

1781

Unique Document # 54B 20006844 0000

This document consists of 28 pages.
No. 12 of 18 copies, Series A.

* 19940002382 *
DOE-OR

MONTHLY STATUS AND PROGRESS REPORT

FOR APRIL 1949

727212

BEST COPY AVAILABLE

A Report Submitted

by the

New York Operations Office

REPOSITORY Oak Ridge Op.
COLLECTION Records Holding Area
Doc. 1944-94
BOX No. Folder # 2 Bldg. 2714-H
FOLDER 4NN-326-87-8 8 of 45

Special Rereview
Final Determination
Unclassified

By: 4-9-84
Date: P. F. Brown

*This page
only*

May 10, 1949

W. E. Kelley, Manager

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
1ST REVIEW-DATE: <u>11/23/94</u>	DETERMINATION [CIRCLE NUMBER(S)]
AUTHORITY: <input type="checkbox"/> AOC <input type="checkbox"/> ADC <input checked="" type="checkbox"/> ADD	1. CLASSIFICATION RETAINED
NAME: <u>J.D. Lynn</u>	2. CLASSIFICATION CHANGED TO: _____
2ND REVIEW-DATE: <u>2/2/95</u>	3. CONTAINS NO DOE CLASSIFIED INFO
AUTHORITY: ADD	4. COORDINATE WITH: _____
NAME: <u>W. Smiley</u>	5. CLASSIFICATION CANCELLED
	6. CLASSIFIED INFO BRACKETED
	7. OTHER (SPECIFY): _____

~~SECRET~~
atch 20

1188907

~~SECRET~~

MONTHLY STATUS AND PROGRESS REPORT

FOR APRIL 1949

TABLE OF CONTENTS

	<u>Page</u>
I. ADMINISTRATION - - - - -	1
II. PRODUCTION - - - - -	3
III. ENGINEERING - - - - -	19
IV. RESEARCH AND DEVELOPMENT - - - - -	21
V. BROOKHAVEN NATIONAL LABORATORY - - - - -	23
VI. MEDICAL - - - - -	25
VII. LICENSING - - - - -	26

~~SECRET~~

[REDACTED]

I. ADMINISTRATION

A meeting was held to discuss coordination of NYCO and HOO policy relative to reimbursement of labor costs on Kellex contracts. Labor problems at MIT arising out of beryllium hazards were discussed with the contractor. Construction of the New Brunswick Laboratory was delayed by a strike of iron workers at Elizabeth, New Jersey. An inventory of equipment and supplies at the Luckey, Ohio, plant, which is to be used by the Brush Beryllium Co., has been conducted. A locomotive has been acquired for service at Lake Ontario Ordnance Works, and an analysis of rail shipping methods is under way.

Contractor Personnel Relations

Problems of personnel policy and labor relations were encountered at the Kellogg Co., Massachusetts Institute of Technology, and the New Brunswick Laboratory.

The Kellogg Corp. The NYCO Director of Personnel met with representatives of Kellogg for the purpose of developing better coordination between NYCO, ⁶⁵ and HOO relative to reimbursement of labor costs for the two Kellogg contracts, one of which is administered by ~~each of the above HOO Operations Offices~~ ^{General Electric NYCO}. Since the majority of personnel employed by Kellogg are engaged on both contracts, it is very desirable that identical action be taken by both Offices in respect to wage and salary approvals, in order to expedite reimbursement and eliminate unnecessary paperwork. A proposal of Kellogg to this end was thoroughly discussed. Following the meeting, Kellogg submitted a formal proposal to replace the mid-point control rule by Kellogg's Salary Control Policy and also to increase salary limitations from \$6,000 to \$8,000 per annum. The Company suggested that its proposal be the subject of a meeting among representatives of the two Operations Offices, General Electric, Kellogg, and the Washington Office as soon as possible. Arrangements for this meeting are being delayed pending a decision as to whether the contract now administered by NYCO is to be transferred to Hanford.

Massachusetts Institute of Technology. A meeting was held with representatives of MIT concerning the problem of beryllium hazards. There have been three cases of beryllium pneumonitis at MIT, which were publicized rather unfavorably. As a result, the union became concerned about the hazard and asked that a premium rate be provided. Although MIT does not favor this, the Institute agrees that some sort of insurance plan is in order. A suggestion was made that, instead of taking out insurance pertaining solely to the beryllium hazard, MIT should establish as a general policy protection from all kinds of hazard such as benzene, mercury, lead, etc. It was also recommended that, before anything is done about this matter, the cost of insurance should be determined, and compared with the probable cost of actually underwriting the difference in pay for any employee who might be incapacitated. The latter plan might prove to be much more economical, because safety precautions are now so adequate that future occurrences will be exceptional cases. MIT agreed to explore all possibilities.

~~SECRET~~

New Brunswick Laboratory. A strike of iron workers at Elizabeth, New Jersey made impossible the delivery of monorails and radiator and pipe enclosures essential to the construction of the laboratory at New Brunswick. No further fabrication is necessary for these materials. A telegram was dispatched to the General Vice President of the International Iron Workers' Union requesting that a government truck be permitted to pick up the materials and deliver them to New Brunswick. No reply was received. Contact was also made with the local union officials in New Brunswick, who turned down our request. At present, the strike is still in effect, and delivery of materials has not been made.

Inventory at Luckey, Ohio, Plant

As reported previously, the Federal Works Agency has granted permission for use of a plant at Luckey, Ohio, by the U. S. Atomic Energy Commission and by its contractor the Brush Beryllium Co. This permit granted the right to use all facilities, including buildings, equipment, and supplies, provided that, upon termination of the lease, all expended material be replaced in kind, fair wear and tear excepted. To eliminate possible confusion regarding the ownership of property at the plant, a joint inventory was taken by the three parties concerned. In order to avoid ear-marking funds for replacement, it has been decided by the AEC that all materials and supplies, and such capital equipment as depreciates rapidly, will be segregated and stored for return to the Federal Works Agency. Hard-to-get items may be "borrowed" from these stores, but will be replaced immediately.

The inventory is now being checked by the Federal Works Agency with its records in Washington, and will be forwarded in the near future to NYCO for acceptance.

Acquisition of Locomotive for Movement of Wastes

The acquisition of a locomotive from the Department of the Army has been delayed temporarily pending its release by other units of the Department of Defense. In order to avoid further delay in AEC work, the locomotive was loaned to NYCO, with the understanding that it be returned in the event it could not be transferred to the Atomic Energy Commission. This locomotive left Baltimore on April 22, 1949, and is scheduled to arrive at the Lake Ontario Ordnance Disposal Area on or about May 6, 1949.

Comparison of Rail Shipping Methods

Studies are now being made of the problems involved in certain recurring shipments of AEC materials by rail in carload lots. These shipments require armed guard services, and are otherwise expensive. The current studies are taking into consideration security, time, and cost. It appears that courier freight is more economical than armed-guard express shipments.

