

File

June 7, 1967

Jack R. Roeder, Inspection Specialist for Staff Operations  
Division of Compliance

Original Signed by:  
Jack R. Roeder

U.S. RADIUM CORPORATION (USRC), BLOOMSBURG, PENNSYLVANIA

Mr. Low told me that on June 6, 1967, Mr. Kirkman called H. A. Vaughn, Vice President and Plant Manager of the subject licensee. Kirkman told Vaughn that he would receive a letter shortly from H. L. Price confirming that the Am-241 operation had been suspended and that it should not be resumed until concurrence of AEC is obtained. Kirkman also told Vaughn that USRC's hazards evaluation and request for resumption of operations should be submitted to DML, with E. Brinkman as contact.

JRR:kt

cc: E. W. Kirkman, CO:I

→ J. A. McElroy, DML

U.S. RADIUM CORPORATION  
BLOOMSBURG, PENNSYLVANIA

A. Summary of Overexposures to Tritium for Period January 1964 to Present as Reported to AEC

<u>Period of Exposure</u>	<u>No. of Individuals Involved</u>	<u>Results of Bioassay of Air Sampling</u>
1. 10/26-11/1/65	1	30.66 uc/liter urine
2. 9 days (per 6/1/66)	1	29.3 - 31.0 uc/liter urine
3. 12/31/66	1	2.16 x 40-hour limit
4. 1/11/67	1	1.46 x 40-hour limit
5. 3/20-23/67	1	70.30 uc/liter urine

B. Summary of Excessive Releases of Tritium to Unrestricted Areas

(NOTE: Between January 1964 and about the middle of 1966, the licensee's air sampling program for tritium had been considered inadequate and, in fact, in the evaluations which had been made, the wrong limits were used. The licensee began reporting excessive releases after improving his tritium monitoring program after repeated citations for inadequate evaluations.)

<u>Period of Release</u>	<u>Location of Discharge</u>	<u>Activity (uc/ml/24 hrs)</u>	<u>Form</u>	<u>X MPC</u>
1. 12/13/66	Glass Tube Fill Facility	$322 \times 10^{-7}$	Dry Gas	166
2. 1/10/67	Glass Tube Fill Facility	$61.3 \times 10^{-7}$	Soluble	30.65
		$15.27 \times 10^{-5}$	Soluble	763.3
3. 1/20/67	Glass Tube Fill Facility	$3.62 \times 10^{-4}$	Dry Gas	9.05
			Soluble	1,810.0
4. 1/31/67	Tritium Building	$35.80 \times 10^{-7}$	Dry Gas	18.26
		$7.15 \times 10^{-8}$	Insoluble	
5. 2/17/67	Glass Tube Fill Facility	$0.12 \times 10^{-5}$	Dry Gas	63.94
		$127.77 \times 10^{-7}$	Soluble	
		$4.65 \times 10^{-9}$	Insoluble	
6. 2/21/67	Glass Tube Fill Facility	$0.18 \times 10^{-5}$	Dry Gas	201.37
		$403.23 \times 10^{-7}$	Soluble	
		$3.58 \times 10^{-8}$	Insoluble	
7. 3/3/67	Hand Application Facility (No Processing)	$0.16 \times 10^{-5}$	Dry Gas	15.44
		$30.55 \times 10^{-7}$	Soluble	
		$2.47 \times 10^{-8}$	Insoluble	

<u>Period of Release</u>	<u>Location of Discharge</u>	<u>Activity (uc/ml/24 hours)</u>	<u>Form</u>	<u>X MPC</u>
8. 3/6/67	Tritium Building	$3.24 \times 10^{-5}$	Dry Gas	126.09
		$246.0 \times 10^{-7}$	Soluble	
		$4.55 \times 10^{-7}$	Insoluble	
9. 3/8/67	Hand Application Facility	$0.048 \times 10^{-5}$	Dry Gas	61.74
		$123.04 \times 10^{-7}$	Soluble	
		$4.28 \times 10^{-8}$	Insoluble	
10. 4/13-14/67 (3 samples)	Glass Tube Fill Facility	(1) $1.20 \times 10^{-5}$	Dry Gas	96.40
		$192.71 \times 10^{-7}$	Soluble	
		$0.003 \times 10^{-7}$	Insoluble	
		(2) $0.90 \times 10^{-5}$	Dry Gas	7.77
		$15.10 \times 10^{-7}$	Soluble	
		$0.006 \times 10^{-7}$	Insoluble	
		(3) $0.77 \times 10^{-5}$	Dry Gas	10.49
		$21.70 \times 10^{-5}$	Soluble	
		$0.003 \times 10^{-7}$	Insoluble	
11. 4/26/67	Tritium Building	$47.13 \times 10^{-7}$	Soluble	23.72
		$0.30 \times 10^{-7}$	Insoluble	

