

H. L. Price, Director  
Division of Licensing and Regulation  
Washington, D. C.  
Roy C. Hageman, Director, Inspection Division  
Chicago Operations Office

May 20, 1960

INSPECTION REPORT - SINCLAIR RESEARCH LABORATORIES, INC. -  
HARVEY, ILLINOIS - LICENSE NOS. 12-140-4, 12-140-5, C-185  
AND C-4185 (PARTS 30 AND 40)

SYMBOL: ID:ETM

Enclosed is an inspection report for Sinclair Research  
Laboratories, Inc., at Harvey, Illinois.

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

Enclosure:  
Inspection Report (1 cy)

CC: Marvin M. Mann, Asst. Dir., Div. of Inspection, Wash.-w/encl.(orig.)

A114

*Draft reviewed by Brackett & Hageman*

OFFICE ▶	ID <i>etm</i>	ID <i>RCH</i>			
SURNAME ▶	Mapp/eb	Hageman			
DATE ▶	5-20-60	5-20-60			

**COMPLIANCE INSPECTION REPORT**

1. Name and address of licensee  <b>Sinclair Research Laboratories, Inc. Harvey, Illinois</b>	2. Date of inspection <b>March 18, 1960</b>
	3. Type of inspection <b>Initial and Reinspection</b>
	4. 10 CFR Part(s) applicable <b>20, 30 and 40</b>

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

<u>12-140-4</u>				
Amendment 1	7-17-59	7-31-61	-	Reinspection #1
(amended in entirety)				
Amendment 2	8-14-59	7-31-61		
Amendment 3	9-23-59	7-31-61		
<u>12-140-5</u>	1-8-59	1-31-64	-	Initial
Amendment 1	11-3-59	1-31-64		
<u>C-185</u>	4-15-57	5-1-58	-	Reinspection
<u>C-4185</u>	7-11-58	7-31-59	-	Reinspection

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 control of the Isotope 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 Isotope Committee.

All orders for radioisotopes go through the Chairman of the Isotope Committee.

The R.S.O. writes a letter to each isotope user giving information and radiological protection instructions which have the force of an order.

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

There have been no overexposures.

(CONTINUED)

7. Date of last previous inspection <b>July 17, 1958</b>	8. Is "Company Confidential" information contained in this report? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (Specify page(s) and paragraph(s))
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DISTRIBUTION:

Marvin M. Mann, Assistant Director  
Division of Inspection  
Washington Headquarters (Orig.)

H. L. Price, Director  
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Eugene T. Mapp *E. T. Mapp*  
(Inspector)  
Approved by: Roy C. Hageman, Director  
Inspection Division  
(Operations office)  
March 23 - April 8, 1960  
(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.

Continuation Sheet #1

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

6. Inspection findings (and items of noncompliance) (continued)

Under License 12-140-4, byproduct material is used for research and development. The estimated (maximum) activity on hand on March 18, 1960 was 80 curies of Hydrogen 3, 37.8 millicuries of Carbon 14, 63 millicuries of Cobalt 60, 30 millicuries of Nickel 63, 20 millicuries of Strontium 90, and 100 microcuries of Phosphorus 32. Since July, 1958 five shipments of neutron-irradiated piston rings and cutting tool tips have been received which had a total estimated activity of 449 millicuries.

Under License 12-140-5, approximately 15,300 curies of Cobalt 60 as sealed sources were on hand.

Under Licenses C-185 and C-4185 no source material was obtained.

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

DETAILS

9. Inspection History

On July 17, 1958 an initial inspection was carried out on this program under Licenses 12-140-4, C-185, and SNM-34. No items of noncompliance were noted as a result of this inspection.

10. Announced Visit

The licensee was notified by telephone on March 14, 1960 of the scheduled inspection.

11. Inspector Unaccompanied

The inspector was not accompanied. The Illinois Department of Public Health had been notified of the scheduled inspection.