~~SECRET~~

~~SECRET~~

II. PRODUCTION

Processed pitchblende ore was shipped from Middlesex under the uranium strategic stockpiling program in increasing amounts. Uranium metal rolling operations will be consolidated at Simonds Saw and Steel Co., which has agreed to meet all AEC rolling requirements for fiscal year 1950. Plans for rescheduling uranium production operations are essentially complete. The scale of operations at the Harshaw brown oxide plant is increasing according to plan.

Thorium-production research at BMI centered on chemical and solvent extraction of monazite sands. Crushing and sampling of beryl ore continued as scheduled at Middlesex. Construction was started on the addition to the Luckey Plant which will produce beryllium metal for the AEC. Work is in progress at Brush on the direct chlorination of beryl and chlorination of beryllium hydroxide for the production of beryllium chloride.

MIT will soon commence casting 5.2"-and 6.2"-diameter beryllium billets for use in extruding shapes needed by BMI. The Gerity-Michigan Corp. of Adrian, Michigan, agreed to undertake beryllium extrusion work for the Commission. Installation of a 2500-ton beryllium extrusion press was started at Revere's Detroit plant. Dr. Kaufmann of MIT completed an investigation of beryllium extrusion techniques, and has developed methods which eliminate cracking in small-scale extrusions. Large-scale extrusions to confirm these results are planned for May.

Distillation equipment to produce low-hafnium zirconium oxide was installed at the Foote Mineral Co. and is in operation. Research on zirconium production and zirconium-hafnium separation is proceeding on a considerable scale, and a number of additional programs are planned.

Arrangements are being completed for the transfer of routine analytical work to the New Brunswick Laboratory. Improvements were made in the Monthly Uranium Report of the NYOO SF Material Accountability Branch.

Operations at Middlesex

During the month of April the strategic stockpiling program for uranium progressed materially. Sampling and crushing operations with beryl ore were continued.

Uranium Stockpiling. As part of the strategic stockpiling program, 10 lots of processed pitchblende ore (uranium content approximately 250 tons) were shipped from Middlesex to Mallinckrodt Chemical Works. An additional 12 lots were shipped to the St. Louis Airport site during the month. Also, Vitro soda salt with a uranium content of approximately 41 tons and one lot (18 tons net) of captured soda were sent to Mallinckrodt as feed materials.

- 3 -

~~SECRET~~

1188911

~~SECRET~~

No actual processing of pitchblende ore took place during the month of April, since no ore was received. The next shipment of pitchblende, which will contain approximately 181 tons of uranium, is expected to arrive at Middlesex about the end of May. There remain at Middlesex, as of April 29, only 8 lots (uranium content approximately 200 tons) of processed pitchblende.

Beryllium Ore Crushing and Sampling. The crushing and sampling of beryl ore at Middlesex is continuing as scheduled. When this operation was begun on March 28, several difficulties were encountered in sampling, which limited the total daily output to 10 tons of ore. These difficulties resulted chiefly from the large particle sizes which had to be maintained in order to obtain satisfactory refinery results at the Brush Beryllium Corporation. By modifying the sampling machinery at Middlesex so that the crushed ore flows satisfactorily, it has been possible to increase the output to approximately 40 tons of ore per day.

Approximately 400 tons of beryl ore have now been crushed, sampled and barreled. By May 6 all the beryl ore that is in bags, a total of about 750 lbs., will have been processed. These operations will be continued, using the beryl ore that is stored in open bins, until approximately 1,000 tons total have been processed.

It is expected that the jaws of the crusher will have to be replaced at the conclusion of this beryl ore operation before the plant will be able to resume the processing of pitchblende ore.

Uranium Production

Arrangements have been made for rolling of uranium at Simonds during fiscal year 1950. Production of uranium metal will shortly be consolidated at Mallinckrodt, ~~and Harshaw~~. The new brown oxide plant at Harshaw is now getting under way on a large scale. Problems of graphite scrap treatment have been considered.

Uranium Rolling. The Simonds Saw and Steel Company has agreed to roll uranium metal for the AEC during fiscal year 1950 at levels as high as 170 tons per month. As reported last month, it is more desirable from an economic standpoint to conduct all rolling operations at one mill. Since the Vulcan Crucible Steel Company cannot handle the larger-size billets which give better casting yields, it was decided to consolidate operations at Simonds. Because of this decision, rolling operations ceased at Vulcan after the March run. Portable Government property is to be removed immediately. Attached property is to be left at Vulcan; provision will be made for emergency standby facilities until the contract expires in August. Simonds submitted a design for a special, mechanized-feed, lead bath for billet heating. The design was approved by the NYCO staff, and Simonds was authorized to prepare an installation estimate.

Allocation and Scheduling of Uranium Metal Production. On the basis of a review of uranium production schedules, it appears that Mallinckrodt and Harshaw will be able to manufacture enough green salt to carry through projected schedules. Consequently, the Linde Air Products Co. plant can be shut

~~SECRET~~

1188912

~~SECRET~~

down on June 30, 1949, and placed in a standby condition until a new green salt plant is constructed. When such new facilities are placed in operation, the Linde plant will be dismantled. The Electro Metallurgical Division Plant will be operated in the fiscal year 1950 only long enough to consume the inventory of green salt produced by Linde. It will then be placed in a standby condition, but will be able to produce uranium metal in a future emergency.

The Mallinckrodt metal plant will operate at almost 100% of capacity after Linde and Electro Met cease operations. By consolidating production in this manner, a very substantial saving will be achieved over the cost of operating all plants at partial capacity.

In the original negotiations for the exchange of property between the Government and Linde, the latter indicated that it considered the Stop I and II building a liability and fire hazard. Recently, the company indicated the feasibility of using the building in question as a storage facility and placed a value of approximately \$500,000 on it. Linde proceeded to insure the building against fire, and requested that the AEC pay the premiums as called for under the contract. This development is now being studied at NYCO. If the company insists on using the building for storage purposes, future decontamination may become a serious problem.

Production of Brown Oxide. Operation of the new brown oxide plant at Harshaw is now getting under way on a large scale. The main difficulties which were encountered centered in the gas burners, the decomposition pots and the Niagara filters. The gas burners coked and plugged up, and proper temperatures could not be maintained. Installation of different burner nozzles for use with city gas has remedied the situation. Difficulty was also encountered in obtaining the proper discharge of cake from the Niagara filters. The present dish-bottom is being replaced with a specially-designed cone, and the discharge slurry line is being increased in diameter from 4" to 6". It is anticipated that these changes will solve the filtering problem. Considerable orange oxide has already been produced, and will be run through the reduction furnaces in early May.