Licensee and Location  
U.S. Radium Corporation  
Bloomsburg, Pennsylvania

License Information

<u>License No.</u>	<u>Authorized Use</u>
37-30-2	Research and Development - Broad License (at. Nos. 3-83, 200 mc each)
37-30-3	Export (has been redesignated XB-37-168)
37-30-6	Application of tritium to timepieces
37-30-7	Application of tritium to timepieces
GL-112	Manufacture and Distribution of tritium foils
GL-117	Manufacture and distribution of ion generators containing Kr-85
GL-122	Manufacture and distribution of aircraft exit markers containing tritium
GL-124	Manufacture and distribution of light sources containing Kr-85
GL-126	Po-210 or Am-241 sources for linear ion generators
GL-165	Am-241 sources
GL-237	Commercial exit signs containing tritium
GL-253	Carbon 14 sealed sources for sale in USRC Isolite Photometers Model 1016

History

The licensee's program was initially inspected on October 2, 1957. Subsequent inspections of varying scope were conducted in 1959, 1960, 1961, 1962 and 1963. The bulk of the licensee's program is conducted under License Nos. 37-30-2 and 37-30-7. The following chronology gives the status of the licensee's program beginning with the inspection conducted December 9-13, 1963.

7/7/67

Inspection and Enforcement

1. INSPECTION DATE:  
December 9-13, 1963

INSPECTORS:  
E. P. Resner  
J. R. Roeder

SCOPE OF INSPECTION:  
(Announced)  
37-30-2  
37-30-3  
37-30-6  
37-30-7  
GL-112  
GL-117  
GL-122  
GL-124

SUMMARY

A. Noncompliance

License No. 37-30-2:

1. 20.105(b)(1), (2) - Excessive levels of radiation existed in an unrestricted area adjacent to a fence around storage vaults.
2. 20.201(b) -
  - a. Failure to evaluate concentrations of tritium released to unrestricted areas.
  - b. Failure to evaluate concentrations of tritium in restricted areas.
  - c. Failure to evaluate hazards associated with the use of sealed sources.
  - d. Failure to evaluate the solubility or insolubility of radioisotopes released in liquid effluents.
3. 20.206(b) - Failure to provide operating personnel with copies of procedures.
4. 30.32(c) - Licensed materials were transferred to unauthorized recipients.
5. License Condition 14 - Failure to make leakage and contamination tests of sealed sources.

B. Safety Items

1. Glove box and hood exhaust systems were either inoperable or filters were clogged.
2. Several employees exhibited excessive urine concentrations of tritium which indicated excessive airborne concentrations of this material in working areas.
3. Operating and radiation safety procedures, in many instances, were outdated.

C. Remarks - The licensee's health and safety program was considered marginal at best. The inspector's opinion was that the licensee's attitude toward safety matters was lethargic and lackadaisical. Because of the poor safety program, a follow-up inspection was planned.

ENFORCEMENT

- A. Forms AEC-591 (clear) were issued for License Nos. 37-30-3, 37-30-6, and the GL licenses.
- B. The items of noncompliance for License No. 37-30-2 were brought to the licensee's attention in a letter from DLR dated March 25, 1964. A second letter from DLR, dated March 25, 1964, discussed the safety items and requested a reply.
- C. The licensee's reply to the two letters, dated April 14, 1964, was not considered adequate in all respects and a letter from DLR dated May 15, 1964, was sent to the licensee requesting additional information regarding (1) air concentrations released to unrestricted areas; (2) air surveys for tritium and associated personnel exposure evaluations; and (3) determinations of solubilities of materials in liquid effluents. The licensee's reply, dated June 5, 1964, was acknowledged in a letter from DLR dated June 17, 1964, in which USRC was cautioned to conduct bioassays for tritium for all workers handling this material.

2. INSPECTION DATE:  
July 8-9, 1964

INSPECTOR:  
E. P. Resner

SCOPE OF INSPECTION:  
37-30-2 (follow-up)  
GL-126  
(Announced)



SUMMARY

A. Noncompliance

License No. 37-30-2

1. 20.201(b) - The licensee failed to evaluate adequately airborne concentrations of tritium released to unrestricted areas.

License No. GL-126

1. License Condition 13 - The licensee had been installing up to 4 foils in ion generators whereas the license limits one foil per device.

