cell Activities. Following the completion of the maintenance described in the June report, hot operation in the cell was resumed on July 5 and continued through July 20; during this time the last five fuel clusters

in the first carrier of fuel were processed. Neglecting down time, processing times varied from 6.75 to 12.4 hours/rod and averaged 9.2 hours/rod for the 35 rods processed. Rates varied from 5.6 to 10.2 kg U/hr and averaged 7.8 kg U/hr.

The first canister loaded into the cell at the start of operations did not properly align with the cap removal device because of interference from the new carrier-to-door seal guides placed in the cell during the last shutdown. The cap removal device had to be modified to permit lateral movement to compensate for the change made in the cell door. After this change was made, the cap on the first canister still could not be removed because of galling between the cap and canister body. A large (1-in.) impact wrench had to be altered and placed in the cell and employed to remove the cap.

The spindle nut froze on the spindle of the hydraulic saw during a blade removal following a blade breakage on the fourth element processed. The nut was finally removed after the application of penetrating oil and molybdenum disulphide, but in the process the spindle threads were damaged. The threads were dressed remotely by use of a file, but the spare steel nut could not be assembled. A new nut was machined from "oilite" with a special alignment pin to simplify assembly, but still could not be assembled. Finally a left-hand die was procured and modified and the spindle threads were recut remotely. The new nut attached satisfactorily after this process.

Before starting on the second carrier of fuel, a new heavier pusher cylinder was installed on the decladder to replace the original cylinder which was too light for the intended service.

On July 25, troubles were encountered in the limit switches and override controls to the bridge crane and GM manipulator, resulting in damage to the gears in the bridge crane. Repairs to the crane and controls occupied the remainder of the month.

Other equipment problems encountered during the month included a main lifting link failure in the charger door hoist system and failure of a connector in the hydraulic lift system, trouble with the TV camera, and the breakage of the canister push rod linkage because of high stresses imposed in using the impact wrench to remove the canister cap. Difficulties were also experienced with the tube winder because it is underpowered for use with the hardened jackets, vacuum leaks in the NaK system which made transfer of NaK difficult, and manipulator boot deterioration, particulary in the gauntlet region.

One interesting sidelight included the dropping of a full can of slugs on the floor and retrieving them with the GM manipulator. In addition, a short length of jacket containing a slug was dropped in a place inaccessible to the manipulators but was retrieved using a manipulator guided nylon cord as a lasso.

Prototype Production Shear. Piping and electrical work on the shear was delayed until the latter part of the month because craft personnel were not available. The shear installation is now scheduled for completion during the first week of August.

Several experimental gag designs for the shear were made and shop work has been started. Upon completion of these pieces and the installation of the shear, representatives of the Birdsboro Corporation will be requested to visit ORNL to assist in the check-out of the equipment before the contract is closed.

The final phases of shop work and assembly of the fuel rotary screw inclined conveyor were started during the month and are scheduled for completion during the latter part of August. Modifications were also started on the leacher to minimize back-mixing of the chopped fuel which occurs at the first flight.

4.0 WASTE STUDIES
(J. O. Blomeke)

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

The proposed Waste Evaporator and High Level Waste Storage Tanks, and the Melton Valley Waste Collection and Transfer System were combined into a single project, and the Low Level Waste Treatment Facility deleted from the project. The revised proposal was submitted as Project 62-5, Subprogram 9400 on the Construction Data Sheet Schedule 44.

The Engineering Department has not yet issued the Preliminary Proposal; however, it is essentially complete. After departmental approval, copies will be available for comment by Chemical Technology Division early in August.

On July 10 a review of the proposed improvements to the ORNL waste systems was made before the Waste Effluents Committee. The main features of the new high level waste storage tanks, the intermediate level waste evaporator and the proposed ion exchange treatment process for low level waste were explained and discussed at length. On July 24 the proposed Melton Valley waste collection and transfer system was reviewed for the committee.

Waste Evaporator and Storage Facility. The Engineering Department has estimated that this facility will cost $1,377,000. The estimate was based on minor changes to the facility as outlined in ORNL CF-61-5-83. The changes are now being incorporated as Revision A to the affected drawings previously issued and the revised drawings are scheduled for drafting the first week of August. Criteria were also issued specifying in detail the condensers for the evaporator and the off-gas system.

4.2 Low Level Waste Pilot Plant (J. M. Holmes, F. N. Browder, W. R. Whitson)

Pilot Plant Installation. All process equipment has now been installed. The process piping is 60% complete. All electrical equipment has been procured and installation is 50% complete. The Instrument Department has issued check prints for final corrections, and approved instrumentation drawings should be issued during the first week in August. The radiation detector systems for the ion exchange columns are being fabricated in the instrument shop and should be ready for installation in Building 2528 by the middle of August.

The process should be ready for cold testing with tap water the last week in August. Actual operation with low-level waste from the settling basin will be delayed until some time in October because of scheduling difficulties, since installation of the underground feed line is not scheduled to start until the last week in September.