Disposition of Graphite Scrap. At present, the Vitro Manufacturing Company burns all graphite scrap received at its plant in Canonsburg, Pennsylvania, in a very simple, home-made burner located on the premises. Company officials and NYCO staff members are in agreement that this burning operation should be performed at Hanford, before the graphite is shipped to Vitro. Since the ashes weigh only 2% to 3% as much as the unburned graphite, this will result in a great saving to the Commission in shipping costs. A description of Vitro's burner has been transmitted to Hanford at its request. Mallinckrodt has also been requested to burn its graphite scrap at St. Louis in a similar manner.

Thorium Production

Both chemical and solvent extraction methods for recovery of thorium from monazite solutions have been studied further during the month.

~~SECRET~~

Chemical Methods. In the NYOO progress report for March it was pointed out that a preliminary chemical separation of uranium and thorium from the bulk of the rare earths present in monazite solutions would simplify subsequent solvent-extraction purification. Such solutions are prepared from monazite sand by the caustic soda-nitric acid process. It was reported that hydroxide and peroxide precipitations had resulted in nearly quantitative recovery of thorium, while a reasonably good separation from the rare earths was accomplished. Preliminary analytical results indicated that the uranium recovery by these precipitation methods was only about 50%. Since then it has been found that cerium, in large amounts, interferes with the fluorimetric method of analysis for uranium. Consequently, it now appears that the percentage recovery is considerably higher; a more precise value will be reported when new analytical measurements have been made and verified.

Solvent Extraction Studies. An engineer from Battelle Memorial Institute is conducting tracer studies at Oak Ridge National Laboratory on a sample of a monazite nitrate solution. It has been found that solvent extraction using mixtures of hexane and dibutyl phosphate recovers substantially all of the uranium present in the solution. Parallel investigations at BMI showed poor uranium recovery, but this was apparently a result of cerium interference in the fluorescence method of analysis used.

Studies with Ce, Y, Pr, and Sm radioactive tracers indicate that complete separation of uranium and thorium from these rare earths in nitrate solutions should be possible by solvent extraction techniques using the above-mentioned solvent mixture.

The distribution behavior of thorium has been studied. It was noted that distribution coefficients varied, depending on whether the transfer was from the organic phase to the inorganic or vice versa. The factors involved will be studied further.

Beryllium Production

A contract has been negotiated for production of high purity beryllium metal. Progress has been made in casting and extrusion of beryllium.

Procurement of High-Purity Metal. A contract was negotiated with the Brush Beryllium Company to produce approximately 1,300 lbs. of raw pebble metal of very high purity before August 1, 1949, at the Cleveland pilot plant. This material is urgently required to permit the fabrication of special shapes for Knolls Laboratory.

Casting. It was reported previously that the optimum operating conditions for the newly-redesigned beryllium metal vacuum casting furnaces had been determined by The Beryllium Corporation during operation of the Government-owned casting plant. The data obtained are now being assembled, and will be used in an evaluation of casting operations. The original Be pebble stockpile at The Beryllium Corporation (4,202 lbs.) was completely

~~SECRET~~

consumed in the course of production of billets. Beryllium pebble metal from the Middlesex stockpile has been shipped to The Beryllium Corporation to be used in casting operations to provide billets for Commission requirements.

The motor-generator set at MIT which was used for the casting of Be billets has been repaired. MIT will now commence the casting of 5.2" - and 6.2"-diameter beryllium billets for use in extruding approximately 300 lb. of shapes required by Battelle. Since work on these billets will prevent MIT from casting 8"-diameter Be billets for a proposed developmental extrusion at the Revere plant during the week of May 16, 1949, five 8"-diameter billets will be furnished MIT from the casting plant at The Beryllium Corporation. This extrusion is discussed further below.

Extrusion. The installation of extrusion equipment is proceeding at Adrian, Michigan, and at the Revere Copper & Brass Co. Dr. Kaufmann of MIT has studied the causes of cracking during extrusion.

1. Adrian. As stated in last month's report, the patent clause in a letter contract for the operation of extrusion facilities at Adrian, Michigan, was rejected by the Canton Drop Forging and Manufacturing Company. Another company, The Gerity-Michigan Corporation of Adrian, Michigan, was therefore contacted. This company agreed to set up and operate the extrusion facilities at Adrian. Because of the urgency of this work, a letter contract was issued on April 12, 1949. This contract was on a cost basis and provided for no fee. A Type A patent clause was acceptable to the company.

It is expected that a cost-type definitive contract will be negotiated during May. Meanwhile, the Gerity-Michigan Corporation is proceeding to set up the extrusion facilities. The first developmental extrusion of $3\frac{1}{4}$ " square shapes for the Materials Development Reactor is planned for the week of May 9. A 2200/500 ton tube and rod extrusion press, a pumping station, a stretching machine, a straightener, a metallurgical laboratory, and some miscellaneous equipment are now assigned to the AEC for its exclusive use. Fifteen 8"-diameter Be billets, nine sound and six cracked, are being shipped to Adrian from the casting plant at The Beryllium Corporation for the May 9 extrusion.

2. Revere. The Michigan Division of The Revere Copper & Brass Co., Inc. started on the installation of a 2,500 ton extrusion press at Revere's Detroit plant. The installation is expected to be completed by the end of May or the early part of June, 1949. The construction of a new Lindberg electric furnace for pre-heating Be billets at the Revere plant was expedited, and the delivery date has been advanced two weeks to May 16, 1949.

3. Research at MIT. Dr. Kaufmann of MIT undertook a small-scale program to determine the causes for cracking of the $3\frac{1}{2}$ " square Be shapes during extrusion from 8" diameter billets, and to discover, if possible,

~~SECRET~~

~~SECRET~~

methods for eliminating this cracking. His work was performed on a 200-ton extrusion press at the MIT laboratory, using 2-inch diameter billets. Dr. Kaufmann's results were highly encouraging. They may be summarized as follows:

- (a) At various constant temperatures ranging from 1900°F to 1500°F, it was found that as the reduction ratio was increased the lateral cracking of extruded beryllium shapes was reduced and finally eliminated.
- (b) It was shown that when billets are extruded at approximately 1500°F cracking can be reduced, or virtually eliminated, depending upon the reduction ratio.
- (c) The use of thicker iron jackets was found to aid in successfully extruding beryllium shapes.

An extrusion is scheduled by MIT for the week of May 16, and at this time Dr. Kaufmann's group will attempt to confirm their findings by extruding 3 $\frac{1}{4}$ " x 3 $\frac{1}{4}$ " shapes from 8" diameter billets on an 1800-ton extrusion press at the Revere plant in Detroit.

Sintering. A contract has been negotiated and is being written with the Brush Beryllium Company for fabrication of beryllium powder metallurgy. It will provide for the fabrication of pie shapes for G.E., rods for G.E., finned tubes for Brookhaven, and rectangular shapes for Oak Ridge. This contract will be on a cost-plus-fixed-fee basis and will cover the period up to August, 1949.