B. Safety Items - None

- C. Remarks - The inspection revealed that the licensee had corrected or was in the process of correcting the items of noncompliance for License No. 37-30-2, with the one exception shown above. A complete inspection was planned.

ENFORCEMENT

- A. The items of noncompliance were brought to the licensee's attention in a letter from SLR dated August 20, 1964. The licensee's reply, dated September 20, 1964, requested a three-month extension of time to reply with regard to tritium air monitoring. The extension was granted in a letter from SLR dated September 24, 1964. A letter reminder to reply from SLR, was sent to the licensee on December 30, 1964. The licensee's reply (adequate) dated January 7, 1965, was acknowledged by SLR on January 19, 1965. In a letter dated March 25, 1965, SLR requested to be informed of whether the tritium monitoring system described in the licensee's last reply, had been put into operation. The licensee's affirmative reply dated March 29, 1965, was acknowledged by SLR by letter dated April 6, 1965.

3. INSPECTION DATE:  
February 3 and 18, 1965

INSPECTOR:  
A. F. Ryan

SCOPE OF INSPECTION:  
Inquiry into a suspected violation regarding an unauthorized transfer of C-14 to a State of California licensee. Additional information to be obtained during next inspection.

4. INSPECTION DATE:  
May 4-7, 1965

INSPECTOR:  
J. E. Hyder

SCOPE OF INSPECTION:

37-30-2  
37-30-7  
GL-117  
GL-122  
GL-124  
GL-126  
(Announced,

SUMMARY

A. Noncompliance

License No. 37-30-7

1. License Condition 16 - Records were not maintained of visual inspections of watch hands.
2. 30.3 - Tritiated luminous paint was applied to timepiece hands and dial; and these articles distributed without a valid AEC license.

License No. GL-122

1. 30.3 - Sealed self-luminous sources were manufactured and distributed without a valid AEC license.

License No. GL-124

1. License Conditions 17 and 18 - Several railroad switch lamps were manufactured and distributed with excessive levels of radiation at exterior surfaces.

B. Safety Items - None

C. Remarks - None

ENFORCEMENT

- A. Forms AEC-591 (clear) issued for License Nos. 37-30-2; GL-117; and GL-126. The items of noncompliance for License Nos. 37-30-7; GL-122; and GL-124 were handled by Forms AEC-592 which were sent to the licensee on June 17, 1965. The licensee's reply, dated June 29, 1965, was considered adequate.



5. INSPECTION DATE:  
February 23-25, 1966

SCOPE OF INSPECTION:  
37-30-2  
37-30-7

INSPECTOR:  
J. E. Hyder

SUMMARY

A. Noncompliance

License No. 37-30-2 592

1. 20.103(a) - Uninlys' results showed that one individual had been exposed to airborne concentrations of tritium in excess of the limits.
2. 20.405(a)(1) - The overexposure of the one individual was not reported to AEC within 30 days.
3. 20.405(b) - The overexposed individual was not notified in writing of the nature and extent of his exposure.
4. License Condition 18 - An employee operating a tritium gas filling system was not wearing gloves as required by procedures.

B. Safety Items - None

C. Remarks - None

ENFORCEMENT

- and per - 4*
- A. Form AEC-591 (clear) was issued for License No. 37-30-7. The items of noncompliance for License No. 37-30-2 were handled by Form AEC-592 sent to the licensee on March 18, 1966. The licensee's reply, dated March 29, 1966, was considered adequate.

6. INSPECTION DATE:  
June 21-24, 1966

SCOPE OF INSPECTION:  
37-30-2  
37-30-7  
GL-122

INSPECTOR:  
J. E. Hyder

SUMMARY

A. Noncompliance

*June 66*

License No. 37-30-2

1. 20,201(b) - Surveys were inadequate to evaluate concentrations of tritium released to unrestricted areas.
2. 20,201(b) - Surveys were inadequate to evaluate concentrations of tritium to which personnel were exposed in restricted areas.

License No. 37-30-7

1. 20,201(b) - Surveys were inadequate to evaluate concentrations of tritium to which personnel were exposed in restricted areas.
2. 20,201(b) - No surveys had been made to evaluate tritium concentrations released to unrestricted areas from the screening room.
3. License Condition 13F - A lot of tritiated dials was not rejected when a number of rejects exceeding that specified were found.
4. License Condition 13G - A change in a quality control testing schedule was not done in accordance with this license condition.

License No. GL-122

1. License Condition 11 - Sealed self-luminous sources containing more than 4 curies of tritium have been distributed under this license without authorization.

