

Klein
Nelson
15

Office Memorandum • UNITED STATES GOVERNMENT

TO : Director,
Division of Licensing and Regulation
FROM : Assistant Director for Compliance, M. M. Mann
Division of Inspection

Signed
by
DATE: OCT 20 1958

SUBJECT: NATIONAL RESEARCH CORPORATION, LICENSE NOS. 20-1465-1 and 3, 10 OCT 30
SYMBOL: INS:CCP

Information gathered during inspection of the subject licensee shows noncompliance with AEC regulations (or license provisions) as set out in the enclosures.

It is suggested that a letter be addressed to the licensee to inform him of the noncompliance items and request that appropriate action be taken to correct or overcome these deficiencies. When corrective action has been completed on this matter, please furnish **NY Inspection Division** with copies of pertinent correspondence (to and from the licensee) and these items will be reviewed during the next regular inspection.

A summary of this case will be included in the **October** report to the Office of the General Manager.

A copy of this memorandum and the enclosure have been furnished the Office of the General Counsel.

Enclosure:

Cpy rpt dtd 9-25-58

Cpy trans memo fm R.W.Kirkman, NY to
M.M. Mann, dtd 9-29-58

→ cc: R.W.Kirkman, NY w/o encl.

ITEM # 2

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Marvin M. Mann, Assistant Director
Division of Inspection, Headquarters

SEP 29 1958

Robert W. Klitzman, Director, Inspection
Division, NYOO

TRANSMITTAL OF LICENSE COMPLIANCE INSPECTION REPORT - 20-1465-1

SUBJECT: INSPECTION

Transmitted herewith is the following inspection report involving noncompliance:

National Research Corporation
Physics Department
70 Memorial Drive
Cambridge, Massachusetts

License Nos. 20-1465-1 and -3

The following items of noncompliance were noted during this inspection:

License 20-1465-1

20.203 "Caution Signs, Labels, and Signals"

(f)(4) "Containers" - in that the brass unit containing two 160 millicurie Krypton 85 sealed sources, although labeled with the sign "Radioactive - Avoid Unnecessary Handling" and having the prescribed symbol, lacked the prescribed sign "Caution - Radioactive Material" and failed to show kind, quantity, and date of measurement of the quantity of licensed material it contained. (See paragraph 16 of report details.)

License 20-1465-3

20.203 "Caution Signs, Labels, and Signals"

(e)(1) "Additional Requirements" - in that the area (storage cabinet) and the storage room where curie amounts of licensed material were being stored, although posted with a sign entitled "Danger - Radioactivity" and having the prescribed symbol, lacked the prescribed sign "Caution - Radioactive Material". (See paragraph 16 of report details.)

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Paragraph 16 of report details.)

(f)(4) "Containers" - in that storage jars "C", "D", "E", and "F", each containing 250 millicuries or greater of strontium or radium trioxide foil were not labeled with radiation caution sign and symbol and failed to show kind, quantity, and date of measurement of quantity of licensed material they contained.

- In that a storage jar containing 7 curies of titanium or aluminum trihydride foil was not labeled with radiation caution sign and symbol and failed to show kind, quantity, and date of measurement of quantity of material it contained. (See paragraph 16 of report details.)

30.3 "License Requirements"

- In that the completed piece of equipment containing one course of titanium or zirconium trioxide fell was demonstrated in Pittsburgh, Pennsylvania, at the Mine Safety Corporation. (See paragraph 10, Aencase -3, of report details.)

Cont'd from 15

6. In that aluminum-titanium hydride fell was not anticipated by the Engineer to possession by the Ilsemer. (See paragraph 6, Ilsemer 6.3, of report entitled.)

Mr. Roebuck was informed of the item of noncompliance and stated he would correct the condition noted. Mr. Roebuck was also informed of the items of noncompliance under item 3 and stated he would correct the conditions noted with regard to conditions under

(continued)

SEP 29 1958

Marvin M. Mann

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citations 20.203(e)(1), (f)(1), (f)(4) and 30.3. He added that he would wait until hearing from DLAR with respect to the citation concerning condition 15, since there was a question as to whether the zirconium-titanium tritride foil should be sealed or unsealed sources.