12. Persons Interviewed

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: Dr. A. I. Snow, R.S.O. and Chairman of the Isotope Committee; Mr. R. H. King, Plant Safety Officer; Dr. J. S. Curtice, Research Chemist; Mr. Hugh Skonecke, General Engineer, Engine Laboratory; Mr. Warren Stump, Processing Division; and Mr. William Mendius, Assistant to the Vice President. 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; Mr. Skonecke on the Engine Laboratory program; Mr. Stump on the Processing Division program; and Mr. Mendius furnished information by telephone on source material procurement.

13. Organization

The research programs at Sinclair which involve the use of licensed by-product and source 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 materials.

As R.S.O. and Chairman of the Isotope Committee, Dr. Snow is responsible for the direct supervision of all uses of radioactive materials. Dr. Snow is also Director, Radiation Division.

Mr. R. H. King, Plant Safety Officer, maintains the records of personnel monitoring, radiation surveys, calibration of survey instruments, leak testing, and of the receipt, use, and disposal of radioactive materials. Mr. King is also Assistant Director, Research Personnel.

March 18, 1960

DETAILS (CONTINUED)

13. Organization (continued)

The Isotope Committee consists of the following: Chairman, Dr. A. I. Snow, Director, Radiation Division; Secretary, Dr. J. S. Curtice, Research Chemist, Radiation Laboratory; Dr. L. H. Beckberger, Senior Research Technologist; Mr. M. L. Hamilton, Assistant Director, Engine Laboratory; Mr. R. H. King, Assistant Director, Research Personnel; Mr. L. D. Norris, Jr., Administrative Assistant and Supervisor of Communications.

The Isotope Committee meets about once every two months to handle requests for the use of radioactive materials. 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 keeps minutes of each meeting. The minutes include actions taken on applications for the use of radioisotopes and the safety precautions required. Records of all decisions of the committee are kept in a permanent file.

14. Administrative Control Procedures

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

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.

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

All orders for radioisotopes go through the Chairman of the Isotope Committee.

15. Radiation Protection Procedures

For any proposed use of radioactive materials, the user informs the R.S.O. 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 Isotope Committee or submits sufficient information in the form of a letter so that a reasonable appraisal of the safety of the operation can be made. On approval of the Isotope Committee, the proper orders are placed.

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

DETAILS (CONTINUED)

15. Radiation Protection Procedures (continued)

If the radioactive material is available at Harvey, approval of the Isotope 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 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.

"Engine Laboratory Radioisotope Projects General Operating Instructions" and "Information on Radioactive Area #...." are posted on the walls of rooms in the Engine Laboratory. These instructions give information on operating procedures and on appropriate radiological protection procedures. At indoctrination meetings, instructions are given to those involved in radioisotope projects.

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.

16. Personnel Monitoring

Film badges were furnished by Nuclear-Chicago Corporation on a weekly basis until about March 1, 1960. Since then, film badges have been furnished by R. S. Landauer, Jr. and Company at two-week intervals plus a thirteen-week cumulative film.

Film badges are worn at all times by Radiation Laboratory personnel.

The reports of film badge exposures received from the suppliers are kept indefinitely by the Plant Safety Officer. He also keeps a cumulative record for all film badge users.

Previously, the film badge user was asked to give the reason for any reported film badge exposure in excess of 50 mr/week. It is now planned to investigate any exposure in excess of 75 mr/two weeks.

There have been no exposures in excess of 300 milliroentgens per week. Since the previous inspection in July, 1958, the reported film badge exposures have been "under 50 mr/week."

Pocket dosimeters are worn to supplement film badges when deemed necessary by the R.S.O. 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 or film badges are worn by visitors and maintenance personnel.

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

DETAILS (CONTINUED)

16. Personnel Monitoring (continued)

Pocket dosimeters are not permanently assigned. Dosimeter exposure records are maintained by the Plant Safety Officer.

17. 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, or by drawing the air sample through a liquid which will pick up the radioactive material and then counting the liquid.

