Form AEC-417 (Tentative)
(8-56)

UNITED STATES ATOMIC ENERGY COMMISSION

Compliance Inspection Report

1. Name and address of Licensee
United States Radium Corporation
P.O. Box 380
Bloomsburg, Pennsylvania

2. Date of Inspection
October 2, 1957

3. Type of Inspection
Initial

4. 10 CFR Part(s) Applicable
20 - 30

5. License (or Permit) No(s). and Expiration date(s)

Number	Exp. Date	Number	Exp. Date
37-30-2 w/amend.#1 - 6 (Mr. C.C. Carroll)	6/30/58		

6. Scope of License(s) and Permit

License -2 Authorized use of any byproduct material between Atomic No. 3 and 83, inclusive, as required except no single discrete source procured under this license shall exceed 25 curies per source, for research and development as defined in Section 11(q) Atomic Energy Act of 1954. Processing for redistribution to AEC licensed users.

Amend.#1 Authorized use of 10 curies of Polonium 210 and 1 curie of Actinium 227.

Amend.#2 Authorized use of 300 curies of Hydrogen 3.

Amend.#4 Authorizes the use of sealed sources for demonstration purposes by the following men: CONT'D

7. Special Conditions and Limitations of License(s) or Permit

License -2

10. Byproduct materials are to be used by, or under the supervision of, individuals approved by the Radioisotope Committee.
11. Labeling shall not be required for laboratory containers such as beakers, flasks and test tubes, used transiently in laboratory procedures during presence of user.
12. Byproduct material not to be used in or on human beings, field or other uses where long term control of the radioactivity may be lost. CONT'D

8. Inspection Findings

The United States Radium Corporation manufactures for resale and export, various sealed sources. Mr. E.M. Burtsavage serves as the Radiological Safety Officer and Mr. C.C. Carroll is the Chairman of the Isotope Committee. Approximately 20 individuals work with byproduct material. The licensee has extensive facilities which includes five laboratories, a storage blockhouse, and a silo used for radioactive waste storage. Sufficient operable instruments were available except that no air sampling equipment was on hand. Satisfactory security is maintained for the storage of byproduct material. Written radiation safety instructions have been prepared. A satisfactory personnel monitoring program using film badges and dosimeters is in effect. Four individuals CONT'D

9. Items of Non-compliance

20.101(a)(2) "Exposure of individuals in a restricted area to radiation"
20.102(b)(1) "Permissible levels of radiation in unrestricted areas"
20.201 "Surveys"
20.203(f)(1) "Caution signs, labels, and signals for containers"
30.33 "Exports of byproduct material"

10. Give date of last previous inspection: None

11. Is "Company Confidential" information contained in this report? No
(Specify page(s) and paragraph(s).)

Distribution:
4 cys. - Division of Inspection, Washington
2 cys. - Inspection Division, NYOO

(Inspector)
William E. Kriegsman

Approved by:
Robert W. Kirkman, Director
New York (Operations Office)

November 6, 1957 (Date report prepared)

If additional space is required for any numbered item above, the continuation may be extended on reverse of this form using head to foot format, leaving sufficient margin at top for binding, identifying each item by number and noting "Continued" on the face of form under the appropriate item.

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

ITEM 6 CONT'D

Mr. W.C. Doran
5420 Vineland Avenue
North Hollywood, California

Mr. Don Reagan
5942 W. Chicago Avenue
Second Floor
Chicago, Illinois

Mr. T.W. Taylor
Morristown, New Jersey

Mr. R. E. Miller
P.O. Box 380
Bloomsburg, Pennsylvania

Mr. R.H. Bull
Radelin-Kirk Laboratory
1168 Bay Street
Toronto 5, Canada

Amend. #5 Authorized use of 1 millicurie of Americium 241.
Amend. #6 Maximum amount of Krypton 85 which licensee may procure as a single source is increased from 25 curies to 100 curies.

ITEM 7 CONT'D

Amend. #1
13. This licence supersedes all previous authorizations and licenses except those for Hydrogen 3.

Amend. #2
14. Total amount of Hydrogen 3 (tritium) procured under this license shall not exceed 300 curies.

Amend. #3
14. Total amount of Hydrogen 3 (tritium) procured under this license shall not exceed 4,865.8 curies.