Inasmuch as the items of noncompliance listed above do not constitute a major, an follow-up inspection is recommended. He suggested that a letter be sent to the licensee requesting confirmation of the items of noncompliance, 20.203 (f)(4) under license -1, and corrected. He recommended that a letter be sent to the licensee requesting confirmation that the items of noncompliance, 20.203(e)(1), (f)(1) and (f)(4) under license -3, have been corrected and requesting that item of noncompliance 30.3 be corrected.

With regard to citation for condition 15 of license -3, it is believed that the zirconium-titanium tritride foils are not sealed sources. Therefore, we recommend that the license -3 be amended by listing the chemical or physical form under Item 7 as being titanium or zirconium tritride foil and by deleting conditions 15 and 16.

It should be noted that the licensee (license -1) has not been cited for possessing two 160 millicurie Kr^{85} sealed sources designed and mounted as per drawing Model LAB-519 rather than one 400 millicurie Kr^{85} source designed and mounted as per drawing Model LAB-472, in that this office has neither drawing and does not know whether any difference exists.

It should also be noted that the licensee has not been cited for failure to comply with condition 16 of license -3, in that it is our belief that the zirconium-titanium tritride are not sealed sources. Therefore, cutting of them does not constitute a violation.

Please note that the NRC Equipment Corporation of Newton Highlands, Massachusetts, was not inspected, in that manufacturing of equipment using the licensed material has not begun as yet, and the research being performed was quite limited and being conducted in the same manner as at the Cambridge Research Division.

Enclosure:

Encl. opt. (2 cys.)

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee

National Research Corporation
Physics Department
70 Memorial Drive
Cambridge, Massachusetts

100-443886-1



4.10 C++ Rev(s) application

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5. License number(s), issue and expiration dates, conditions, restrictions, endorsements:

[illegible]

20-1465-3 4/4/58 4/30/60 Scope: 200 sources not to exceed \$1000 each - total 200 sources of Hydrogen 3, Sodium, Radium, Thorium, sealed sources Model LAB-1, and other sources. Sources Corp. sealed sources Model LAB-1, and other sources. (CONFIDENTIAL)

6. Inspection findings (and items of noncompliance)

The Applied Physics Department of the National Research Corporation at Woburn, Massachusetts, is using titanium and zirconium tritride fuel for the production of heat in processes and products which can be utilized for the manufacture of aircraft components at Newton Highlands, Massachusetts. Dr. Hanserichmidt supervises the use of the licensed material and is assisted by Dr. Winston, the Radiation Safety Officer who is responsible for radiological safety at both plants. In addition to the licensed material, two life milligrams of sealed sources, in a single unit, are used. Dr. Mr. Roehrig for developing instruments for gas chromatography. An independent Health Safety Committee, under the chairmanship of Dr. J. C. Simons, Director of the Applied Physics Department, approves proposed radiostoppage programs and periodic inspections. Facilities, instrumentation, radiation safety precautions and procedures, personnel monitoring, survey, procurement, waste disposal and record-keeping procedures are adequate. The only items of noncompliance observed or noted during the course of the inspection are as set out below:

London 22-144-3

24. 203 "Caution Signs, Labels, and Signals"

(c)(4) "Excluded person" - An individual who is excluded from the program for reasons set forth in 42 CFR 101.11. b6
b7C

7. Date of last previous test: _____

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DISTRIBUTION:

2 cys.-Division of Inspection, Headquarters
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Approved by:

Paul R. Malone

Robert H. Johnson, Director
New York

(Operations office)

September 21, 1953

(Data report prepared)

