Form AEC-117 (1-58)

UNITED STATES ATOMIC ENERGY COMM.

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee
Sinclair Research Laboratories, Inc.
400 East Sibley Boulevard
Harvey, Illinois

2. Date of inspection
July 17, 1958

3. Type of inspection Initial

4. 10 CFR Part(s) applicable
20, 30, 40 and 70

5. License number(s), issue and expiration dates, scope and conditions (including amendments)
12-140-4 7-10-57 7-31-59 Scope: Hydrogen 3, any, 100 curies, for research and development as defined in Section 11(q) of the Atomic Energy Act of 1954. Any byproduct material between Atomic Nos. 3-83, inclusive, any, 1,000 millicuries, except: Cobalt 60, 25 curies; Iridium 192, 25 curies; Strontium 90, 100 millicuries. Total 130 curies. Conditions: #10-Material to be used at address given. #11-Materials to be used by, or under the supervision of, individuals designated by radioisotope committee, Dr. Adolph I. Snow, Chairman. #12-Materials may be used at any or all Sinclair facilities, owned or leased. #13-Supersedes 12-140-2 and 12-140-3. #14-Written administrative instructions required. #15-Curie of Iridium 192: that quantity of activity which presents radiation intensity of 0.55 roentgens per hour at one meter. #16-Total tritium procured not to exceed 100 curies. #17-Each sealed source container of licensed material to be used outside shielded exposure device to be permanently labeled. #18-Leak testing of sealed sources containing beta and/or gamma emitting byproduct material except Iridium 192, Tantalum 182 and plated Cobalt 60 to be every six months and results furnished (CONTINUED)

6. Inspection findings (and items of noncompliance)

No items of noncompliance were observed or otherwise noted during the course of the inspection.

All uses of radioactive material are under the direct control of the Radioisotope Committee, which passes on the use of all radioisotopes.

Enforcement of radiological safety precautions is the responsibility of the Radiological Safety Officer (R.S.O.), who is also Chairman of the Radioisotope Committee.

The Plant Safety Officer is responsible for maintaining records of personnel monitoring, radiation surveys, leak testing, and the receipt, use, and disposal of radioactive materials.

No overexposures have been reported.

License 12-140-4. The byproduct material program involves the utilization of radioisotopes for research and development and field use.

(CONTINUED)

7. Date of last previous inspection
None

8. Is "Company Confidential" information contained in this report? Yes ☒ No ☐
(Specify page(s) and paragraph(s))
Continuation Sheet #1, Paragraph 6 (continued)
Continuation Sheet #6, Paragraph 18 (continued)

DISTRIBUTION:
Dr. Marvin M. Mann
Division of Inspection
Washington, D. C. (2 cys)

Eugene S. Mann (Inspector)

Approved by: Roy C. Hagaman
Roy C. Hagaman, Director
Inspection Division
(Operations office)

July 18, 1958
(Date 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.

16-75314-3 U.S. GOVERNMENT PRINTING OFFICE

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

D11

5. License number(s), issue and expiration dates, scope and conditions (continued)

AEC upon request. #20-Byproduct material not to be used in or on human beings.

C-185 4-15-57 5-1-58 Scope: Licensed to receive possession of and title to 10 pounds of refined source material for use as an analytical reagent. Licensed to transfer and deliver possession of and title to refined source material to anyone licensed by AEC, within limits of his license. Conditions: Subject to all provisions of the Act and to all valid rules and regulations of the AEC, including 10 CFR 20. Neither this license nor any right under it to be assigned or otherwise transferred.

SNM-34 7-16-58 9-30-62 Scope: Licensed to receive and possess up to 1400 grams of U-235, the plutonium, and the byproduct material contained in eight irradiated MTR or ETR fuel elements. Authorized to use up to 700 grams of U-235, the plutonium and the byproduct material contained in four of the irradiated MTR or ETR fuel elements as a gamma radiation source. Conditions: Special nuclear material and by-product material not to be separated by chemical, physical or other means, nor shall the physical form of the elements be altered in any manner. Subject to all applicable provisions of the Act and to all applicable rules, regulations and orders of the AEC. In connection with its receipt, possession, use and transfer of said materials, licensee to observe procedures set forth in applications dated 2-3 and 5-4-56, 7-2 and 8-23-57, and 5-1-58.