Studies on Modifications to the ORNL Low Level Waste System

A flowsheet scale-up was made for a recently developed HNO_3-regenerated ion exchange treatment process for ORNL low level waste. This process as originally developed used a resin that required HCl as the regenerant. The HCl feature was considered disadvantageous because of the requirement for special materials for an HCl evaporator and because of the resulting chloride waste. Therefore, modification of the process to permit use of HNO_3 instead of HCl was tried since it seemed better suited to ORNL operations. The HNO_3 flowsheet has now been successfully demonstrated on actual ORNL process waste by Holcomb in a 1-liter-per-minute pilot plant in the basement of the lime-soda waste treatment plant. This process appears promising despite one significant disadvantage, vis., larger waste volumes.

For a 750,000-gallon-per-day plant treating ORNL low level or process waste, the HNO_3 flowsheet would produce 8,750 gallons of 0.33 M HNO_3 regenerant waste per regeneration cycle or about 35,000 gallons per week. This assumes no recycle of regenerant to utilize the remaining acid; such a recycle would result

in considerably lower waste volumes to be evaporated. This 35,000 gallons per week constitutes about 35% of the capacity of the intermediate level waste evaporator now being designed for the Laboratory. Furthermore, the waste would normally be lower in radioactivity by a factor of ~100 than intermediate level waste, which requires 5 ft of concrete shielding for the evaporator. Thus, these two factors cast some doubt on the wisdom of using the intermediate level waste evaporator for the low level regenerant waste. A better course seems to be to build a small HNO_3 evaporator for low level regenerant waste instead of trying to use the intermediate level evaporator.

4.3 Pot Calciner Hot Cell Facility (H. O. Weeren)

Design work was started on laboratory equipment for a proposed small-scale pot calciner to be run on actual waste solution from Idaho and Hanford. The primary purpose of this test will be to determine the distribution of volatile fission products under calcining conditions. The effect of various additives and different gas blankets on the fission product volatility will be noted. The test will be run in Cell 1 of Building 4507. The present schedule calls for fabrication and assembly of equipment in October and November, cold tests in December and January, and start of hot operation in February, 1962.

4.4 Pot Calcination Pilot Plant (J. M. Holmes)

As a result of recent discussions between ORNL and ICPP personnel, a demonstration waste calcination pilot plant will be installed in the ICPP hot pilot plant cells. The pot calciner will be demonstrated using wastes from TBP-25, Darex or electrolytic dissolution, low-sulfate Purex and high-sulfate Purex processing in the order given. SIR, STR, Thorex, and Zirflex wastes will be considered for testing after the technology for calcining these wastes is sufficiently advanced to permit the design of corrosion-resistant equipment capable of containing them. Upon completion of the pot calcination program, other calciners such as the BNL rotary calciner will be tested using the same feed, off-gas contamination, and mechanical handling equipment. The use of additives to control the volatility of waste components such as sulfate and ruthenium or to form glasses from high porosity easily leachable calcines will also be demonstrated.

Specific responsibilities for each phase of the cooperative program have been assigned. ORNL will perform the work through the laboratory, cold unit operations, special equipment testing and preliminary design, while the ICPP

personnel will be responsible for the detailed engineering design, equipment installation, and hot pilot plant operating phases.

A concerted effort is under way to complete the installation of the cold ORNL unit operations evaporation equipment in order to provide the necessary data for hot pilot plant equipment design by December 1961.

5.0 MISCELLANEOUS PROJECTS

5.1 Safety and Containment

Containment of Building 3026 and the Volatility Pilot Plant in Building 3019 are now complete and of Building 4507 nearly complete. Containment changes in Building 3508 are still being held in abeyance.

Building 4507 Containment (A. M. Rom). Application of Amercoat to the penthouse floor was finished. Radiation and pressure drop instruments were approximately 60% installed. A preliminary test of the penthouse emergency ventilation system in a simulated containment emergency indicated excessive air in-leakage through the building joints, particularly at the ceiling line and around the gantry crane door and vestibule doors. A study aimed at finding the most expedient way to seal the penthouse is in progress. The volatility equipment in cell 4 continued to be operated during this period and preparations are now in progress to ready cells 1 and 3 for operation.

Metal Recovery Canal (F. E. Harrington). Work Order A-01446-11 for the design and cost estimate for a Metal Recovery Canal permanent filter and ion exchange circuit has been cancelled. The decision to abandon this canal after shipping the stored Brookhaven fuel sections to SRP made this action advisable. The canal will be cleaned only to the extent needed to safely ship the contained fuel. Cleaning will be done by discharging the contaminated water and subsequent rinses to the Intermediate-Level Waste System concrete storage tanks. This transfer will require the installation of a steam jet discharging to an existing line from the 3505 caustic tank to tank W-5. Work Order A-70570-12 will be issued the first week in August to cover this work. Work Order A-70570-11 to cover the labor and materials for loading the fuel sections into the carriers has been issued.

A survey of the shipment is contained in a letter from F. E. Harrington to J. O. Blomeke entitled "Shipment of BNL Fuel Sections." Samples of canal water indicated that the water contained 21, 2×10^5, and 4.3×10^5 counts/min/ml of gross alpha, beta, and gamma (scintillation), respectively. A sample of algae

reading 600 and 220 mr/hr on hard- and soft-shelled Cutie Pies, respectively, was sent to Dr. S. I. Auerbach. Micro-organisms which mature into small flies were also found in this sample and led to the installing of "feed bags" in the canal.