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

ITEM 5 CONT'D

<u>Number</u>	<u>Date</u>	<u>Exp. Date</u>	<u>Scope and Conditions</u>
20-1465-3 (Cont'd)			<p>Scope (Cont'd)</p> <p>200 sources not to exceed 1 curie each - total 200 curies of Hydrogen 3, as U.S. Radium Corp. sealed sources Model LAB-507; both to be used as ionization sources in vacuum gauges, gas analyzers and other instruments involving production of excited or ionized gas as principle of operation. Material may be distributed to ABC licensees;</p> <p>Conditions: #10-Unless otherwise specified, the authorized place of use is the licensee's address at 89 Memorial Drive, Cambridge, Massachusetts. #11-Byproduct material may also be used at ABC Equipment Corporation, 160 Charlemont St., Newton Highlands, Massachusetts. #12-The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards for Protection Against Radiation". #13-Byproduct material shall be used by, or under the supervision of, Dr. G. Frederick Vanderschmidt. #14-This license supersedes License No. 20-1465-2 issued July 25, 1957. #15-Byproduct material as sealed sources shall be encapsulated prior to possession by the licensee. #16-Byproduct material as sealed sources shall not be opened. #17-Total amount of Hydrogen 3 (tritium) acquired under this license shall not exceed 5,000 curies. #18-Hydrogen 3 procured under this license will be shipped direct from supplier to manufacturer of sources listed, U. S. Radium Corp. or Radiation Research Corp.</p>

ITEM 6 CONT'D

sealed sources, although labeled with the sign "Radioactive - Avoid Unnecessary Handling" and having the prescribed symbol, lacked the prescribed sign "Caution - Radioactive Material" and failed to show kind, quantity, and date of measurement of the quantity of licensed material it contained. (See paragraph 16 of report details.)

License 20-1465-3

20.203 "Caution Signs, Labels, and Signals"

- (e)(1) "Additional Requirements" - in that the area (storage cabinet) and the storage room where curie amounts of licensed material were being stored, although posted with a sign worded "Danger - Radioactivity" and having the prescribed symbol, lacked the prescribed sign "Caution - Radioactive Material". (See paragraph 16 of report details.)
- (f)(1) "Containers" - in that four storage jars, each containing 100 millicuries or greater of zirconium or titanium tritride foil, although tagged with the sign "Danger - Radioactivity" and having the prescribed symbol and showing the kind, quantity, and date of measurement of the quantity of licensed material each jar contained, lacked the prescribed sign "Caution - Radioactive Material".

ITEM 6 CONT'D

20.203 "Caution Signs, Labels, and Signals"

(f)(1) "Containers" - in that one tritium mounted foil totaling one curie, although tagged with a sign worded "Danger - Radioactivity" and having the prescribed symbol and showing the kind, quantity, and date of measurement of the quantity it contained, lacked the prescribed sign "Caution - Radioactive Material". (See paragraph 16 of report details.)

(f)(4) "Containers" - in that storage jars "C", "D", "E", and "F", each containing 250 millicuries or greater of zirconium or titanium tritride foil were not labeled with radiation caution sign and symbol and failed to show kind, quantity, and date of measurement of quantity of licensed material they contained.

- in that a storage jar containing 7 curies of titanium or zirconium tritride foil was not labeled with radiation caution sign and symbol and failed to show kind, quantity, and date of measurement of quantity of material it contained. (See paragraph 16 of report details.)

30.3 "License Requirements"

- in that the completed piece of equipment containing one curie of titanium or zirconium tritride foil was demonstrated in Pittsburgh, Pennsylvania, at the Mine Safety Corporation. (See paragraph 10, license -3, of report details.)

Condition 15

- in that zirconium-titanium tritride foil was not encapsulated prior to possession by the licensee. (See paragraph 10, license -3, of report details.)

PART 30 INSPECTION

National Research Corporation
Applied Physics Section
70 Memorial Drive
Cambridge, Massachusetts

Date of Inspection: July 10, 1958

Persons Accompanying Inspector:

None.