Zirconium Production

Procurement and delivery of zirconium is proceeding on schedule.

Raw Metal Production. As anticipated in the March report, the equipment at the Foote Mineral Company for distillation of $ZrCl_4 - POCl_3$ to produce low-hafnium zirconium oxide has been installed and is in operation. The distillation column operates very smoothly, and no problems are foreseen in its use. Small-scale work on the decomposition of the Zr complex to produce a pure zirconium oxide is being carried out simultaneously with operation of the column.

Foote reports that the low-hafnium zirconium oxide being produced by the phosphate precipitation method has been purified to less than 0.1% hafnium, and that this material is now being chlorinated for the production of crystal bar by the iodide dissociation process.

Fabrication. Arrangements have been made with Battelle Memorial Institute to receive Bureau of Mines zirconium sponge and to convert it by the arc melting process to ingots for shipment to other Commission locations. Arrangements have also been made with the Bureau of Mines to supply fabricated zirconium as the need arises for the period up to June, 1949.

~~SECRET~~

1188916

~~SECRET~~

Production Research and Development

Research and development work on the production of beryllium and zirconium metal and on Hf-Zr separation was carried on at various sites and by many contractors during the month of April.

Beryllium. Development of a process for beryllium chloride production is continuing at the Clifton Products Co. Chlorination and metal production processes are being developed at Brush Beryllium Co., which is also studying the fabrication of beryllium powder. Sylvania Electric Products Co. is investigating high-purity beryllium metal production.

1. Clifton Products, Inc. The silica brick lining of the chlorinator is deteriorating rapidly. It is planned to renovate the unit with a new type of fused-quartz lining as soon as this material can be delivered to the site. Meanwhile, the apparatus will continue to be used in an effort to maintain production, even if only on a small scale. At present, production is proceeding at a rate of approximately 15 lb. of flake per week.

Designs for a large beryllium chloride distillation unit were submitted by Clifton. It is hoped that with the new chlorinator lining, beryllium chloride of satisfactory quality for metal production can be produced at an increased rate, so that the large distillation unit will not be necessary. Clifton will estimate the cost of building a laboratory-size distillation unit capable of satisfying the occasional small requests received by NYOO for beryllium chloride of higher purity than that usually available.

2. Brush Beryllium Company. It has been reported previously that a process for production of beryllium by the vapor-phase reduction of beryllium chloride with sodium is being developed at Brush. As part of this overall process, studies are in progress on the direct chlorination of beryl and the chlorination of beryllium hydroxide to produce beryllium chloride.

Thus far, direct chlorination of beryl has been carried out by passing chlorine gas over beryl pelletized with carbon. The operation is conducted at 1500°C, which approaches the melting point of beryl. This higher temperature of operation has made possible the conversion of 63 per cent of the beryllium oxide present in the beryl charge. The chlorination is partially selective; about twice as much beryllium is chlorinated as aluminum or silicon. In an attempt to improve this 63 per cent conversion, the effect of an increased amount of chlorine gas and a longer contact time, as well as of increased operating pressure, will be studied.

Laboratory studies on the chlorination of beryllium hydroxide have been conducted with chlorine, phosgene, and carbon tetrachloride. Carbon tetrachloride appears to be more reactive than the other two

~~SECRET~~

chlorinating agents, since an operating temperature of approximately 1100°C is required when it is used, as compared with 1200°C for the other two agents. Iron is removed effectively from the charge as ferric chloride, which is more volatile than beryllium chloride. For example, reacting a beryllium hydroxide and carbon mixture with carbon tetrachloride at 1100°C for approximately five minutes reduces the ferric content from 0.58 per cent to 0.002 per cent, based on beryllium oxide. This work has progressed so satisfactorily that a larger-scale apparatus is planned.

Work on the vapor-phase reduction of beryllium chloride with sodium is proceeding on a 100-gm. scale until the semi-pilot-plant equipment is in operation. Briefly, this process is carried out as follows: From separate boilers, beryllium chloride and sodium are vaporized into a reaction tube at such rates that the sodium is 75 per cent in excess. The reaction is carried on at 900°C under atmospheric pressure. The resultant product, Be + NaCl, is a powder; the NaCl is removed by sublimation at 950°C and 50 microns. Under these conditions, partial sintering of the beryllium occurs. There is strong evidence to indicate that if the NaCl is sublimed off at lower temperatures and higher vacuum (1-5 microns), the beryllium will remain unagglomerated as a powder with a particle size of approximately 15-20 microns. This matter is now under investigation.

The importance of this process cannot be minimized, since it promises to make possible direct production of beryllium powder or sponge of high purity. An average analysis of the sponge is as follows:

- Assay: 99.5 per cent beryllium
- BeO - 0.3 per cent
- Fe - 100-200 ppm.
- Ni - 100-200 ppm.
- Mn - 100-200 ppm.
- Cr - 400 ppm.

Work is also in progress at Brush on development of techniques for handling beryllium powder in the proper atmosphere during its preparation and after packaging. In a recent experiment, sintered process QM beryllium was extruded at 400°C (below the recrystallization temperature) in a carb alloy die, with a 90 per cent reduction in area. Extrusion pressure was 100 tsi. This material represents beryllium which has been severely cold-worked. As can be seen from the table below, its diamond-point hardness (285) was the highest of several grades of sintered beryllium tested. Heat treatment studies will be performed on this material to discover what effect can be produced on grain size.

<u>Type of Sintered Beryllium Specimen</u>	<u>Diamond-Point Hardness</u>
Vapor-phase sodium reduction	123
Vacuum-cast metal	150
Vacuum-cast, extruded at 1950°F	143
Process QM	166
Process QM, extruded at 1960°F	147
Process QM, extruded at 400°C (90 per cent reduction)	285

~~SECRET~~

From the above table it can also be seen that beryllium obtained by vapor-phase reduction of beryllium chloride with the Na is the softest of those tested. This is also demonstrated by the relative difficulty experienced in breaking up metal sponge produced by this process.

Work on the development of powder metallurgy techniques for the fabrication of several shapes for the GE pile progressed satisfactorily. A cost estimate is in preparation by Brush for the fabrication of quantities of these shapes, which include GE "gears" and tri-fluted rods. Development work on the preparation of GE "washers" has been terminated, since this type of shape is now obsolete.

3. Sylvania Electric Products Co. A small laboratory furnace has been constructed at Sylvania for the purpose of preparing beryllium metal with reduced oxide content by evaporation. It is hoped that the metal thus obtained will show improved cold physical properties.

Initial work on beryllium purification by vacuum evaporation indicates that the aluminum and magnesium content of the charge can be reduced by operating at approximately 700°C. A fractionating process is contemplated which should reduce the concentration of these elements by low-temperature operation. This is to be followed by high-temperature evaporation for final beryllium purification.