5.2 Alpha Lab, Room 211, Bldg. 3019 (E. L. Nicholson, P. L. Robertson)

The problem of fire protection for the glove boxes in Room 211 was reviewed. Solvent extraction work in the glove boxes will use relatively high flash point diluents such as diethyl benzine, which has a closed cup flash point of 138°F. The use of potential solvent ignition equipment such as direct electrical heating in the glove boxes will be minimized. In addition, electrical power to mixers, etc., will be disconnected when the boxes are unattended. It was also decided to provide all glove boxes with a metal exhaust hose, instead of the usual plastic hose. Metal hoses were ordered for all glove boxes in Room 211.

Discussions with Fire Department personnel indicated that CO_2 flooding of a glove box was not particularly effective. With the use of CO_2 it would also be difficult to prevent pressurizing a glove box. Dry powder extinguishers are preferred on all counts except possibly from the standpoint of cleanup after a fire. It was suggested that forthcoming fire extinguishing tests in a glove box for the TrU program in Building 4505 should include a dry powder test.

Installation of the laboratory in Room 211 continued, using craft manpower as made available.

5.3 HRLAL Design (W. R. Winsbro)

The Title I report for the HRLAL was completed and distributed by Vitro. It was then reviewed, and approved by both ORO-AEC and ORNL during the period of this report. A copy of the report has been submitted to the ORNL Hot Cells and Sources Committee for their review and comment.

A modification to the project directive (CL-256), authorizing additional funds for all Title I and Title II design, has been prepared and released by the ORO-AEC. Project funding was increased by $175,000, from $50,000 to $225,000. The distribution of total funding is as follows:

Vitro Engineering Company	$202,000
Corps of Engineers	7,000
ORNL Participation	16,000
Total	$225,000

Vitro commenced Title II design around mid-June 1961. A drawing and specification schedule has been prepared, reviewed by ORNL and the ORO-AEC, and finalized. The latest issue of this schedule lists 76 drawings and 51 specifications and is based on a Title II design completion date of November 10, 1961. The current status of the Title II design is summarized below:

Vitro estimated completion for the month of July	13%
Vitro estimated total completion to date	22%
Number of drawings submitted for approval to date	5
Number of drawings approved to date	0

5.4 23 MDL Design (A. R. Irvine)

Vitro Engineering Company completed and issued the conceptual design report, KLX-1835, for the U-233 Metallurgy Development Laboratory.

5.5 BNL Kilorod Program (A. R. Irvine)

Preparation of preliminary material balance and equipment flowsheets which would be used for the BNL Kilorod Program if it is assigned to ORNL was begun. It is now anticipated that all thoria sol would be prepared in the Unit Operations Facility in Building 4501 and transferred to Building 3019 for blending with U-233. This approach would minimize the equipment design problem, as well as the space and manpower problems. The major area of uncertainty in the flowsheet concerns the firing cycle, and in particular, the reduction phase of the firing cycle. The variables of time, temperature, and hydrogen concentration required for adequate reduction of UO_3 to UO_2 are not yet fully established; nor is the procedure for removal of sorbed hydrogen from the oxide.

5.6 Pa-U Program (B. B. Klima, F. L. Peishel)

Equipment for the Pa-U program will be located in Cell 3 of Building 4507 and in Laboratory 1 of Building 3508. The design of equipment for the former location is now 95% complete. Design for the latter location 61% complete, fabrication 19% complete, and installation 10% complete.

The target date for the irradiation of the Pa-231 is now October 22, 1961. Fabrication of individual pieces of processing equipment will be completed by the middle of September and installation is scheduled for completion October 1. Cold testing of process equipment will begin October 1.

The items to be installed in Building 3508 for Pa-231 pellet preparation consists of pelleting and welding equipment. Design of this equipment is

approximately two weeks behind. The pelleting press has been purposely delayed because of the possible use of a Lawrence Radiation Laboratory concept, which, if acceptable, will expedite the particular unit. The welding equipment will be based on data now being obtained in the shops by S. D. Clinton for a similar problem.

The separated and partially decontaminated U-232 and Pa products from the Building 4507 operations will be processed further in a double 2-in.-thick lead shielded glove box with Castle manipulators and two additional unit shielded glove boxes, all at 3508.

5.7 Eurochemic Assistance Program (E. M. Shank)

One transmittal letter listing 23 documents was sent to R. J. Sloat at Eurochemic. The categorized list (ORNL-CF-59-4-84, Rev. 1, Suppl. 1) of information sent to and received from the Eurochemic Company, January 1, 1961, through June 30, 1960, was completed and will be sent to reproduction. Nine Eurochemic-Originated documents were reproduced but not distributed.

5.8 Fuel Shipping Study (L. B. Shappert)

The drop surface for the cask drop tests has been completed in the 7000 area. It consists of a 6-in.-thick slab of reinforced concrete. The quick release mechanism has been tested by dropping a 1-ton steel-framed lead slab onto the surface while taking high speed motion pictures. All equipment appeared to work satisfactorily. Instrumentation for the drop tests is virtually complete.