ITEM 8 CONT'D

exceeded 3,000 mr for 13 week periods which included one or more weeks of exposure in the 300 to 900 mr range (paragraph 20). Radiation level and surface contamination surveys have been conducted. No air survey program is in effect, nor is there equipment available for this purpose (paragraph 15). Leak tests have been conducted as required for the sealed sources. Procurement procedures are adequate to ensure that the licensed limits are not exceeded. The licensee exported 380 millicuries of tritium on September 13, 1957 (paragraph 16). Radioactive wastes are shipped to ORNL for disposal. A storage silo in which the wastes are stored is in an unrestricted area and levels of radiation of 500 mr/hr were found at its surface (paragraph 18). Records of waste disposal, purchase, inventory, personnel monitoring, surveys, and leak tests were satisfactorily maintained. A hood contaminated with Sr^{90} was not labeled to indicate the presence of radioactive materials and another hood containing 100 curies of tritium was not labeled.(paragraph 19).

PART 30 INSPECTION

United States Radium Corporation
P.O. Box 300
Bloomsburg, Pennsylvania

Date of Inspection: October 2, 1957

Persons Contacted:

Mr. C.C. Carroll, Director of Sponsored Research
Mr. H.H. Dooley, Chief Chemist
Mr. E.M. Burtsavage, Health Physicist

12. Organization and Administration

The United States Radium Corporation is an independent corporation having plants at Bernardsville, New Jersey, Whippany, New Jersey, North Hollywood, California, and Toronto, Canada, in addition to the inspected plant at Bloomsburg, Pennsylvania, the sole location for the use and storage of byproduct material. The head office of United States Radium Corporation is at Morristown, New Jersey. Mr. C.C. Carroll, who serves as the Isotope Committee Chairman, is the Director of Sponsored Research. Mr. H.H. Dooley, the Chief Chemist, has immediate supervision over all work involving byproduct material. Mr. E. M. Burtsavage, the Radiological Safety Officer, is the head of the Health Physics Department. He is assisted by a radiation surveyor and a radiation monitor. Approximately 20 individuals are involved in the handling of byproduct material and another 30 are using radium at this plant.

13. Facilities and Uses of Byproduct Material

Exhibit "A" to this report is a list of the isotopes purchased from 1954 through July 1957 and a list of the inventory as of September 30, 1957. The facilities of United States Radium Corporation pertaining to the use and handling of byproduct material are as follows:

A. Laboratory No. 1 - Polonium Laboratory. The Polonium Laboratory is equipped with fume hoods, paper covered benches, and a sink. Curie lots of Polonium are received and nitrated solutions are prepared in the hoods in order to manufacture PoBe Neutron sources for resale.

B. Laboratory No. 2 - Laboratory No. 2 is not currently in use except for the storage of small amounts of H^3.

C. Laboratory No. 3 - Laboratory No. 3 is used for the storage of tritiated titanium foil, thallium thickness gauges and krypton light sources.

D. Laboratory No. 4 - Laboratory No. 4 is equipped with 2 fume hoods, stainless steel benches, and remote handling equipment. One hood is used for the preparation of tritiated titanium foil, the other hood for filling sealed light sources with krypton.

E. Laboratory No. 5 - Laboratory No. 5 is equipped with a hot cell surrounded on all sides by at least 4 inches of lead or 16 inches of concrete. It is designed for a capacity of 5 curies of cesium and is used for the encapsulation of the cesium in monel. The cesium is received in the form of cesium chloride solution and is evaporated to dryness in the hot cell. The hot cell is exhausted to the roof through a series of filters.

F. Sr^{90} Laboratory - The Sr^{90} Laboratory is equipped with several individual hoods, stainless steel benches, a sink and remote handling equipment. It is used for the manufacture of Sr^{90} sealed sources for use in thickness gauges and light sources.

A storage blockhouse is described under paragraph 17. A silo used for the storage of waste disposal is described under paragraph 18.

In addition to the above, a large laboratory is used for the preparation of radium pigments and similar radium containing materials.

14. Instrumentation

Operable instruments were available as indicated in Exhibit "B".

15. Radiological Safety Precautions and Procedures

Written radiological instructions have been prepared by the licensee. A copy is included in the licensee's file. Surveys of all areas in which isotopes are used are conducted at frequent intervals. A review of the records indicated that contaminated areas are promptly cleaned up. The only notable consistently high levels were found in the records of the Polonium Laboratory where from 500 - 700 mr/hr surface contamination existed in the vicinity of the sink. The The instrument used by the surveyor was not included in these records. Independent measurements conducted at the time of the inspection showed no surface contamination. The laboratories, according to Mr. Dooley, had been "recently" cleaned and no work was in progress in any of the laboratories at the time of the inspection. No air surveys were conducted by the licensee. Mr. Purtravage conducts leak tests of all sealed sources and a check of the records indicated that leaking sources were either re-encapsulated or discarded.