6. Inspection findings (continued)

COMPANY CONFIDENTIAL

The byproduct material on hand and the estimated yearly use are as follows:

RADIOISOTOPE	APPROXIMATE AMOUNT USED ANNUALLY	APPROXIMATE AMOUNT ON HAND 7-17-58
Strontium 90	10 millicuries	20 millicuries
Carbon 14	11.5 millicuries	3 millicuries
Sulfur 35	500 millicuries	20 millicuries
Cobalt 60	500 millicuries	194 millicuries
Nickel 63	30 millicuries	30 millicuries
Iron 59	100 millicuries	1.5 millicuries
Tantalum 182	25 millicuries	9 millicuries
Phosphorus 32	500 millicuries	17 millicuries
Iodine 131	500 millicuries	- - -
Hydrogen 3	100 curies	80 curies

Solid radioactive waste such as irradiated piston rings, cutting tools, and chips is sent to Argonne National Laboratory for disposal.

License C-185. Uranium acetate and nitrate and thorium nitrate are used as analytical reagents.

License SNM-34. The special nuclear material on hand consisted of 576 grams of Uranium 235 contained in four MTR fuel elements used as a gamma radiation source in a specially constructed radiation cave.

DETAILS

9. The inspector was not accompanied.

10. The following members of the staff of Sinclair Research Laboratories, Inc. (hereinafter referred to as Sinclair) were interviewed, and they furnished the information given in this report: Mr. E. J. Martin, Vice President; Mr. William Mendius, Assistant to the Vice President; Dr. Aldolph I. Snow, Radiological Safety Officer and Chairman, Radioisotope Committee; Mr. R. H. King, Plant Safety Officer; Dr. Jay S. Curtice, Research Chemist; and Mr. Hugh Skonecke, Supervisor in the Engine Laboratories. Dr. Snow furnished information on the over-all program and on radiological health and safety, Mr. King furnished information on the records, Dr. Curtice on radioisotope inventory, and Mr. Skonecke on the Engine Laboratories program.

11. Organization

The research programs at Sinclair which involve the use of licensed by-product, source, and special nuclear materials are under the general supervision of Mr. E. J. Martin, Vice President and General Manager. Mr. William Mendius, Assistant to the Vice President, maintains liaison between management and the users of licensed material.

Dr. Adolph I. Snow, Senior Project Chemist, as Radiological Safety Officer and Chairman of the Radioisotope Committee, is responsible for the direct supervision of all uses of radioactive materials. Dr. Snow also is Director of the Radiation Laboratory.

Mr. R. H. King, Plant Safety Officer, handles the records of personnel monitoring, radiation surveys, leak testing, and the receipt, use and disposal of radioactive materials.

The Radioisotope Committee is composed of Dr. A. I. Snow, Chairman; Dr. L. H. Beckberger, Dr. Jay S. Curtice, Mr. M. L. Hamilton, Mr. R. H. King, and Mr. Lionel D. Norris, Jr. Their qualifications are as follows.

Dr. Snow, Senior Project Chemist and R.S.O. has a Ph.D. degree in Physical Chemistry. He was an Instructor at the University of Chicago Institute for the Study of Metals for two years. He had seven years' research experience at Ames Laboratory. He has had about six years' experience on catalysis research and application of physical chemistry to petroleum problems.

Dr. Beckberger, Senior Research Technologist, has a Ph.D. degree in Chemical Engineering. He has had 13 years' industrial experience in catalysis research, reaction kinetics, thermodynamics, process design, economic analysis, and process development. He attended the Oak Ridge School of Reactor Technology for one year.

Dr. Curtice, Research Chemist, has a Ph.D. degree in Physical-Organic Chemistry. He has had three years' experience in industrial organic chemistry including catalytic processing and synthetic lubricants and one year's experience in handling MTR fuel elements of kilocurie strength.

Mr. Hamilton, Assistant Director of the Engine Laboratories, has a B.S. degree in General Engineering. He has had 24 years' experience in the Engine Laboratories.

Mr. King, Assistant Director of Research Personnel Services and Plant Safety Officer, has a B.S. degree (Premedical). He has had 1½ years' chemical laboratory experience and 6½ years' experience in personnel and safety work.