Sylvania will conduct some experimental studies on the preparation of high-purity beryllium by the thermal dissociation of beryllium iodide. The apparatus proposed does not involve the hot wire technique by which MIT attempted unsuccessfully to grow dissociated beryllium. The design proposed by Sylvania provides for dissociation on a tantalum plate heated by a tungsten filament.

Zirconium. Research on zirconium deals both with metal production techniques as such, and with the special problem of separation from hafnium.

1. Metal Production. A wide variety of processes for the production of zirconium metal are being studied, and additional investigations are projected.

- a. National Research Co. Construction of the continuous casting machine is well under way, and the tentative date for the first trial run, utilizing stainless steel, is set for the first part of May. One and two inch nitrided dies are being fabricated at N.R.C.

A small experimental unit for investigating the dissociation of various halides is being used presently in an effort to determine the best compound for this phase of the work. The only compound tested to date is zirconium tetrachloride. There is evidence that some metal escapes from the reaction chamber along with the regular exhaust products.

- b. Brush Beryllium Company. Under existing Contract 510, Brush has recently undertaken studies on the development of a process for the production of zirconium by vapor-phase reduction of the tetrachloride with sodium. These studies are based essentially on techniques developed for the vapor-phase reduction of beryllium. Some initial work has already been undertaken, and difficulty has been experienced from alloying of the zirconium with the nickel-tube reaction chamber. Consideration is being given to the possible use of a titanium or zirconium lining to overcome this alloying.

- c. Massachusetts Institute of Technology. MIT is studying two methods for the production of zirconium: bomb reduction of zirconium tetrachloride with calcium, employing zinc chloride or beryllium chloride as a booster; and reduction of zirconium oxide with silicon. The latter study was undertaken after it had been demonstrated that carbon is unable to reduce zirconium oxide. Nevertheless, although the work has not progressed very far, silicon appears to reduce zirconium oxide fairly well. No actual data are yet available. A third method planned for early investigation at MIT involves the preparation of zirconium crystal bar by the thermal dissociation of zirconium tetraiodide, employing induction heating rather than the conventional hot-wire method. It is hoped that it will be possible to grow much larger crystal bars in this manner.

- d. Battelle Memorial Institute. It has been mentioned previously that NYOO is considering a possible development program at Battelle Memorial Institute for the production of zirconium by an improved hot-wire process. Such a process might be capable of producing crystal bar of a much larger size than is currently available. No decision on this program has yet been reached, however, because of difficulties with the Iodine Education Bureau, for which Battelle is currently conducting development work on the iodide process. This organization takes the position that if Battelle were to conduct the above program for the AEC, the Iodine Education Bureau should acquire any patents which evolved from such work. This arrangement is obviously quite unsatisfactory. Efforts are now in progress to effect a satisfactory agreement among the parties on the matter of patents. If these efforts are successful, the AEC may be able to give further consideration to initiation of such a development program at Battelle.

- ~~SECRET~~
- e. Horizons, Inc. At the April 20 meeting of the Zirconium Advisory Group discussions were held with representatives of Horizons, Inc. regarding the company's technical proposal for investigating the production of zirconium in coherent form by electrolysis from fused fluoride baths. It was decided by the Group that a short-range program of several months' duration could well be justified to determine the feasibility of this method. Consequently, Horizons will be requested to submit a budgetary estimate for conducting this investigation on such a basis.

In view of the strong background of Westinghouse Electric Corporation's Bloomfield, New Jersey, laboratory on electrolytic zirconium, this company will also be requested to submit a similar proposal. When both proposals have been received, a decision will be made to determine which laboratory shall conduct the investigation.

- f. Titanium Alloy Manufacturing Company. A proposal for effecting improvements in the Kroll Zirconium Process was received from Titanium Alloy and was reviewed by the Zirconium Advisory Group and NYCO staff members. The proposal appears attractive and will be acted upon accordingly. Titanium Alloy has had extensive experience with titanium, an element similar in many ways to zirconium. Much of the necessary equipment is already available.
- g. Electro Metallurgical Division. A proposal relative to Kroll Zirconium Process improvement, submitted by the Electro Metallurgical Division of U.C.C.C., was reviewed unfavorably by the Zirconium Advisory Group and the staff of NYCO. In comparison with the Bureau of Mines and Titanium Alloy, Electro Met has had relatively little zirconium experience. In addition, the estimated cost for the undertaking was rather large.
- h. Bureau of Mines (Albany, Oregon). A proposal to expedite the Kroll process improvement program at the Bureau of Mines was favorably reviewed by the Zirconium Advisory Group and NYCO. The development program is already under way on a small scale. This proposal will involve a transfer of \$25,000 to the Bureau of Mines, and will enable the Bureau to reach definite recommendations for large scale plant construction by the end of this calendar year.
- i. Armour Research Foundation. The Armour Research Foundation informed NYCO that a process had been developed in its laboratory for the production of ductile titanium under a

~~SECRET~~

contract with an industrial firm. This process is claimed to be different from any known titanium process, and it was felt that it should be applicable directly to zirconium. Further discussions are planned with Armour to determine whether this process actually is different from any under development within the AEC.

- j. Sylvania Electric Products, Inc. Preliminary examination by Argonne of a recent uranium-zirconium, zirconium sandwich produced by Sylvania indicates that this specimen may have imperfections. A more careful examination of the sandwich is now under way. The sandwich was made by Sylvania using a die which was not especially designed for the work; consequently, it is felt that this did not represent Sylvania's best efforts. A new die especially designed for the work has been received, and will be used during the next few weeks to prepare several sandwiches. If these sandwiches are satisfactory, specimens containing enriched uranium will then be prepared for Argonne.

Zirconium powder obtained from the Dominion Manufacturing Company of Canada was tested and evaluated by Sylvania. Results show that this powder flows and presses fairly well, but sinters poorly. The sintered product has a low density and is not ductile. In addition, the Canadian powder showed a strong trace of boron in spectrographic analysis. This fact would weigh heavily against the product for project use. The possibility exists that this Canadian powder may sinter more favorably at elevated temperatures (above 1300°C), but such an operation cannot be carried out in ordinary sintering furnaces.

Close to theoretical densities of zirconium metal are obtained by sintering compacts of zirconium hydride directly, and these sintered products are ductile. The hydride decomposes during the sintering operation. Zirconium specimens prepared by this method were cold-rolled up to 40 per cent without cracking. Those prepared from the metal powder show edge-cracking at approximately 30 per cent reduction.

2. Zirconium-Hafnium Separation Studies. For project use zirconium metal must be reduced in hafnium content. To this end, several production research programs are now under way, and others are contemplated.