5.9 Assistance to Chemical Development (A. M. Rom)

Plasma Jet. An all metal (brass) reaction chamber for the plasma jet was designed and submitted to E & M for fabrication. This design provided for a top mounted jet directed downward through the chamber which is water jacketed for cooling. A 2-in. window was provided at the bottom of the chamber for observing the flame during operation.

The plasma jet is being used by several groups and another experimental apparatus is in preliminary design for premixing UF_6, CH_4, and H_2 prior to injection into the plasma jet flame at a known rate.

4507 Optics. Construction drawings are being made of a prism objective to be located on the inside of a new 10-in. sleeve drilled into the operating face of Cell 2. The prisms will be manipulated from outside the cell and will transmit the picked-up image to a telescope to be provided separately.

Purex 1WW Carrier. Study sketches were reviewed by others and detailed design will start incorporating pertinent reviewer's comments.

5.10 CANE Project (J. W. Landry)

The CANE sequenced sampler is approximately 50% complete. Completion is scheduled for October 1 to allow one week for preliminary testing and a trial at ORNL. Installation of the CANE sequenced sampler at the Project Gnome site presently is scheduled by Lawrence Radiation Laboratory for October 15. The CANE sequenced sampling experiment is part of the Project Gnome isotopes program. The major objectives of this program, as set forth in the Technical Director's Operation Plan, are as follows: In addition to the sequenced gas samples, ORNL will obtain integral samples and core samples for the CANE studies.

Isotopes Program. The major objective of the isotopes program is to study the behavior of as many different chemical elements as possible by radioactive tracer techniques. A second objective is to verify the yield of the nuclear explosive.

The Gnome experiment is designed only to test the recovery of isotopes. Those of special interest are:

1. Isotopes of atomic number less than 90 which may have applicability as compact heat or power sources. Examples are Tl-204 and Po-210.
2. Fissionable isotopes, particularly U-233 and Pu-239.
3. Isotopes of transplutonic elements.
4. Tritium, which will have application on controlled thermonuclear work and various types of research.

The actual feasibility of the production and recovery of these isotopes depends more on the phenomenology of the explosion than on the ability to manufacture the blanket or explosive components or their individual chemistry. Only the case of a residual cavity under pressure will be discussed in detail.

The tracers to be studied will either be produced by the explosion in quantities known to various degrees or added pre-shot external to the explosive. In the case of important species where the amount produced would be poorly known, it is more desirable to add known amounts of tracer in one to 100-curie quantities. This will probably be the case for the following nuclides:

Cm-232, Am-244, Pu-238, U-233, Th-230, Po-210, Tl-204, and H-3.

The recovery of tritium depends primarily on the state of the cavity following the detonation because tritium behaves like hydrogen, and forms water with

oxygen. If the cavity does not collapse, water vapor will be contained inside and could be recovered by displacing the gases to the surface. If the cavity collapses, however, the water vapor will diffuse through the broken rock and be very difficult to recover.

The following specific measurements are planned:

1. An attempt will be made to obtain a prompt sample by running a vacuum pipe from the zero point to the surface of the ground. Condensible debris will be caught on a reinforced cellulose filter and permanent gases in a ballast tank behind the filter. The filter will catch particulates with good efficiency down to sub-micron diameters. The final gas pressure in the ballast tank is expected to be atmospheric or less. Differential samples of the gas will be taken on a time sequenced basis by ORNL. The prompt sampling technique is not unique to a salt environment but applicable to other media as well. Filter and gas samples will be analyzed for a number of nuclides.
2. In the event a cavity under pressure is encountered by the first drill hole, it is planned to vent the hot gases through a decontamination system. A number of samples of this gas will be taken at the well head by filling evacuated bottles during the venting. These samples will be analyzed for several nuclides.
3. Following the venting, an attempt will be made to recover solid and/or liquid salt samples by core drilling in a second hole. A vertical profile through the puddle would be most desirable. This sample will be separated into several portions by position and phase, where possible, and analyzed for many nuclides.
4. Both the gas and solid samples will be chemically analyzed for major constituents. Chemical studies will aslo be made on the most interesting nuclides to determine oxidation state, solubilities in water and acids, fractional crystallization effects, scavenging by sediments in salt, etc. NRDL may participate in this work. Flowsheets and economic studies of recovery of some species may be made. The cost of recovery of uranium and transuranium elements is determined in part by the volume of salt which has to be processed. The heavy elements are associated with the insoluble silts which comprise only a few per

cent of the salt mass. Conditions leading to the isolation of the silt from the melt will result in concentrating the heavy elements. Slow cooling is one such condition.

In order to obtain optimum information on isotope production and recovery, accurate account will be kept of the materials used within about 100 feet of the device. Materials of interest are concrete, water, wood, cloth, plastic, rubber, paraffin, tars and grouts of various kinds. The total of all these things should be kept as small as possible, and it would be desirable if it were less than 4,000 lbs.

6.0 PROJECT ENGINEERING

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

A list of the 54 drawings started during July 1961 is given in Table 3. In addition, 28 drawings started earlier proceeded to the check print stage and 36 to approved status. In July 13 sketches and 70 illustrations were prepared.