11. Organization (continued)

Mr. Morris, Administrative Assistant and Supervisor of Communications, has a B.S. degree in Chemistry and is working for his M.B.A. degree. He worked five years on the Manhattan Project at the University of Chicago and at Oak Ridge, where he had extensive experience in the preparation and handling of radioactive species and did considerable work on detection equipment, fission chemistry and tracer problems. He has had six years' experience in the field of catalysis reaction kinetics and two years in administration.

The Radioisotope Committee meets about once in two months to handle requests for the use of radioactive materials. The functions and responsibilities of this committee are given in detail in Section 12, which follows.

12. Administrative Control Procedures

The scope of responsibility of the Radioisotope Committee and the manner in which it functions are as follows.

The committee does not attempt to evaluate the merit of projects using radioisotopes, but it passes on the conformity of the request with AEC requirements.

The main safety responsibility rests with the user and the R.S.O., and the committee does not carry on day-by-day supervision of safety precautions. Enforcement of radiological safety precautions is the responsibility of the R.S.O.

The committee approves the use of an isotope (or mixture of isotopes) at a certain strength, and under the direction of certain supervisory personnel. If any one of these factors is changed, the committee must be notified, and a new approval requested.

The committee has the responsibility of determining whether the intended user is sufficiently informed and has set up the proper safeguards to use the requested isotope safely. The committee may ask for periodic oral reports on the radiological safety aspects of any project involving radioisotopes.

All business of the committee can be carried on if a quorum of four is present; the R.S.O. must be one of the four.

The committee passes on the use of all radioactive isotopes, including uses at levels below activities requiring AEC approval, but excluding the use of uranium and thorium in analytical reagents.

The committee issues an annual report and keeps minutes of each meeting. Records of all decisions of the committee are kept in a permanent file.

13. Radiation Protection Procedures

For any projected use of radioactive materials, the procedure followed is for the user to inform the R.S.O. or his designated representative of the experiments contemplated. The individual user and the R.S.O. then work together to insure that proper safety precautions will be followed. The user then meets with the Radioisotope Committee or submits sufficient evidence in the form of a letter so that a reasonable appraisal in regard to the safety of the operation can be made. On approval of the Radioisotope Committee, the proper orders are placed.

13. Radiation Protection Procedures (continued)

In the event that the radioactive material is available at Harvey, approval of the Radioisotope Committee is necessary before the first such use but not for continued uses of the same isotope at or below the levels approved by the Radioisotope Committee.

The R.S.O. writes a letter to the responsible isotope user (the supervisor in charge) giving information on the nature of the isotope involved, the radiation emitted, the concentration of the activity, disposal instructions, and monitoring required. This letter is supplemented by information given orally to the user by the R.S.O.

Instructions are posted on the walls of rooms in the Engine Laboratories. These instructions give information on operating procedures and on appropriate radiological protection procedures.

Physical examinations for all personnel handling radioactive materials include initial and yearly complete blood counts, urinalysis, chest x-ray, plus a routine general physical examination.

14. Personnel Monitoring

Film badges are furnished by Nuclear-Chicago Corporation on a weekly basis. Film badges are worn at all times by all users of radioactive materials, except where such monitoring devices are not applicable (for example, in the case of work with Carbon 14 or Sulfur 35).

The reports of film badge exposures received from Nuclear-Chicago are kept indefinitely by Mr. King. A cumulative dose record is kept by Mr. King for each person who has ever received a dose of 50 mr/week or more. In the case of any reported exposure in excess of 50 mr/week, the film badge user is asked to give the reason for this exposure.

No overexposures have been reported (that is, no film badge readings in excess of 300 mr/week).

The typical highest film badge exposures reported are as follows:

PERSON	PERIOD	DOSE (mr)	CUMULATIVE DOSE (mr)
[redacted]	Jan. 20 - Jan. 24, 1958	65	65
	Jan. 24 - Jan. 31, 1958	55	120
	Jan. 20 - Jan. 24, 1958	60	60
	Jan. 24 - Jan. 31, 1958	55	115
	Jan. 31 - Feb. 7, 1958	195	310
	Feb. 7 - Feb. 14, 1958	110	420
	May 6 - May 10, 1957	55	55
	March 24 - March 28, 1958	50	105

E46

Pocket dosimeters are worn at all times by tracer chemists. Pocket dosimeters are worn during the starting period of standardized operations such as wear tests to obtain daily readings to give an accurate base line. Pocket dosimeters are also used for maintenance personnel and visitors. Dosimeters are permanently assigned for regular personnel; separate dosimeters are available for transients and occasional users.