Persons Contacted:

Dr. G. Vanderschmidt, Physicist
Mr. J. R. Roehrig, Senior Physicist

9. Organization and Administration

The National Research Corporation at Cambridge, Massachusetts, is primarily interested in the development and production of rare metals. The Applied Physics Section, the only users of the licensed material, is concerned with developing the products and processes for manufacture by the NRC Equipment Corporation at Newton Highlands.

Vanderschmidt, the only user of the titanium and zirconium tritride foil, is responsible for all projects using the material as well as inventory. Roehrig has been the only user of the Krypton 85 sealed sources. The Radiological Safety Committee, under the chairmanship of Dr. J. C. Simmons, Director of Applied Physics Department, approves proposed programs involving radioactive materials, inspects periodic survey results of facilities, and reviews procedures. Vanderschmidt stated that the committee meets approximately once a month and that minutes are kept. He reported that the committee was made up of the following members:

Dr. J. C. Simmons, Chairman
Dr. A. W. Winston, Radiation Safety Officer
Mr. J.V.E. Hansen, Business Manager
Mr. C. F. Taylor, Personnel Manager
Dr. Wayne Keller, Chemist
Dr. Sealer, Toxicology Consultant

Vanderschmidt stated that although the NRC Equipment Corporation at Newton Highlands had a separate Radiological Safety Committee under the chairmanship of Mr. F. Torney, Section Head, both plants have the same radiation safety officer who is responsible for the radiological safety at both locations, namely, Dr. Winston. Vanderschmidt said that the R.S.O.'s specific duties consisted of educating personnel in radiological safety, making periodic checks to ensure compliance with approved procedures, reviewing weekly film badge reports, and maintaining records.

Vanderschmidt's training and experience consisted of no formal courses in radioisotopes other than that received at M.I.T. in experimental nuclear physics. He added that while at M.I.T. he had used Cobalt 60 and radium as ionizing sources and had used tritium, krypton, and radium during on-the-job training at the National Research Corporation.

Roehrig's training and experience have included no formal courses in radiological safety but on-the-job training for a period of five years at National Research Corporation, using radium and Krypton 85.

Winston's training and experience in radiological safety consisted of both formal courses at M.I.T. and on-the-job training at Schlumberger Well Survey Corporation. Vanderschmidt stated that Winston attended a Tracerlab course in radioisotope handling and during the period of 1956-57 was Radiological Consultant for the City of Houston, where he organized and taught courses in radiological monitoring and protection.

10. Facilities and Uses of Byproduct Material

License No. 20-1465-1

Roehrig said that only the 400 millicurie Krypton 85 sealed source was being used and that it actually consisted of two units of 160 millicuries each. He reported that they were permanently mounted in a brass container and that the only handling of the unshielded source was when the end caps were assembled. He added that it was only necessary to perform this operation once and that thick rubber gloves were worn. Roehrig stated that he was the only one who used and handled the Krypton 85 sealed sources and that they had been used in developing and improving instrumentation for gas chromatography.

License No. 20-1465-3

Vanderschmidt stated that less than 20 curies of titanium and zirconium tritride foil had been procured and that three instruments each containing approximately two curies of tritium foil had been completed. He added that all handling of the foil and its installation in the equipment had been performed in the storage room. Vanderschmidt reported that the three completed instruments were used in other rooms in the building and that on one occasion one of them had been demonstrated in Pittsburgh, Pennsylvania, for the Mine Safety Corporation. He stated that no manufacturing was being performed at the Newton Highlands plant and that the small research group there, working mostly with radium, had conducted similar experiments using approximately one square inch of titanium-zirconium tritride foil. Vanderschmidt said that the actual use and handling of the foil was as follows:

- (1) The foil is checked for strength by placing in an evacuated ionization chamber. Gloves are worn or tweezers used for this operation, which requires possibly 30 seconds to mount and demount.
- (2) The back of the foil is marked for purposes of identification.
- (3) The foil is placed in a bottle and assigned a number.
- (4) When ready for use, the foil is removed from the bottle, cut to the size needed to obtain the radiation intensity desired, and installed in the piece of equipment. (Several seconds are required for cutting and two minutes for installation.)
- (5) The source is tagged in the instrument, showing kind, quantity, and date of measurement.