A breakdown of drafting time during July by cost account is as follows:

Account No.	Manhours	% of Total
3370-1	8.0	0.4
3370-22	186.0	9.9
3370-33	44.0	2.3
3370-34	66.5	3.5
3370-73	176.0	9.3
3370-108	332.0	17.6
3370-113	24.0	1.3
3370-123	966.7	51.2
3200-00	47.0	2.5
3340-1	38.0	2.0
	1888.2 hours	100.0%

There were 208 hours of overtime worked in July 1961.

6.2 Engineering and Instrument Department Assistance

A summary of drawings prepared during July in the Engineering and Instrument Departments is given in Table 4.

6.3 Material Purchase Status

Table 5 gives a listing of all outstanding purchase requisitions (except

instruments) as of August 1, 1961.

6.4 Work Order Status

Table 6 presents a listing of all outstanding work orders as of August 1, 1961, for which the Process Design Section is responsible.

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

HEG/nr

Table 3. Summary of Drawings Started in Process Design Section Drafting Room During July, 1961

Job No.	Drawing No.	Rev.	Title	Date Started
503	D-45656		Immi Contactor Solvent Extraction System, T-6, T-9, T-9A Cooling Coils	7/10/61
	D-45657		Immi Contactor Solvent Extraction System, T-30, Storage Tank Modification	7/10/61
	D-45659		Immi Contactor Solvent Extraction System, Waste Holdup Tank Pit & Shielding Supp.	7/10/61
	D-45660		Immi Contactor Solvent Extraction System, Waste Holdup Tank Pit, Piping Modif.	7/10/61
	C-45661		Immi Contactor Solvent Extraction System, Waste Holdup Tank Pit, Cover	7/5/61
	D-45696		Immi Contactor Solvent Extraction System - Waste Holdup Tank Pit, Dry Well	7/24/61
701	E-34233		TrU Lab. Typical Cubicle Cells 3, 4, and 5 - Plan and Sections	7/6/61
	D-34365		TrU Lab, 12-unit Disconnect	7/5/61
	E-45688		Cell No. 4 Circle Flowsheet - TrU-CP	6/30/61
	E-45689		TrU-CP Cell No. 5 Circle Flowsheet	7/7/61
	D-45664		TrU-CP Impact Wrench Modification	6/29/61
	E-45682		TrU-CP Proposed Building Layout No. 28	7/17/61
	E-45683		TrU-CP Sections A-A and B-B	7/17/61
702	D-34131	4	Alpha Containment Box for Cell No. 3	7/28/61
	D-34310	1	10-ml Shielded Sample Carrier	7/28/61
	D-34335	2	Finger Pump Support and Modifications	7/28/61
	D-34540	1	Pa-U Program - Alpha Box, Bottom Liner	7/25/61
	D-34543	1	Pa-U Program - Batch Extraction System	7/26/61
	D-34601		U-232 Preparation Program - Preliminary Process Flowsheet	7/27/61
	E-45662		Pa-U Program - Dissolver Assembly	7/7/61
	C-45667	1	Pa-U Program - 12-unit Disconnect Mark II	7/5/61
	D-45668		Pa-U Program - Cell 3 Interim Closure Detail Sheet No. 1	7/18/61
	D-45669		Pa-U Program - Arrangement and Details Polyethylene Disconnect	7/6/61
	C-45670		Pa-U Program - Support Details	7/11/61
	D-45671		Pa-U Program - Cell 3 Piping	7/12/61
	D-45672		Pa-U Program - Dissolver Details	7/11/61
	D-45673		Pa-U Program - Cell 3 Interim Closure Detail Sheet No. 2	7/11/61
	D-45674		Pa-U Program - Cell 3 Interim Closure Detail Sheet No. 3	7/12/61
	D-45675		Pa-U Program - Cell 3 Interim Closure Detail Sheet No. 4	7/12/61
	D-45676		Pa-U Program - Cell 3 Interim Closure Detail Sheet No. 5	7/12/61
	D-45677		Pa-U Program - Single Unit Plastic Disconnect - Assembly & Details	7/13/61

Table 3, Continued

Job No.	Drawing	Rev.	Title	Date Started
702 Cont'd	D-45678		Pa-U Program - Cell 3 Electrical Installation - Sheet 1	7/13/61
	D-45679		Pa-U Program - Cell 3 Electrical Installation - Sheet 2	7/18/61
	D-45680		Pa-U Program - Interim Closure Details - Sheet 6	7/20/61
	D-45684		Pa-U Program - Carrier Insert and Capsule Holder	7/17/61
	C-45685		Pa-U Program - Installation Details Polyethylene Disconnect Bracket on Micro Bellows and Finger Pump	7/17/61
	D-45686		Pa-U Program - Cell 3 Piping, East Wall Elev. and Connection Sch.	7/13/61
	D-45687		Pa-U Program - Cell 3 Northeast Roof Plug	7/18/61
	D-45688		Pa-U Program - Slug Chute (Cell 3) Assembly and Details	7/18/61
	D-45689		Pa-U Program - Cell 3 Processing Box - Back Elevation	7/19/61
	D-45690		Pa-U Program - Cell 3 - Processing Box - Right Side Elevation	7/19/61
	D-45691		Pa-U Program - Cell 3 Processing Box - Left Side Elevation	7/20/61
	D-45692		Pa-U Program - Cell 3 - Processing Box - Bottom Plate	7/19/61
	E-45693		Pa-U Program - Equipment Rack "B"	7/24/61
	D-45694		TrU Precipitator	7/25/61
	D-45697		TrU - Ion Exchange Panelboard - Cell 3	7/27/61
	D-45698		Pa-U Program Cell 3 Piping - In-cell Interconnection Piping	7/27/61
	C-45601		Pa-U Program - Cole Connector - Assembly and Details	7/22/61
Miscellaneous Jobs				
3370-56	D-34536	1	Lab 259-D - Exhaust System	7/24/61
3370-80	D-45654		Plasma Jet Condensation Chamber	7/12/61
3370-113	D-44690		Carrier Drop Test Inst. Mtg. Bracket For Carriers 1 thru 8	7/24/61
A-42157-41	D-34530		High Level Waste Facility - Engineering Flowsheet No. 1	7/31/61
	D-34550		High Level Waste Facility - Engineering Flowsheet No. 3	7/31/61
	D-34551		High Level Waste Facility - Engineering Flowsheet No.4	7/31/61
	C-34620		High Level Waste Facility - Valve Pit Schematic	7/31/61