Records of pocket dosimeter daily readings are kept by Mr. King on sheets that hold one week's readings.

15. Radiation Surveys

The following types of surveys are made: area surveys of radiation levels; wipe tests of surfaces of equipment, walls, and sources; and air monitoring in areas where airborne contamination is possible.

Area surveys are carried out with appropriate portable survey meters. Surfaces are tested by measuring the activity of the wipes. Airborne activity is measured by drawing a known amount of air through a filter and then measuring the activity level of the deposit on the filter.

Laboratory monitors are kept running constantly in areas where significantly active radioactive materials are in use. Hood filters are checked for activity build-up on a set schedule. Clothing and shoe contamination is detected by laboratory monitors or ratemeters.

Radiation surveys are made by Dr. Snow as R.S.O. or his designated representative. Routine surveys of the Engine Laboratories are done by supervisory personnel in the Engine Laboratories.

Records of radiation surveys are kept by Mr. King. Records maintained by him include the following typical surveys:

The storage room in the Engine Laboratories is monitored every three months.

The engine is monitored when a new radioactive piston ring is put in.

Shipments of piston rings and cutting tools irradiated at Argonne National Laboratory are monitored when received by Sinclair.

Shipments of tools and rings and chips are monitored when they are sent to Argonne for disposal.

Other work areas where radioactive materials are used are monitored regularly.

Radiation surveys are recorded on a special form entitled "Radiological Monitoring of Work Areas."

16. Records

Records are kept by Mr. King of personnel monitoring, radiation surveys, leak testing, and the receipt, use, and disposal of radioactive materials.

17. Posting and Labeling

Rooms, areas, facilities and equipment in which licensed materials are used or stored are posted with signs comprising a radiation caution symbol and appropriate wording.

Containers used for storage or transport of licensed material are labeled with signs consisting of a radiation caution symbol and appropriate wording.

18. License 12-1140-4

The byproduct material program involves the utilization of radioisotopes for research and development as defined in Section 11(q) of the Atomic Energy Act of 1954 and for field uses in leak detection and mixing experiments in refineries and pipelines and the like.

18, License 12-1h0-4 (continued)

COMPANY CONFIDENTIAL

E44

Facilities and equipment used for the byproduct material program are located in the Radiation Laboratory Building and in the Engine Laboratories.

The tracer laboratory in the Radiation Laboratory Building contains new modern laboratory furniture and equipment, including Kewaunee isotope hoods. The radioisotope storage vault consists of concrete-lined holes in the floor, stoppered by 16-inch-long concrete plugs. Other equipment includes a low intensity dry box, 5-foot long-handled tongs, magnetic pickup with 5-foot handle, interlocking lead bricks, lead pots, remote pipettor, long-handled tongs, clamping tongs, and long-handled sample carrier.

The counting room in the Radiation Laboratory Building is equipped with the following instruments: Packard Tri-Carb Liquid Scintillation Counter, Nuclear Measurements Survey Meter, Philips Monitor, Berkeley Juno Survey Meters, Nemson Electroscope, and Nuclear Chicago Gas Flow Counter with Sample Changer, Scintillation Probe and Sodium-Iodide Well Crystal, Ultrascaler, Ratemeter, Laboratory Monitor, and Geiger Counter with Probe.

The Engine Laboratories are equipped with suitably shielded engines and machines for performing wear tests on irradiated piston rings and cutting tools. The storage area in a special locked room contains concrete-lined holes in the floor, stoppered by 16-inch-long concrete plugs. There are special lead storage containers for radioactive piston rings and cutting tools.

The counting area is a specially designated location in the Engine Laboratories is equipped with the following instruments: Tracerlab Piston Ring Wear Analyzer, Sodium-Iodide Crystal connected to Amplifier, Superscaler, Laboratory Monitor, and Cutie Pie, and Nuclear Instrument and Chemical Survey Meter and Detector in 2-inch lead shield.

Records kept by Mr. King of each radioisotope received have information on current inventory, amount of waste disposal, and amount of isotopes used in any given period. On receipt of a radioisotope, the user fills out a form and sends it to Mr. King. The user also notifies Mr. King when any amount of isotope is disposed of and by what method.