Vanderschmidt stated that a special set of tools was used for cutting the foil. He added that the tools were labeled and stored in such a manner so as to ensure their not being used for any other purpose. He said that the tools were cleaned following use and were never handled except when gloves were worn.

Vanderschmidt verified the fact that the zirconium and titanium tritride sources were not actually sealed or encapsulated, in that the tritium is chemically bound to a thin layer of zirconium or titanium which is either rolled or evaporated on stainless steel foil. These tritium foils are not covered in any manner.

11. Instrumentation and Calibration Procedures

Vanderschmidt reported that two Juno survey instruments were available, one a Model H-4-602 Espey Manufacturing Company, and the other, a Model SRJ-1 Technical Associates. An operable Tracerlab radiation meter, Model SU-1H, having a range of 15 to 1500 mr/hr was available. In addition, an Atomic

Instrument Company GM survey meter, Model 409, was reportedly available. Vanderschmidt stated they possessed a special ion chamber which permitted them to check within one percent the radiation activity of the tritium foils.

12. Radiological Safety Precautions and Procedures

Vanderschmidt reported that the users had received their radiological instructions orally from the R.S.O. He said that no written instructions were available but that they were not felt necessary in that the users consisted of only himself, Roehrig and Torney. Vanderschmidt stated that no radiation surveys had been made of their restricted and unrestricted areas for contamination spread, but that extensive checks of the tritium foils had been made to determine any loss in activity. He added that these checks were made once a month and that to date no detectable loss had been noted. It was his opinion that the air was indirectly being monitored during these source checks since room air passes over the sources and through the instrument when being checked. Vanderschmidt reported that some of the tritium foils were leak tested by the manufacturer, using a mass spectrometer prior to receipt of them by NRC. Vanderschmidt said that upon receipt of the tritium foils, they performed a leak test of their own by checking them over a long period of time in a vacuum chamber. He added that no change in ionization intensity was noted. He stated that rubber gloves were always worn during the handling of the tritium foils, tweezers, or tools used during cutting operations. Roehrig reported that a radiation survey made initially of the krypton sources showed a dose rate of 25 mr/hr at the surface. Roehrig said that leak tests had been performed by the manufacturer, and on one occasion the krypton sources had been returned to the manufacturer for a second leak test and found to be satisfactory.

13. Procurement Procedures and Controls

License No. 20-1465-1

Roehrig stated that he was responsible for ordering the licensed material and seeing that the license limit was not exceeded. He reported that Krypton 85 sealed sources were procured from U. S. Radium Corporation and delivered directly to him unopened. He added that the 1000 millicurie Kr⁸⁵ sealed source (Serial No. 8596) was procured on 7-17-56. He called attention to the fact that it was originally assayed as 1009 millicuries and later re-assayed and found to be 550 millicuries. Roehrig stated that the two 160 millicurie Kr⁸⁵ sealed sources, Model LAB-519, with Source Nos. 9589 and 9590, were procured in December 1956.

License No. 20-1465-1

Vanderschmidt said that he was responsible for ordering the tritium foil and for seeing that the license limit was not exceeded. He reported and his records confirmed that approximately 20 curies of tritium foil had been procured to date from the U. S. Radium Corporation. He added that the Receiving Department had been directed not to open the packaged licensed material but to deliver it directly to himself or Mr. Simons. Vanderschmidt stated that the licensed material was procured by requisition, one copy being sent to the AEC and the other to either the Radium Research Corporation or U. S. Radium Corporation. At the time of the inspection, an inventory of their tritium revealed 18.7 curies in one square inch amount or less. Vanderschmidt reported that NRC Equipment Corporation at Newton Highlands had 1.25 curies.