Table 4. Summary of Drawing Progress in Engineering and Instrument Departments for Month of July, 1961

Job No.	Job Order Number	Drawing Number	Rev.	Title	Transmittal Date
2528	A-70455-11	D-45578		Wiring Diagram	7/6/61
3019	A-20458-12	Q-2052-1	5	N_2 Control Panelboard Front Layout	7/5/61
		Q-2052-5	2	N_2 Control Panelboard Rear Panel Piping Panel #VPP-N_2DE	7/5/61
		Q-2052-6A	6	N_2 Control Panelboard Rear of Panel Piping	7/5/61
		Q-2052-6B	6	N_2 Control Panelboard Flow Diagram	7/5/61
		Q-2052-46	2	Rear of Graphic Panel Wiring Diagram	7/5/61
		Q-2052-47	3	Power Wiring Between Remote Locations and Main Control Panelboard	7/5/61
		Q-2052-71	2	HF-FV-1001 Scrubber Front and Back of Panels	7/5/61
		Q-2052-73	1	Scram System	7/5/61
4501	A-42507-12	D-44059		Denitrating Furnace - Detail Sheet No. 10	7/13/61
		D-45050		Denitrating Furnace - Assembly	7/13/61
		D-45051		Denitrating Furnace - Detail Sheet No. 1	7/13/61
		D-45052		Denitrating Furnace - Detail Sheet No. 2	7/13/61
		D-45053		Denitrating Furnace - Detail Sheet No. 3	7/13/61
		D-45054		Denitrating Furnace - Detail Sheet No. 4	7/13/61
		D-45055		Denitrating Furnace - Detail Sheet No. 5	7/13/61
		D-45056		Denitrating Furnace - Detail Sheet No. 6	7/13/61
		D-45057		Denitrating Furnace - Detail Sheet No. 7	7/13/61
		D-45058		Denitrating Furnace - Detail Sheet No. 8	7/13/61
		D-45059		Denitrating Furnace - Detail Sheet No. 9	7/13/61
4505	A-01491-11	D-43686		Screw Drive Trap Door Valve - Assembly	7/25/61
		D-43687		Screw Drive Trap Door Valve - Detail Sheet No. 1	7/25/61
		D-43688		Screw Drive Trap Door Valve - Detail Sheet No. 2	7/25/61
		D-43689		Screw Drive Trap Door Valve - Detail Sheet No. 3	7/25/61

Table 5. Purchase Requisition Status Aug 10, 1961

Job No.	Purchase Req. No.	Date Issued	Description
Miscellaneous			
-59	D-0014	3/29/61	U jet tests and explosive valve tests
4507	D-0043	5/26/61	Periscope alterations
-113	D-0054	7/10/61	100 # Steel shot
-80	D-0055*	7/11/61	3 Vycor and Co. blue sight glasses
-59	D-0056	7/20/61	8 Pressure and vacuum pressure gauges
-59	D-0057*	7/20/61	7 O-seal Swagelok connectors
-59	D-0058	7/25/61	7 Conax Explosive valves
-59	D-0059*	7/29/61	14 - Stainless steel bellows valves
4507	D-0060	7/28/61	4 Removable boot assemblies
Transuranium - 4507			
700	D-0303	12/28/60	Bids request, fabrication of TrU carrier
700	D-0328	3/24/61	Two manipulator boots for alpha box
702	G-9701	6/29/61	30 Air-operated polythene valves
702	G-9703	6/30/61	Seven ceramic glove ports
123	G-9704	7/6/61	12 Teflon filters
123	G-9705	7/10/61	48 Contact plugs and sockets
702	G-9706	7/13/61	Stirrers
123	G-9707	7/13/61	Rulon tubing
123	G-9708	7/13/61	720 Polyethylene bottles
123	G-9709	7/18/61	1000 # Elec. Hoists
123	G-9710	7/18/61	Stainless steel piston check valves
123	G-9711	7/18/61	600 volt control cable
123	G-9712	7/18/61	10# Polyethylene welding rod
123	G-9713	7/20/61	20-125 V 7-prong connectors
123	G-9714	7/21/61	1 Variable speed control
123	G-9715	7/21/61	1 - 1/6 HP Gear motor
123	G-9716	7/21/61	1 Sigma pump
123	G-9717	7/21/61	1 - 2-ton Lift table
123	G-9718	7/21/61	2 - 1/2-ton Electric hoists
123	G-9719	7/21/61	6 Wire coil springs
123	G-9720	7/25/61	6 Pyrex flasks and 1 glass wash bottle
123	G-9721	7/25/61	Hot plate and magnetic stirrer
Waste - Ion Exchange Pilot Plant			
604	F-2004	5/31/61	Chemanalyzer for water analysis
Waste - Calcination Pilot Plant			
605	G-1002	4/27/61	One Centrifugal pump for ANN
605	G-1003	6/7/61	Lockheed subcontract