Laboratory monitors are kept running constantly in areas where significantly active radioisotopes are in use. Hood filters are checked for activity build-up periodically as a function of type of use. 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 Laboratory are done by supervisory personnel in the Engine Laboratory.

Records of radiation surveys are kept by the Plant Safety Officer. Records maintained by him include the following typical surveys:

The storage room in the Engine Laboratory is monitored periodically.

The diesel engines are monitored when a new radioactive piston ring is put in.

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

Shipments of tool tips and rings and chips are monitored when they are shipped for final disposal.

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

There has been a complete survey of all buildings.

The monthly survey of the radioactive waste storage area shows the radiation levels at 2 feet from the drums and 3 feet from the ground and the condition of the area, the drums, and the signs.

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

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

DETAILS (CONTINUED)

18. Leak Testing

The 10-millicurie Strontium 90 sealed source used in a Cenco 27625 Beta-Ray H/C meter was wipe-tested for leakage and contamination on October 16, 1959, with the following results: counts per minute on blank cotton swab, 18, 31, 34, 38; counts per minute on swab after wiping, 34, 32, 22, 31; and on March 17, 1960, with the following results: activity of blank cotton swab .005 - .015 mr/hr; activity of cotton swab after wiping .005 - .005 mr/hr.

The 3.5-microcurie Strontium 90 sealed source used as a calibration source for the Jordan survey meter in the radiation cave was wipe-tested on March 17, 1960. The results were negative.

Records of leak-test results are maintained by the Plant Safety Officer.

19. Inventory Records

Records kept by the Plant Safety Officer (P.S.O.) of each radioisotope received have information on current inventory, amount of waste disposal, and amount of isotopes used in any given period. On receiving a radioisotope, the user fills out a form and sends it to the P.S.O. The user also notifies the P.S.O. when any amount of an isotope is disposed of and by what method.

Inventory records are also kept by the Secretary of the Isotopes Committee.

20. Waste Disposal

Solid radioactive waste such as irradiated piston rings, cutting tool tips, and chips is shipped out for final disposal. One shipment was sent to Argonne National Laboratory. In the future, waste will be sent to Argonne, to Oak Ridge National Laboratory, or to a commercial waste disposal firm.

Liquid radioactive waste is being stored in a 3,000-gallon tank pending disposal.

Liquid hydrocarbons containing radioactive wear particles (Iron 59, for example) are stored in isolated marked drums for decay. Incineration of these hydrocarbons has not been done since several months previous to the last inspection in July, 1958. An amendment authorizing disposal by incineration will be applied for.

Waste disposal records kept by the Plant Safety Officer consist of letters from the users showing the amounts of isotopes disposed and the methods of disposal. Laboratory notebook records kept by users are the primary waste disposal records.

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

DETAILS (CONTINUED)21. Program and Scope of Work

License 12-140-4, Amendment No. 1 authorizes the possession of 100 curies of Hydrogen 3 and 1,000 millicuries of any byproduct material of atomic number 3 to 83, inclusive, except 25 curies of Cobalt 60, 25 curies of Iridium 192, and 100 millicuries of Strontium 90, total 130 curies, in any form, for research and development as defined in Section 30.4(k) of 10 CFR 30. The byproduct material obtained under this license is used in the Radiation Laboratory, the Engine Laboratory, and the Processing Division for research and development experiments.

The radioisotope inventory as of March 18, 1960 was as follows.

<u>ISOTOPE</u>	<u>FORM</u>	<u>ESTIMATED (MAXIMUM) ACTIVITY ON HAND</u>
Hydrogen 3	Tritium gas	7 curies
	Tritium water and liquid hydrocarbons	73 curies
Carbon 14	Barium carbonate	11 millicuries
	Carbon monoxide	1 millicurie
	Organic compounds	25.8 millicuries
Cobalt 60	Various forms (not including irradiated tool tips and piston rings)	63 millicuries
	Oil additive	30 millicuries
Strontium 90	Sealed sources	20 millicuries
	Calibration source	3.5 microcuries
Phosphorus 32	Red phosphorus	100 microcuries

Neutron-activated piston rings and cutting tool tips were received at Sinclair as follows since the last inspection.