- a. Oak Ridge (Y-12). The proposal from Y-12 for studying hafnium-zirconium separation was discussed with the Zirconium Advisory Group at the April 20 meeting. Laboratory

studies on the vapor pressure of the zirconium and hafnium halides are proposed. In addition, boiling-point data for the simple halides under pressure are to be obtained. Such fundamental data are essential as a background for studies of the separation of zirconium and hafnium by fractional sublimation or distillation. Y-12 also proposes to investigate the hafnium-zirconium separation by chelation extraction and to evaluate studies with other chelates previously studied at Oak Ridge in connection with tetravalent uranium salt extraction. The necessary personnel and equipment to conduct these laboratory studies is available, and no transfer of funds would be required to undertake this work. If a pilot plant operation should prove necessary, however, a transfer of funds will be involved.

It was agreed by Drs. Marvin and Pittman of the Washington Office, and by the Zirconium Advisory Group that the program should be undertaken. Inasmuch as Y-12 is now under the direction of the Division of Research, Washington Office, the concurrence of Dr. Pitzer will also be requested. At the aforementioned meeting of the Advisory Group, it was decided that Oak Ridge would be requested to carry on simultaneously with the chelate studies and the extraction of thiocyanates of hafnium and zirconium. It is felt that the thiocyanate compounds will be much cheaper than any of the chelates, and that work with this system might produce the necessary results in a much shorter time.

- b. University of Louisville. A preliminary design of the proposed column for studying hafnium-zirconium separation by pressure distillation of zirconium and hafnium halides was completed. It is expected that this design will be submitted to NYOO shortly. Essentially, the column is composed of two 4", high-flanged sections equipped for refluxing, and an air-cooled condenser for the distillate. The column will consist of 24 perforated plates, equipped with downcomers. This design is based on a one-half-inch head of liquid on each plate. It will be constructed to operate at pressures up to 800 pounds per square inch. Tests are now in progress to determine the optimum material of construction for the column.
- c. Ionics, Inc. A proposal was received from Ionics, Inc. to undertake a hafnium-zirconium separation program utilizing ion exchange. In general, this proposal was favorably regarded; the cost, estimated at \$58,500, was considered rather high. Ionics will be informed accordingly, and will be asked to resubmit a cost estimate on a less elaborate basis.

~~SECRET~~

- d. Bureau of Standards. As reported previously, laboratory studies are in progress at the Bureau of Standards on the separation of hafnium from zirconium by phosphate precipitation. It is hoped that the optimum conditions for effecting this separation can be established. Sulphuric acid is used to bring the zirconium and hafnium salts into solution for ultimate phosphate precipitation. The effect of variations in the acid on HF separation and on the character of the precipitate is being studied. The effect of variations in the amount of hafnium and zirconium precipitated on separation and zirconium recovery is also being investigated. Hitherto, triethyl phosphate has been used as the precipitant. In view of the fact that approximately 24 hours are required for completion of the operation using this material, the relative values of methyl phosphate and phosphoric acid will be studied.

Work thus far completed on the above points indicates that a 40 per cent H_2SO_4 solution and 25 per cent precipitation of the hafnium and zirconium in solution produces a 4:1 reduction in hafnium. That is, the mother liquor will contain 1/4 as much hafnium as originally. Thus, it is possible to start with a zirconium salt containing 2 per cent hafnium and, in two precipitations, reduce the hafnium concentration to approximately 0.1 per cent.

As mentioned previously, pilot-plant work on this method will be initiated at an early date. Although a number of variables clearly remain to be determined, considerable information will be gained by beginning pilot-plant work at this time. The problems elucidated will include materials of construction required, methods of handling the precipitate, and methods for converting to the oxide.

- e. Rohm & Haas. The preliminary laboratory investigation of hafnium-zirconium separation by ion exchange is nearly complete, but only a few results are available as yet. These results indicate that pH is not an important variable, but that the concentration of oxalic acid (the complexing agent) may be very important. Experiments have been run with oxalic acid concentration as low as 0.1 per cent. In one run using 0.5 per cent oxalic acid the hafnium content was reduced by half in one pass. Indications are that, by reducing the oxalic acid concentration, the separation factor is improved.

Analysis and Quality Control

During the month of April, a schedule for analytical work at the New Brunswick Laboratory was prepared. A quality control meeting was held at Hanford during the latter part of the month.

~~SECRET~~

~~SECRET~~

New Brunswick Laboratory. Various analytical programs were suspended during April until the New Brunswick Laboratory is ready to undertake analytical work. An analytical schedule was prepared for the routine work that New Brunswick is to assume in the future. It is indicated that the routine analytical load at New Brunswick will be about 88 samples a month, and the special load will be about 75 samples a month. Most of these 163 samples will require extensive quantitative determinations. All such work will be in addition to the analytical development program at the Laboratory.

Metal Quality Meeting at Hanford. Hanford reported at a meeting on April 25 and 26 that definite improvement had been noted in slug reactivity from billets cast during the end of 1948 and the first month of 1949. It was Hanford's opinion that extra cropping was not the chief factor responsible for the improvement. Nevertheless, the current cropping procedure will be continued for several months at least, in order to permit further studies. An attempt will be made to minimize the variable factors in metal casting operations. It was suggested that the change from the old to the new brown process may be one of the significant causes for the improvement in slug reactivity.

Source and Fissionable Material Accountability

A representative of NYOO visited the Harshaw Chemical Co. to study possible means for reducing unaccounted-for material. A report on accounting procedures at Vitro was received for review by NYOO. The NYOO Monthly Consolidated Normal Uranium Report was revised and expanded.

Hexafluoride Production at Harshaw. A representative of NYOO visited the Harshaw Chemical Co. to review the problem of unaccounted-for material at this installation. Green salt and hexafluoride production was surveyed, and many recommendations were made for recovery of material in the various exhaust streams. It was also recommended that a program be initiated to make day-long, continuous studies of the active content of gases from the roof scrubber, and to relate these eventually to the various process cycles.

Survey at Vitro. A survey of SF material accounting procedures at the Vitro Manufacturing Co. was performed during February, and a draft of the report was submitted to NYOO for review. The major recommendation in the report is that the scrap material received by Vitro should be weighed, sampled and assayed upon receipt, instead of before processing, as is the present procedure. The additional handling cost involved must be balanced against the expected increased accuracy of the monthly scrap inventory report.

NYOO Monthly Uranium Report. It was indicated last month that the SF Accountability Branch, Oak Ridge Extension, would prepare a report on the annual audit of NYOO accountability records. The draft of the report has been received for comment. The three chief recommendations were: (1) that the reports from Mallinckrodt and the St. Louis Area Office can be improved in mechanical accuracy; (2) that the explanations of unaccounted-for material in the

~~SECRET~~

consolidated NYCO report should be expanded; and (3) that every effort should be made by Operations Offices to submit monthly consolidated reports earlier than in the past.

The February Consolidated NYCO Normal Uranium Report submitted April 1, 1949, was expanded materially in accordance with these recommendations. It included additional loss information and several pages of explanations to facilitate the work of checking individual station reports with the consolidated report.