Table 5, continued

Job. No.	Purchase Req. No.	Date Issued	Description
PRFP - Mechanical			
510	D-6247	5/26/61	Twelve 18-in.-dia cutoff wheels
510	D-6259	7/14/61	1 Bolt die
510	D-6260	7/24/61	220-gal Hydraulic oil
PRFP - Chemical			
503	D-6414	3/21/61	Glove boxes and auxiliaries
Transuranium - 3508			
700	D-6613	3/17/61	One pair ANL Model 8 manipulators
123	D-6614	4/5/61	Fabricate tandem shielded glove box
123	D-6818	7/24/61	Leveling jack
3508	D-6819	7/25/61	12 Filter cartridges
Volatility			
404	D-7019	6/29/61	INOR-8 pipe and tubing
404	D-7020	7/26/61	INOR-8 sheet and plate

*Issued and completed in July, 1961.

Table 6. Work Order Status Aug. 1, 1961

Job Number	Job Order Number	Charge Number	Engr.	Date Issued	Cost Estimate	Description	% Complete
2026	A-06125-11	329053	WRW	1/ /61		Preliminary Design HRLAL Addition	100
3019	A-01546-11	3370XX-125	WGS	7/24/61		Ventilation System for Sample Gallery	0
3019C	A-93249-01	329090	WGS	6/29/60	9,100	Hot Analytical Cell and Hood Vent Filters, Titles I, II, and III	85
3019C	A-93249-02	329090	WGS	6/29/60	2,600	Hot Analytical Cell and Hood Vent Filters, ORNL Participation	60
3019C	A-93249-03	329090	WGS	6/29/60	1,500	Hot Analytical Cell and Hood Vent Filters, I & C Div. Participation	0
3019C	A-93249-04	329090	WGS	6/29/60	82,600	Hot Analytical Cell and Hood Vent Filters, Lump-sum Contract, Hixon Constr. Co.	75
3505	A-01446-11*	337053-22	FEH	12/9/60	2,000	Design and Estimation for Canal Water Filter and Ion Exchange Unit	100
3505	A-70570-11	337053-132	HBG	7/26/61	15,000	Loading of SRP Carriers	0
4507C	A-01362-11	337053-20	AMR	6/15/60	10,115	Temporary Containment Changes for Cell 2	85
4507	A-01514-11	337053-37	RPM	5/18/61		Install HF Cylinder Cabinet in 4507	100
4507C	A-93114-02	337090-01	AMR	7/29/60	11,300	4507 Containment Changes, ORNL Participation	100
4507C	A-93114-03	337090-01	AMR	7/29/60	106,000	4507 Containment Changes, CPFF Contract	100
4507C	A-93114-04	337090-01	AMR	7/29/60	21,000	4507 Containment Changes, Detection Instruments	35
4507C	A-93114-05	337090-01	AMR	7/29/60	5,000	4507 Containment Changes, Title II Engineering	100
4507	A-93560-30	337092-133	ELN	3/10/61	11,000	Install Valve Pit and Underground Waste Line	15
7930	A-01467-11	337053-114	ARI	2/10/61		Preliminary Design Assistance on U-233 Metallurgical Laboratory	50
Reclamation of Used Equipment							
-1	A-41624-41&-61	337053-01	PLR	7/16/59	10,000	General Equipment Repair and Storage for Re-use	100
CANE Project							
-59	A-01545-11	3370XX-59	JWL	7/24/61	7,318	Fabricate Gnome Sampler Vessels	0
-59	A-20475-11	337053-59	JWL	3/16/61	6,508	Fabricate Instrumentation for Gnome Sequenced Sampler	60
-59	A-20484-11	337053-59	JWL	4/14/61	5,000	Design and Fabricate Transistorized Timer	30
Fuel Shipping Study							
-113	A-01499-11	337053-113	LBS	5/5/61	15,000	Fabricate Three Carrier Models for Drop Test	50
Homogeneous Reactor Program							
304	A-20345-11	337053-109	BFB	5/18/60	3,707	Instruments for Spectrophotometric Fuel Analysis Loop	100
Volatility Program							
404	A-01533-11	337053-73	RPM	6/28/61		Assistance to BMI on VPP Corrosion Tests	0
Power Reactor Fuel Processing							
500	A-20428-11	337053-22	ARI	11/30/60	580	Instrumentation for Experimental Flowmeter Test	0
503	A-70447-11	337053-133	ELN	1/16/61	50,000	Modification of Immi Equipment for Pu-Al Processing	100
503	A-93553-01	337092-133	ELN	3/7/61	3,350	Fabricate Accessories for Pu-Al Carrier	75
506	A-01528-11	337053-132	WRWh	6/27/61	1,765	Install Glove Box Sampling Station, 3019	10
506	A-01535-11	337053-132	WRWh	6/27/61	907	Fabricate Auxiliary Vessels for U-233 Storage	30
506	A-93636-01	337092-132	WRWh	5/19/61	4,730	Install and Pipe U-233 Storage Tank	55
506	A-93636-03	3370XX-132	WRWh	7/10/61	2,850	Install 6 in. Lead Shield Around U-233 Storage Tank	0
510	A-01418-11	337053-106	WFS	9/2/60	14,113	Final Design Items, Segmenting Facility	80
510	A-01488-11	337054-106	WFS	4/7/61	19,000	General Maintenance on SRE Decladder and Auxiliaries	100
510	A-01525-11	337054-106	WFS	6/12/61	6,850	Maintenance on SRE Equipment	90
510	A-42264-13	337054-106	WFS	12/14/60	19,695	General Maintenance on SRE Decladder and Auxiliary During Operation	100
511	A-01448-11	337053-106	WFS	12/14/60	18,234	Fabrication of Inclined Conveyor	100
511	A-01491-11	337053-107	WFS	4/19/61	12,000	Design of 250-ton Shear Auxiliary Equipment	40
511	A-93174-01	337092-106	WFS		171,600	Procure 250-ton Shear from Birdsboro Corporation	100
511	A-93174-02,3,4,5	337092-106	WFS	6/2/60	3,360	Design Auxiliaries for 250-ton Shear	30