<u>MATERIAL ACTIVATED</u>	<u>DATE RECEIVED</u>	<u>ESTIMATED ACTIVITY WHEN RECEIVED</u>
3 iron piston rings	10-20-58	24 millicuries
10 high speed steel cutting tool tips	11-10-58	140 millicuries
4 piston rings	7-13-59	50 millicuries
15 high speed steel cutting tool tips	9-29-59	210 millicuries
2 piston rings	1-19-60	25 millicuries

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

DETAILS (CONTINUED)

21. Program and Scope of Work (continued)

License 12-140-5 and Amendment No. 1 authorize the possession of 17,000 curies of Cobalt 60 in the form of sealed sources (AECL stainless steel welded pencils) for investigation of the effects of gamma radiation on petroleum processes and products.

At the time of the inspection approximately 15,300 curies of Cobalt 60 as sealed sources were on hand in the radiation cave as a radiation source used for investigating the effects of gamma radiation on petroleum products and processes.

Licenses C-185 and C-4185

License C-185 was issued April 15, 1957 and expired May 1, 1958. License C-4185 was issued July 11, 1958 and expired July 31, 1959. Each license provided for the receipt of ten pounds of source material during the term of the license for use as an analytical reagent.

No source material was obtained during the term of either license. The last purchase of source material was 3 pounds of uranyl acetate on April 29, 1955.

22. Facilities and Equipment

In the Engine Laboratory, located in E Building, Test Cell 26 is equipped with two suitably shielded diesel engines for performing wear tests on irradiated piston rings. There are labeled waste cans for oil. The engine is labeled, the area is posted, and the door is posted with a sign consisting of the conventional radiation symbol in magenta on yellow background and the words CAUTION RADIOACTIVE MATERIAL.

Room E-20 is equipped with a suitably shielded milling machine for performing wear tests on irradiated cutting tool tips. There are labeled waste cans. The room and the machine are posted.

Room E-9A is the storage room. It is posted and is kept locked. There are 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 tool tips.

In Room E-11, the counting area is posted and 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-Chicago Survey Meter and Detector in 2-inch lead shield.

March 18, 1960

DETAILS (CONTINUED)

22. Facilities and Equipment (continued)

"Engine Laboratory Radioisotope Projects General Operating Instructions" and "Information on Radioactive Areas #9, #2, #1" are posted, respectively, in Test Cell 26, Room E-20, and Room E-9A.

In the Processing Division, located in G Building, Carbon 14 is used in catalytic experiments at a maximum concentration of 10 microcuries per gallon. The maximum volume of each sample is about one quart. Instructions are posted. The apparatus and the sample bottles are labeled with the conventional radiation symbol in magenta on yellow background and the words CAUTION RADIOACTIVE MATERIAL. Mixing of radioactive solutions is done by Radiation Laboratory personnel, and final disposal is supervised by the R.S.O.

In the remote Radioactive Waste Storage Area, drums of contaminated hydrocarbons (cutting oils and lubricating oils) and dry waste (Kleenex, etc.) are stored pending final disposal. The drums are labeled, and the area is posted with a sign consisting of the conventional radiation symbol in magenta on yellow background and the words CAUTION, RADIATION AREA, RADIOACTIVE MATERIAL STORAGE.

In the Radiation Laboratory, located in N Building, the tracer laboratory, Room N-6, contains modern laboratory furniture and equipment, including two Kewaunee Oak Ridge-type hoods and one California-type hood. A separate sink empties into the radioactive waste storage tank. The hoods are posted with signs consisting of the conventional radiation symbol in magenta on yellow background and the words DANGER RADIOACTIVE MATERIAL. Laboratory containers are labeled.

The counting room, Room N-4, is equipped with many instruments which include a Packard Tri-Carb Liquid Scintillation Spectrometer and a Nuclear-Chicago Gas Flow Counter with sample changer, scintillation probe, and sodium iodide well crystal.