~~SECRET~~

III. ENGINEERING

A. W. Hopeman & Sons Company of Rochester was awarded a sub-contract for construction of the superstructure of the AEC training building at the University of Rochester, and began work. Construction at Mallinckrodt Chemical Works is now under way again, after a delay resulting from the laborers' strike. New Brunswick Laboratory construction is 87 percent complete. The Brush Beryllium Company entered into subcontracts for architectural and construction services in erection of the beryllium production plant wing at Luckey, Ohio.

University of Rochester

A. Friederich and Sons, subcontractor for substructure work connected with construction of the AEC training building at the University of Rochester, completed all work on April 8, 1949. Bids for construction of the superstructure of the training building were opened on April 5, 1949, and A. W. Hopeman and Sons Company, of Rochester, was awarded the subcontract. Hopeman's low bid amounted to \$607,780. The second low bid was for \$632,000; high bid was for \$849,540.

Work under the Hopeman subcontract began on April 18, 1949, with erection of a field office shanty. Since then the subcontractor has completed excavation for the five-inch steam line passageway under the existing hospital buildings and erection of temporary wood-partitioned rooms in the training building basement for use of workmen. The plumbing subcontractor has fitted and placed several hundred feet of steam lines under the basement ceiling, preparatory to welding. Electric conduit piping from electric manhole to transformer room has been installed.

As a result of disagreements between contractors and the Laborers' Union in the Rochester area, a strike may be called on May 4, 1949. It is not expected that progress on construction of the training building will be materially affected.

Mallinckrodt Chemical Works

The St. Louis laborers' and hod carriers' strike, which began on March 28, 1949, ended early in April. The effect of the strike was to delay construction for two weeks.

The George L. Cousins Contracting Company, contractor for construction of the facilities building, completed the installation of concrete block and started laying the finished concrete floor. Roofing has also been completed. All other work (steamfitting, electrical, plumbing, etc.) is proceeding satisfactorily. Work under the Cousins contract is approximately 80 percent complete; the terminal date will be about June 3, 1949.

With the end of the strike, the Robert Paulus Construction Company resumed work on Plant 6-E construction; work is now about 6 percent complete.

~~SECRET~~

Paulus is pouring pile caps and grade beams in the main building. The foundation for the substation has been poured, and concrete blocks are being laid. Boiler-house construction is about 30 per cent complete. The J. S. Alberici Construction Company has laid the concrete block wall and is now laying concrete foundations for silos. The stack has been erected. Practically all structural steel work is complete. Kremer-Hicks, contractor for the installation of boiler-house equipment, has completed about 25 per cent of its work. Installation of boilers is 75 per cent finished. One boiler has actually been installed and is being tested.

New Brunswick Laboratory

Construction under the contract with Frank Belluscio & Sons, Inc. is 87 per cent complete. A new heating plant has been completely installed, and control wiring for the plant will be completed and tested during the first week in May. All laboratory furniture has been delivered to the site. Installation of furniture will be completed by May 13, 1949. Exterior grading and pouring of sidewalks is in progress, and general landscaping will be completed early in June. Several rooms are now sufficiently complete to permit operations. By the end of June it is believed that the premises will be completely cleared of contractor personnel, so that full occupancy and operation will be possible, except for minor items such as radiator enclosures and other iron work, installation of which will be delayed because of a statewide shop ironworkers' strike.

Brush Beryllium Company

A subcontract for architectural services in erection of the Beryllium Production Plant Wing was entered into between the Brush Beryllium Company and F. J. McFadden on April 11, 1949, effective as of March 15, 1949. On the same date a subcontract for furnishing labor and material for erection of the wing was awarded by Brush to the T. J. Hume Company. This work involves conversion of part of a plant at Luckey, Ohio, presently owned by the Government and known as the Luckey Magnesium Plant, Plancor 669, into a beryllium plant which will contain both contractor-owned and Government-owned equipment. The plant will be used for production and fabrication of beryllium products. Construction work has begun and is progressing satisfactorily.

~~SECRET~~

1188928

~~SECRET~~

IV. RESEARCH AND DEVELOPMENT

Contracts have been negotiated for thermal conductivity studies of ceramic materials and superconductivity measurements on alloys. Programs for mass spectrographic and physics research are being extended.

Thermal Conductivities of Ceramic Materials

Contract No. AT(30-1)-602 is being prepared with MIT for basic research in the field of ceramics. This work will be supervised by F. H. Norton, head of the Ceramics Department, and involves the development of a method or methods for the precise determination of thermal conductivities on relatively small specimens of special ceramic materials. The program includes:

1. Development of methods for preparation of pure specimens of accurate dimensions.
2. Study of errors inherent in thermal conductivity measurements on small specimens.
3. Development of apparatus which will minimize this error and give precise results.
4. Measurement of thermal conductivities of such materials as:
 - (a) High temperature oxides: beryllia, zirconia, thoria, and magnesia
 - (b) High temperature nitrides: titanium and zirconium
 - (c) High temperature sulphides: cerium
 - (d) Stable carbides: silicon and beryllium.

Mass Spectrographic Research at Wesleyan University

A meeting has been held with representatives of Wesleyan University to agree upon an appropriation for the second year of Contract No. AT(30-1)-451. This contract provides for basic research in the field of mass spectrography. The budget proposed by Wesleyan for the coming year is approximately \$7,800, an increase of about \$4,500 above the expenditures for the first contract year (actual plus estimated). At the request of AEC representatives, Wesleyan will try to prepare a new budget in which the University will bear some of the overhead cost, although for the first half of the contract term the AEC bore the whole overhead expense (40% of wages and salaries).

Superconductivity of Alloys

Lump-sum Contract AT(30-1)-597 for AEC support of a basic research program at the University of Pennsylvania has been negotiated and written, but

- 21 -

~~SECRET~~

1188929

~~SECRET~~

not yet signed. Work under the contract, which is to be supervised by Prof. F. C. Mix, will deal with superconductivity of alloys, particularly of the gold-bismuth system, and correlation of superconducting properties with other known properties of solids. The amount of the contract is \$17,860 for the first year of a two-year program (June 1, 1949 - May 31, 1951).

Extension of Physics Research Contracts

Several contract extensions for basic research are being negotiated for the next fiscal year. Two of the most important are:

Columbia University - Contract No. AT-30-1-GEN-72 (Prof. J. R. Dunning, Scientific Director). This contract provides for research in nuclear physics. The program is centered around the 36-inch cyclotron, an electronically-controlled neutron-velocity spectrometer, two types of beta-ray spectrometer, and several counting equipments. This work is closely related to the program being undertaken by the Columbia Physics Department with the 140-inch synchrocyclotron at Irvington-on-the-Hudson.