16. Procurement Procedures and Control

All purchases of isotopes are reviewed by Mr. Dooley and Mr. Carroll to ensure that the licensed limits are not exceeded. The licensee required that all purchasers submit a copy of their individual licenses prior to the shipment of any isotopes. The licensee has exported Kr 5 and Sr 0 to several foreign countries. In addition, the licensee exported, on September 13, 1957, 3.0 millicuries of tritium in the form of tritiated titanium foil to Nuclear-Mark Limited of Canada, a U.S. Radium Corporation subsidiary, for use by the Canadian army. Monthly reports have been submitted to Cecil Buchanan U.S.A., regarding all exports of isotopes.

17. Storage

The following material was stored in the laboratories described in paragraph 13

A. Laboratory No. 1 - contained approximately 0.5 curie of Polonium.

B. Laboratory No. 2 - contained approximately 3 millicuries of Ni^{63}.

C. Laboratory No. 3 - contained approximately 100 curies of tritiated titanium foil, approximately 70 curies of krypton 85 in sealed light sources and 5 curies of thallium 204 in the form of thickness gauges.

D. Laboratory No. 4 - contained approximately 1.0 curies of tritium in the for of gas and 10 curies of Krypton 85 also as a gas.

E. Sr^{90} Laboratory - The Sr^{90} Laboratory contained approximately 600 millicuries of Sr^{90} in the form of strontium sulfate.

The remainder of the isotopes currently on hand, as indicated in Exhibit "B", are stored in a concrete blockhouse in an open area toward the rear of the plant. The blockhouse was locked and the keys were in the custody of Mr. Palmeri, the Assistant Chief Chemist. An unlabeled Sr^{90} contaminated hood was found outside of the blockhouse. Radiation levels of 50 mrep/hr were found on the external surface of the hood. At the conclusion of the inspection, Mr. Dooley stated that the hood had been placed inside the blockhouse and would remain there until shipped to ORNL for disposal. The storage of waste material is discussed in paragraph 18.

18. Waste Disposal

Mr. Dooley stated that all radioactive wastes were packaged and sent to ORNL for disposal. The only possible exceptions to this noted during the inspection were as follows: The sink trap in the Sr^{90} Laboratory showed evidence of internal Sr^{90} contamination by virtue of a radiation level of 20 mr/hr (γ), at a distance of 3 inches. The liquid waste from the cesium in the hot cell in Laboratory No. 5 passed through an ion exchange chamber on the outside of the building. The ion exchange resin, as measured by the inspector, showed no residual activity at the time of the inspection.

The bulk wastes are packaged in paper and placed in 55 gallon drums for shipment to ORNL. In the interim period prior to shipment, the drums are stored in a 6 x 3' cylindrical silo located approximately 100 yards from the laboratory building. At the time of the inspection, radiation levels from the drums as measured by the inspector, were 1 r/hr at the surface and 500 mr/hr at 1 foot from an individual drum. A radiation level of 500 mr/hr existed at the external surface of the silo. Mr. Dooley stated that the entire property was a restricted area. A single strand wire fence approximately 60 feet from the silo marked the boundary of their property. The fence, itself, was ineffectual as it was noted during the inspection that a young girl came on the licensees property from an adjoining residence. The radiation level at the fence itself was approximately 1 mr/hr. As noted in paragraph 19, the silo was properly posted as a high radiation area.

The quantities of waste disposed of over the past 3 years are as indicated in Exhibit "C".

The amounts of wastes shippedto ORNL were estimated by Mr. Dooley as follows: "Beta emitting isotopes are calculated according to theoretical values since it is impossible to obtain accurate survey reading on the majority of these isotopes when packaging. The accuracy of Cs^{137} shipments is estimated at plus or minus 10%. To account for rapid decay, $Po^{1[illegible]}$ values were calculated at the time of shipment as were Cr^{51} transfers". (From Mr. Dooley's letter of October 11, 1957, a copy of which is in the licensee's file).

19. Posting

All laboratories, with the exceptions as noted below, the storage blockhouse and the silo, as well as containers were properly posted with high radiation signs, radiation signs and radioactive material signs as required. The hood containing 100 curies of tritium in Laboratory No. 4 was not posted, nor was the individual tritium container within the hood. The Sr^{90} hood noted in paragraph 17 was not posted to indicate the presence of Sr^{90}.

20. Personnel Monitoring

The licensee maintains both a daily non-self-reading pocket dosimeter, and a weekly film badge service from Radiation Detection Corporation of San Francisco, California. The records indicated that in the past year four individuals receive exposures in excess of 3000 mr over a 13 week period and simultaneously received single week exposures in excess of 300 mr. Data concerning these overexposures is contained in Exhibit "D".

No exposures to personnel working with byproduct material occurred in excess of 300 mr in any week. A review of the film badge records revealed high levels of radiation and contamination in the Radium area, and the accompanying state official intends to look into this matter. Exhibit "E" is a summary of the annual and accumulative doses of the employees. A Neutron film badge program was also in effect at this licensee's facilities and the records did not indicate that any excessive exposures had occurred.