Facilities in the radiation cave, Room N-7, include cranes and hoists for handling the radiation source and an 18-foot-deep well for storage of the source. Access to the cave is through a shielding door of magnetite concrete. The door is posted with a conventional radiation symbol in magenta on yellow background and the words CAUTION HIGH RADIATION AREA.

There are three separate interlock systems to prevent opening of the cave door while the source is out of the well and to prevent raising the source while the cave door is open or closing the cave door while personnel are present in the radiation cave. The interlock systems are: mechanical hoist interlock, cave radiation level interlock, and cave door interlock. The radiation level interlock is controlled by a Jordan Rams II Remote Area Monitoring System with a remotely actuated check source.

March 18, 1960

DETAILS (CONTINUED)

22. Facilities and Equipment (continued)

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 adjoining radiation chemistry laboratory, Room N-2, contains the controls for the remote manipulator in the cave and the panel board for controlling the process reaction vessel in the cave. There is a shielding window between the cave and the radiation chemistry laboratory.

23. Compliance with License Conditions

LICENSE 12-140-4

Condition 11 provides for use at "facilities owned or leased by subsidiaries of Sinclair Oil Corporation in all 49 states."

Condition 12 requires compliance with 10 CFR 20. Compliance details are given in Sections 16, 17, 20, and 22 of this report.

Condition 13 defines a curie of Iridium 192.

Condition 14 requires that sealed sources be leak tested every six months and that records be maintained. Compliance details are given in Section 18 of this report.

Condition 15 provides for use of byproduct material by individuals approved by the Isotope Committee. Compliance details are given in Section 14 of this report.

Condition 16 requires tagging of each sealed source to be used outside of a shielded exposure device. No sealed sources are so used, as stated by the Chairman of the Isotope Committee.

Condition 17 prohibits use of byproduct material in or on human beings. Byproduct material is not used in or on human beings, as stated by the Chairman of the Isotope Committee.

Condition 18 requires that the licensee possess and use the licensed byproduct material in accordance with certain documents. The Chairman of the Isotope Committee stated that the statements, representations, and procedures contained in the documents referred to are being followed.

Condition 19 prohibits use of byproduct material in products distributed to the public. The Chairman of the Isotope Committee stated that byproduct material is not used in products distributed to the public except as provided for in Condition 20.

Condition 20 provides for the addition of 48 millicuries of Carbon-14 labeled hydrocarbon into the feed of a catalytic reforming unit with the concentration of Carbon-14 in the product gasoline not to exceed  $3.3 \times 10^{-7}$  microcuries per milliliter. The Chairman of the Isotope Committee stated that the specified procedure was followed and that the concentration of Carbon-14 in the product gasoline was well below the limits given.

Continuation Sheet #11

Sinclair Research Laboratories, Inc.  
Harvey, Illinois

March 18, 1960

DETAILS (CONTINUED)

23. Compliance with License Conditions (continued)

LICENSE 12-140-5

Condition 10 is complied with in that the licensed material is used at the Radiation Laboratory in Harvey, Illinois, as specified.

Condition 11 requires compliance with 10 CFR 20. Compliance details are given in Sections 16, 17, 20, and 22 of this report.

Condition 12 is complied with in that byproduct material is used by or under the direct supervision of Dr. A. I. Snow, Dr. J. S. Curtice, or Mr. G. A. Uhl, as specified.

Condition 13 requires that written administrative instructions be supplied to each individual user of byproduct material. This condition is complied with by means of the letter written by the R.S.O. to the isotope user, the instructions posted in the Engine Laboratory (both described in Section 15 of this report), and the booklet entitled "Radiological Health and Safety Procedures" which is supplied to isotope users.

Condition 14 requires that the licensee possess and use the licensed byproduct material in accordance with certain documents. The Chairman of the Isotope Committee stated that the statements, representations, and procedures contained in the documents referred to are being followed.