Table 6, Continued

Job Number	Job Order Number	Charge Number	Engr.	Date Issued	Cost Estimate	Description	% Complete
Waste Program							
603	A-06213-11*	334053-1	FNB	5/26/61	750	Cost Estimate By-pass Stream, Melton Hill Lake to Melton Valley	100
603	A-93534-10	363290-00	FEH			Design of Waste Tank and Evaporator	96
604	A-01524-11	337053-34	JOB	5/3/61	3,000	Install PVC Line from 3518 to 2328	0
604	A-70455-11	337053-34	JOB	3/2/61	30,000	Fabricate and Install Equipment for Ion Exchange Pilot Plant	50
604	A-70455-12	337053-34	JOB	2/28/61	10,000	Procure and Install Instruments for Ion Exchange Pilot Plant	100
604	A-70455-13	337053-34	JOB	3/30/61	2,000	Decontamination of Used Equipment for Ion Exchange Pilot Plant	25
605	A-01484-11	337053-34	JOB	3/27/61	15,000	Design Pot Seals for Calciner Pilot Plant	25
605	A-01547-11	3370XX-30	HOW	7/26/61	19,300	Fabricate and Install Pot Calcination Hot Cell Unit	0
Transuranium Facility							
7511	A-70489-61	3370XX-108	WEU	4/25/61		Architect-Engineer Design Assistance, TrU Mechanical Equipment	0
7511	A-70397-14	337053-28	BFB	12/12/60	24,500	Fabricate and Install Mockup of Intercell Conveyor	90
702	A-01480-11*	337053-108	BBK	3/21/61	2,150	Piping and Electrical Design Revisions to Transuranium Alpha Box Cell 3, 4507	100
702	A-70397-13	337053-28	BBK	7/15/60	4,950	Design and Install Instruments for Transuranium Cell 3 Glove Box	100
702	A-70397-15	337053-28	BBK	3/22/61	12,000	Install Alpha Box and Equipment in Cell 3, 4507	30
702	A-70397-16	337053-28	BBK	5/26/61	18,900	Modify Cell 4, Bldg. 4507, and install TrU SOX	0
702	A-70397-17	337053-28	BBK	5/26/61	28,100	Fabricate and Install TrU SOX Equipment, 4507 Mockup	0
702	A-70397-18*	337053-28	BBK	5/26/61	5,400	Instrumentation Design and Installation, TrU SOX, 4507 Mockup	0
702	A-70442-13*	3370XX-108	BBK	6/28/61	7,740	Design Changes on TrU Transfer Box, 4507	60
702	A-70442-14*	3370XX-108	BBK	7/21/61	5,500	Provide New O-Ring Seals on TrU Transfer Box	40
-123	A-70499-11*	337053-123	BBK	5/26/61	16,900	Fabrication and Installation of Pa Process Equipment, 4507 Mockup	30
-123	A-70499-12	3370XX-123	BBK	5/26/61	10,800	Fabricate Carrier for Pa	0
-123	A-70499-13	3370XX-123	BFB-FLH	5/31/61	1,900	Alpha Seal Adapt. for Castle Manipulator	0
-123	A-93483-01	337092-123	BBK	5/29/61	34,900	Install Shielded Glove Box and Equipment, Lab 1, 3508	100
-123	A-93687-01	3370XX-123	BBK	7/21/61	6,875	Convert Model 8 Manipulators in 4507 Mockup for Heavy Duty Service	0

C - Work Orders concerned with Containment
* - Request for close-out submitted

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