21. Records

Records of purchase, inventory, waste disposal, film badge results, dosimeter results, survey results and leak test results were all satisfactorily maintained by the licensee. Instrumentation used by the inspector for independent measurements were:

Eltronics Beta Gamma Survey Meter Model PR-5A, serial #NYAEC 4454 (calib. 7/10/57)
Juno Ionization Chamber Model SIC-17C, serial #NYAEC 3030 (calib. 8/21/57)

The licensee holds no AEC contracts.

The licensee appeared willing to comply with the provisions of his license and 10 CFR 20 and 30.

Isotope	Purchases 1-54 to 7-57 (curies)	Inventory 8-30-57 (curies)
H^3	1112.4	250
Sr^{90}	257.4	53.7 + 30,000 dock marke
Kr^{85}	230.7	2[illegible].0
Cs^{137}	61.0	11.6
Co^{60}	45.8	8.4
Tl^{204}	11.0	5.0
Ir^{192}	10.0	
Po^{210}	9.8	0.6
Pm^{147}	.5	0.5
$CePr^{144}$	0.5	
Ac^{227}	0.2	0.06
Ru^{106}	0.125	
C^{14}	0.060	0.01
Ni^{63}	0.03[illegible]	0.03
Zn^{65}	0.010	
Fe^{55}	0.002	
Ag^{110}	0.001	
Cs^{134}	0.001	
Ba^{133}	0.0001	
Y^{90}	undetermined small amounts	
Cr^{51}	undetermined small amounts	

EXHIBIT A

INSTRUMENT	MODEL	LOCATION
Survey Meters:		
Beckman	MX-2	Health Physics office
Beckman	MX-3	General lab.
Beckman	MX-4	Measurement lab.
Technical Associates	SRJ-1	General lab.
Technical Associates	Juno 3	#4 annex
Technical Associates	Juno 3	Isotopes lab.
Tracerlab Inc.	SU1B	Radium lab.
Tracerlab Inc.	SU1H	Measurement lab.
Universal Atomics	1055	General lab.
Nucleonic Corp. of America	RM-1	Measurement lab.
Detectron - scintillation	235	Measurement lab.
NRD	CS-40	#4 annex
Proportional Counters:		
Radiation Counting Lab.	1	Measurement lab.
Nuclear Measurement Co.	PCC-12	Measurement lab.
Radiation Counting Lab.	1	High radiation countir 1
Nuclear Measurement Co.	PCC-10	High radiation countir 1
Nuclear Measurement Co.	PC-2B	Health Physics lab.
Geiger Counters:		
Nuclear Instrument and Chem. Corp.	1615-B	General Lab.
" " " "	1615	#2 annex
" " " "	1615-B	Swab lab.
Atomic Instrument Co.	410	Radium lab.
" " "	410	General lab.
Others:		
Keithley Electrometer	200	#4 annex
Nuclear-Chicago, radiation analyzer	1810	Measurement lab.
Foxboro beta source checker	-	Measurement lab.
The Ohmart Corp.	1U	Measurement lab.
The Ohmart Corp., detector	AH-1	Measurement lab.
F. C. Henson Co., electroscope	1	Measurement lab.
Applied Physics, Carey Reed electrometer	31	Health Physics lab.

EXHIBIT "B"

Strontium 90

1955	-	1240 millicuries
1956	-	1360 millicuries
1957	-	790 millicuries

This material consisted of scrap radioactive foil, experimental phosphor, waste tissues and handling equipment.

Promethium 147

1955	-	12.8 millicuries
1956	-	150 millicuries

This material consisted of experimental phosphor, foils, waste tissues.

Cesium 137

1955	-	300 millicuries
1956	-	260 millicuries
1957	-	450 millicuries

This material consisted of unusable sealed sources, waste tissues and contaminated handling equipment.

Carbon 14

1955	-	less than 1 millicurie
1956	-	less than 1 millicurie

This material consisted of waste tissues and handling equipment.

Nickel 63

1955	-	none
1956	-	0.5 millicurie

This material consisted of plated wire.

Thallium 204

1955	-	15 millicuries
1956	-	31 millicuries

This material consisted of experimental phosphors and plated sources, wast tissues and handling equipment.

Polonium 210

1955	-	7.61 millicuries
1956	-	41.39 millicuries

This material consisted of scrap metal foils, phosphor and waste tissues.

Chromium 51

1955	-	10 millicuries
1956	-	20 millicuries
1957	-	35 millicuries

This material consisted of test piston rings and contaminated handling equipment.

EXHIBIT " C "