Johns Hopkins University - Contracts Nos. AT(49-1)-309 and AT(49-1)-310 (Prof. G. H. Dieke, Head of Physics Department). Last year Dr. Dieke conducted a program of investigation of the energy states of the lithium 7 nucleus. For the coming year an expanded program is proposed. A 1 mev Van de Graaff is now in operation. Funds to construct a beta-ray spectrometer are requested. Most of the proposed work centers around these instruments and auxiliary equipment in their application to the investigation of details of the nature of atomic nuclei.

- 22 -

~~SECRET~~

1188930

~~SECRET~~

V. BROOKHAVEN NATIONAL LABORATORY

Plans for the organization of the Medical Department and hospital at Brookhaven National Laboratory have matured rapidly during the past three months. The general operation of the department will be supervised by the Laboratory's Associate Director for Biology and Medicine, who will take office about September of this year. Under the leadership of the recently-appointed Chairman, responsibility for the operation of the Department is divided among five senior staff members, each in charge of one of the Divisions: Pathology, Bacteriology, Bio-Chemistry, Physiology, and Medical Practice. The last Division consists of the medical staff now engaged in the care of personnel and the study of problems concerning the health of individuals employed by the Laboratory. Each Division will operate a research laboratory. It is planned that the personnel of these laboratories, in addition to conducting research in their respective fields, will cooperate with the clinical research of the hospital, support the regular medical service as needed, and assist in cooperative work with scientific personnel on leave from the Associated Universities or other institutions.

The Laboratory's 42-bed hospital, now adequately staffed and equipped, is already receiving patients, and the program of comprehensive and repeated physical examinations of all employees is continuing. The Out-Patient Clinic, operating on a 24-hour, 7-day week basis, is providing medical care for laboratory employees and their dependents. Charges for hospitalization and out-patient treatment are based on rates currently in effect in nearby hospitals and in New York City. In hospital care, emphasis will be placed upon keeping the care of patients in the hands of persons qualified for clinical work. A portion of the research staff is being drawn from men who have had clinical experience; in time, it is planned to train these individuals in procedures calling for the use of short-lived isotopes.

The suitability of certain diseases for study at Brookhaven is being considered. Cardiovascular and renal disease and arthritis have been suggested, and cancer has been approved. Arrangements have been made with the Director of Memorial Hospital, New York City, for joint study and treatment of a limited number of patients with cancer of the thyroid. After admission to Memorial, patients will be transferred to Brookhaven for measurements on intake of radioactive iodine, protein metabolism, etc. Available data will be exchanged between the two hospitals, and Memorial consultants will work at Brookhaven. Patients requiring x-ray therapy and surgery will be returned to Memorial. The average stay of such patients at Brookhaven will be three to four months. The first thyroid cancer patient from Memorial was recently admitted to the BNL hospital, and more are expected shortly.

It has been decided that a full-time surgeon will not be maintained at the Laboratory, but facilities will be available for emergency surgery. It is planned to appoint consultants for specialist services in surgery, ophthalmology, urology, and other fields.

~~SECRET~~

1188931



Current plans call for utilization of the present temporary hospital buildings for several years. The existing wooden infirmary building will be remodeled to afford temporary housing for the pathology, physiology, bacteriology, and bio-chemistry laboratories. Wherever possible, equipment will be installed in such a way that it can easily be transferred at a later date to permanent laboratories. Tentative floor plans for these permanent laboratories have been drawn up, subject to final approval. It is proposed to locate them on the southern edge of the main center of the laboratory, in conjunction with those scheduled for the Biology Department. Final plans will not be made, however, until the temporary laboratories have gone into operation and practical experience has been gained.

VI. MEDICAL

Development of a urine analysis program for control of exposure to uranium has begun. NYCO has cooperated with the Association of American Railroads in publication of instructions for railroad employees, to be followed in the event of emergencies involving AEC shipments.

Uranium Health Program

NYCO has begun an investigation into the feasibility of using the levels of uranium excretion in urine as a control measure in production plants and processing facilities. The study was initiated with the employees of Harshaw Chemical Company and Simonds Saw and Steel Co. Analyses are being performed by the NYCO Medical Division Chemistry Laboratory, and the results are being correlated with air exposure data by the Industrial Hygiene Section with the assistance of the Staff Biometrician. Air exposure data have not been entirely satisfactory because they represent general levels in various situations and do not apply specifically to individuals, for whom exposures must be calculated in a somewhat synthetic manner from known air data for each of their activities during the course of the working day. Furthermore, air exposure data can be applied to workers wearing respirators only by using a correction factor. If the investigation now in progress develops a method for using uranium concentration in urine as an index of individual exposure and of the amount stored in each individual's body, such analyses will eventually become a standard part of the NYCO health control program.

Regulations of the Association of American Railroads

The Bureau of Explosives of the Association of American Railroads recently published a revision of its pamphlet No. 22, which contains procedures for railroad employees to follow in case of such emergencies as train wrecks, derailment, etc. An additional section was incorporated in this revision regarding the handling of radioactive materials. The NYCO Safety Section made available to the Bureau of Explosives the necessary fundamental information and collaborated in the writing of the additional section. In order to assure maximum safety with a minimum of confusion, a standard set of procedures was adopted for all types of materials, on the basis of the requirements for dealing with the most radioactive which are likely to be transported by train. This immediately provides a factor of safety in all situations except the worst and eliminates the necessity for railroad employees to make any decisions, especially under emergency conditions, in a field where they have no knowledge. The instructions are simple and have been carefully couched in terms which should be clear to all railroad employees.

VII. LICENSING

Since March, 1947, the Licensing Division has issued 1,869 licenses in the following categories:

	March 1947 Through <u>April 1949</u>	During <u>April 1949</u>
Producers	315	13
Processors.	35	-
Distributors.	294	7
Consumers	<u>1,225</u>	<u>42</u>
	1,869	62

Nearly all licenses are for one year's duration. Approximately 1070 have been renewed for an additional one year period. Others will be extended from time to time as their expiration dates are reached and applications are made for renewal.

Examination of the inventories and records of domestic processors, distributors, and consumers of source material continued during the month.

The following exports were authorized during April:

Incandescent Mantles	381,807*
Uranium Nitrate.	1.31 lb.
Uranium Acetate.	0.50 lb.
Miscellaneous Uranium Ores	8.00 lb.
Thorium Nitrate.	15,972.06 lb.
Thorium Dioxide.	0.91 oz.
Thoriated Tungsten Wire.	13.56 lb.

Shipments of incandescent mantles were made to 28 countries. Substantial quantities of thorium nitrate for the manufacture of mantles were sent to Canada, Germany, India, and Egypt. Thoriated tungsten wire for vacuum tubes was sent to Mexico, Germany, Switzerland, Italy, and Sweden. Other exports involved small quantities of uranium and thorium to be used for educational, analytical, or medicinal purposes.

* The ThO₂ content of these mantles is estimated at 382 lb.