B. Safety Items - None

C. Remarks - None

ENFORCEMENT

- A. The items of noncompliance were handled by issuance of Forms AEC-592 which were sent to the licensee on June 22, 1966. The licensee replied in two letters dated August 11, 1966, and August 17, 1966, respectively, which, in combination were considered adequate.

7. INSPECTION DATE:  
January 9-12, 1967

592

SCOPE OF INSPECTION:  
37-30-2  
37-30-7

INSPECTORS:  
E. Epstein  
P. R. Nelson

SUMMARY

A. Noncompliance

License No. 37-30-2

1. 20.201(b) - Evaluations of airborne concentration released to unrestricted areas from the tritium building and gas fill laboratory were inadequate in that:
  - a. Samples were not taken of dry tritium gas released;
  - b. Samples were not taken to determine tritium concentrations on particulates or of dry tritium during non-working hours, all of the work week, or during special jobs;
  - c. Particulate activity on filter media and soluble tritium absorbed in exhaust drying columns was not evaluated;
  - d. Evaluations which were made employed concentration limits for dry tritium only although high concentrations of soluble tritium were also present.
2. 20.201(b) - Surveys were inadequate to evaluate concentrations of tritium to which employees were exposed in that:
  - a. No breathing zone samples were taken while employees were handling multi-curie quantities of titanium tritide, tritiated resin in toluene, or during gas filling operations;
  - b. Incomplete breathing zone samples were taken during certain operations where airborne tritium could be expected;
  - c. Evaluations were inadequate to evaluate average concentrations during a 40-hour work week;
  - d. Evaluations of average concentrations to which employees were exposed were incorrect since the wrong limits were used.

3. 20,201(b) - Evaluations were inadequate to determine in-plant unrestricted area airborne concentrations.
4. 20,106(a) - Releases of soluble tritium in air effluents to unrestricted areas exceeded the limits when averaged over one year.
5. 20,103(a) - An employee performing gas fill operations was exposed to airborne soluble tritium in excess of the limits.
6. 20,405(a), (b) - Reports in writing were not made to AEC and to one employee of overexposure to airborne soluble tritium.
7. 20,206(a) - Employees working in restricted areas were not always instructed in hazards and precautions and in applicable Federal Regulations.
8. 20,203(d)(1) - The gas fill area was not posted as an airborne radioactivity area.
9. License Condition 17 - Smear tests in working areas were not made daily as required by procedures incorporated into the license.

License No. 37-30-7

1. 20,201(b) - Evaluations of airborne concentrations of tritium released to unrestricted areas from the watch dial building and the hand dial application area were inadequate in that:
  - a. No sampling was ever performed for soluble tritium or dry tritium released during painting operations;
  - b. Filters and drying column concentrations had not been determined;
  - c. Release limits for dry tritium were used whereas high concentrations of soluble tritium had been found in all samples taken.
2. 20,201(b) - Evaluations of airborne concentrations to which employees were exposed in restricted area were inadequate in that:

- a. Some breathing zone sample filters were not evaluated for particulate activity and drying columns were not counted to evaluate this contribution to airborne concentrations of tritium;
  - b. The samples taken were inadequate to evaluate average concentrations during a 40-hour work week;
  - c. Evaluations of average concentrations to which employees were exposed were incorrect since the wrong limits were used.
3. 20.201(b) - No evaluations had been made of in-plant unrestricted area airborne concentrations.
  4. 20.106(a) - Airborne releases of soluble tritium to unrestricted areas from the hand application area exceeded the limits when averaged over one year.
  5. 20.405(a) - The AEC was not notified within 30 days of excessive releases to unrestricted areas of soluble tritium.
  6. 20.206(a) - Employees working in restricted areas were not always instructed in hazards and precautions and applicable Federal Regulations.
  7. 20.203(d)(1) - The silk screen room was not posted as an airborne radioactivity area.
  8. 20.103(a) - One employee was exposed to excessive airborne concentrations of soluble tritium during one week in January 1967.
  9. License Condition 17 - Contrary to this condition:
    - a. Employees bypassed step-off and rubber control areas of the silk screen area and watch dial building;
    - b. Some hood exhausts had less than the required 100 linear feet per minute face velocities;
    - c. Smear tests of restricted areas were not made daily and turned over to the Radiation Safety Officer.

B. Safety Items - None

C. Comments - None

ENFORCEMENT

A. The items of noncompliance were handled by issuance of Forms AEC-592 which were sent to the licensee on March 3, 1967. The licensee replied in a letter dated March 22, 1967, which was considered adequate.