Waste disposal. Solid radioactive waste such as irradiated piston rings, cutting tools, and chips is sent to Argonne National Laboratory for disposal. Liquid waste is stored in a 3,000-gallon tank and then is concentrated by distillation and (or) ion exchange; the activity of the effluent is measured to be certain that it is at a safe level for disposal. The concentrated liquid waste is recycled or sent to an authorized disposal agency. Liquid hydrocarbons containing radioactive wear particles

18. License 12-140-4 (continued)

(Iron 59, for example) are stored in isolated marked drums until the activity has decayed; the hydrocarbons are then burned in calculated small quantities to assure that airborne activity is well below safe levels. The activity of the residue is monitored. No activity is disposed of in the sewer system unless it is below the authorized disposal levels.

Compliance with special conditions of license 12-140-4 is as follows.

Condition 14, requiring written administrative instructions, is complied with by means of the letter written by the R.S.O. to the isotope user and the instructions posted in the Engine Laboratories, both described in Section 13, and General Instruction Book D-23, entitled "Procedures regarding ordering and use of radioactive materials at Harvey."

Condition 17, requiring tagging, is complied with in that all sealed sources are used in shielded exposure devices.

Condition 18, requiring leak testing of beta-gamma emitting sealed sources, is complied with by records of the following tests. The 10-millicurie Strontium 90 sealed source used in a Cenco 27625 Beta-Ray H/C Meter was wipe tested on October 28, 1957, with the following results: counts on blank swab: 33, 32, 32, 28, 31; counts on swab after cleaning: 34, 35, 32, 33, 31; and on March 11, 1958, with the following results: counts on blank swab: 24, 21, 23, 25; counts on swab after cleaning: 23, 24, 25, 22. The wipe test procedure set up by Central Scientific Company was followed for testing this source.

The 3-microcurie Strontium 90 sealed source used as a calibration source for the Jordan Survey Meter in the radiation cave was wipe tested on April 6, 1958.

Condition 19, requiring leak testing of alpha-emitting sealed sources, is not applicable in that only Strontium 90 sealed sources are used.

Condition 20 is complied with in that byproduct material is not used in or on human beings.

19. License C-185

This license expired May 1, 1958. Renewal applications were sent on June 26, 1958, by E. C. Elliott at Harvey to Otto Urschel in Sinclair's New York office for forwarding to AEC.

Uranium acetate is used for sodium analysis. On July 17, 1958, three pounds were on hand in the warehouse and three pounds in the laboratory. Three pounds were purchased on 10-22-52, 10-17-53, 7-13-54, 4-8-55, and on 4-29-55.

Uranium nitrate on hand on July 17, 1958, amounted to one-half pound in the warehouse and one pound in the laboratory.

Thorium nitrate on hand on July 17, 1958, amounted to six pounds in the warehouse and one-quarter pound in the laboratory.

20. License SNM-34

The special nuclear material on hand on July 17, 1958, consisted of 576 grams of Uranium 235 contained in four 90-day-cooled spent MTR fuel elements used as a gamma radiation source.

Facilities and equipment used in conjunction with the special nuclear material are located in the radiation cave and the adjoining radiation laboratory in the Radiation Laboratory Building.

20. License SNM-34 (continued)

The radiation cave facilities include cranes and hoists for handling the fuel elements and their containers and an 18-foot-deep well for storage of the fuel elements. Access to the cave is through a shielded door of magnetite concrete. A five-key interlock system on the cave door insures that the shield door cannot be closed while the cave is occupied.

The adjoining radiation laboratory contains the controls for the remote manipulator in the cave and the panel board for controlling the process reaction vessel in the cave.

Two process pipe labyrinths with suitable auxiliary shielding are provided at one end of the cave for introducing the liquid and gaseous process materials to be studied, as well as the general utilities required in an operation of this type. There is also a dry materials access port with a remotely operated mechanical conveyor.

The radiation detection equipment available includes a Victoreen Area Monitor, Nuclear Instrument and Chemical Laboratory Monitor, Cutie Pie portable ionization chamber survey meter, Portable count rate meter, Pocket dosimeters, and Film badges.

Extensive, detailed instructions entitled "Outline of procedure for receiving spent nuclear reactor fuel elements" were submitted with the license application. These instructions cover the following steps: Preparation, Receiving truck and unloading, Transporting container, Removing elements and reloading, Cleanup and windup.