14. Storage and Security of Material

Tritium foil and the two 160 millicurie Kr^{85} sealed sources are stored in a locked cabinet in the back physics laboratory. Vanderschmidt reported that the cabinet is locked at all times except when the licensed material is being used and that the room is always locked at night. The room cannot be entered except by entry through the adjacent laboratory which is attended by laboratory personnel. Vanderschmidt pointed out that the access door was posted with the radiation caution sign and symbol and that the personnel had been instructed as to its meaning and intent. Vanderschmidt stated that only he and Winston possessed the key to the cabinet. Three instruments, each containing 2 curies of titanium-zirconium tritride foil, were also stored in the room. Vanderschmidt reported that the 1-1/4 curies of tritium foil used at Newton Highlands was kept in a locked room when not attended.

15. Waste Disposal

License No. 20-1465-1

The 1000 millicurie Kr^{85} sealed source was sold to Esee Research & Engineering Company at Linden, New Jersey, on August 1956, in a trading place of equipment for detecting helium in-air. He added that Esee had assured them that they possessed the necessary specific license to receive the Krypton source.

License No. 20-1465-3

Vanderschmidt reported that no completed instruments containing tritium foil had been sold or transferred as yet. He added that approximately 2 curies of tritium foil as scrap had been returned to the supplier.

16. Posting of Areas - Labeling of Containers

It was noted that, although the area (storage cabinet) where curie amounts of licensed material were being stored and the storage room containing the cabinet were posted with a sign worded "Danger - Radioactivity" and having the prescribed radiation symbol, they lacked the prescribed sign "Caution, Radioactive Material".

Jars "C", "D", "E", and "F", each containing 250 millicuries or greater of zirconium and titanium-tritride foil were not labeled. Another jar containing 7 curies of zirconium-titanium tritride foil was not labeled. Four jars, each containing 100 millicuries or greater of titanium or zirconium tritride foil, although labeled with a sign "Danger - Radioactivity" and having the prescribed radiation symbol and showing the kind, quantity, and date of measurement of the quantity of licensed material each jar contained, lacked the prescribed sign "Caution - Radioactive Material".

The metal unit housing the two 160 Kr^{85} sealed sources, although labeled with a sign "Radioactive - Avoid Unnecessary Handling" and having the prescribed symbol, was not labeled with the prescribed sign "Caution - Radioactive Material" and failed to show the kind, quantity, and date of measurement of the quantity it contained.

One tritium mounted foil totaling one curie, although tagged with a sign worded "Danger - Radioactivity" and having the prescribed symbol and showing the kind, quantity, and date of measurement of the quantity it contained, lacked the prescribed sign "Caution - Radioactive Material".

The following radiation survey readings were taken by the inspector at the time of the inspection:

2-1/2 mr/hr at the surface of the storage room cabinet
0.4 mr/hr at 3' from the storage cabinet
0.15 mr/hr at the access doorway
less than 4.0 mr/hr at 12" from the 320 millicurie Kr^{85} sealed sources.

17. Personal Monitoring

Vandereschmidt reported that pocket dosimeters are not being worn but that Landauer film badges are worn by the users and processed weekly. A review of the film badge results for HRC at Cambridge and HRC at Herton Highlands showed the maximum radiation dose received in one week as being 110 millirem, with the average being only 15 - 20 millirem. No urine tritium assay program is in effect or is contemplated unless an unplanned loss occurs.

18. Records

Records of procurement, transfer, and personnel monitoring are being maintained. It was noted that procurement invoices are being retained by the Purchasing Department, with Vandereschmidt maintaining copies of the invoices and the records received and transferred.

With regard to AEC contracts, Vandereschmidt reported that HRC has just delivered vacuum flask analysis of fuel elements and other inventory materials under AEC contracts. He added that Lockheed has received a contract for the development of materials fire shipped, received, and stored according to HRC's assembly, storage, and handling regulations and that HRC is an accountability system with the symbol "VAC".