DLR:RGP

FEB 15 1961

National Lead Company
1050 State Street
Perth Amboy, New Jersey

Attention: Mr. G. L. Stukenbroeker

Gentlemen:

Thank you for your letter of December 14, 1960, informing us that you have corrected or will correct those deficiencies in your by-product material program which we brought to your attention in our letter of November 30, 1960. These matters will be reviewed during the next inspection of your facilities.

As requested in your letter, we have amended your license to authorize James J. Cullen to be your Health Physics Officer. Amendment No. 4 to License No. 29-6033-1 is enclosed.

Very truly yours,

James R. Mason, Chief
Isotopes Branch
Division of Licensing
and Regulation

Enclosure:
Amendment No. 4 to License No. 29-6033-1

bcc: Compliance Division, HQ)
Compliance Division, NYOO) w/cpy. ltr. 12/14/60
Public Document Room)

OFFICE ▶	DLR:RSB RGP:lrm:LRR	CO	DLR:IB Original Signed by JRMason James R. Mason			
SURNAME ▶						
DATE ▶	2-2-61	2/9/61	2/14/61			

Form AEC-318 (Rev. 9-53) U. S. GOVERNMENT PRINTING OFFICE 16—62761-3

B/2

RGP

6748

NATIONAL LEAD COMPANY

111 BROADWAY

NEW YORK 6, N.Y.

NUCLEAR METALS DIVISION

December 14, 1960

Mr. James R. Mason, Chief
Isotopes Branch
Division of Licensing & Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Mason:

Ref: DLR:RGP; AEC License 29-6033-1

We are in receipt of your registered letter dated November 30, 1960. In this letter you state several items in which we are not in compliance with conditions of our AEC Byproduct Material License No. 29-6033-1.

Relative to your Item 1, an electric alarm was installed on the doors to the Standardization Laboratory on about October 20, 1960. When either of the doors are opened an alarm will be set off. This alarm is also interlocked to the plant protection office, where someone is in attendance at all times.

Your Item 2 states a physical radiation survey was not made after the completion of each radiographic exposure to determine that the 51 curie cobalt 60 source was returned to its storage condition. In actual practice a survey was made everytime with our portable survey instrument, but no record was made of this survey. Since about September 1, 1960, a record has been made of these physical examinations to determine if the sources are in "safe" storage.

Concerning your Item 3, since about September 1, 1960, records have been established which will show source utilization. This will permit the determination of average radiation levels around and in our restricted areas. Our personnel radiation monitoring has always been in compliance with conditions of our license. Environmental surveys have always been made, but records are now kept of these surveys. On September 6, 1960, both of our cobalt 60

sealed sources were leak tested by Picker X-ray Corporation and found to be less than 0.002 microcuries. These results are put in record form for the regular AEC inspection.

It is requested that James J. Cullen, a licensed radiographer, be placed as the Health Physics Officer for our 29-6033-1 license and that my name be deleted from this responsibility. Mr. Cullen is a permanent employee of the National Lead Company at Perth Amboy, New Jersey.

If there are any questions associated with our answers to your letter of November 30, 1960, please contact me.

Very truly yours,

G. L. Stukenbroeker

GLS:FK

NOV 3 0 1960

DLR:RGP

National Lead Company
1050 State Street
Perth Amboy, New Jersey

Attention: Mr. G. L. Stukenbroeker

Gentlemen:

This refers to the inspection conducted on July 18, 1960, of your activities authorized under AEC Byproduct Material License No. 29-6033-1.

It appears that certain of your activities were not conducted in full compliance with a condition of your license and the requirements of the AEC's "Standards for Protection Against Radiation," Part 20, Title 10, Code of Federal Regulations, in that:

1. The high radiation area existing in the Standardization Laboratory during the use of your Cobalt 60 sources was not equipped with an interlock or warning system meeting the requirements of Section 20.203(c)(2), "Caution signs, labels and signals."

2. A physical radiation survey was not made after the completion of each radiographic exposure to determine that the 51 curie Cobalt 60 source was returned to its storage condition as required by License Condition No. 16, "Radiation surveys."

3. Survey records were incomplete, in violation of Section 20.401(c), "Records of surveys, radiation monitoring and disposal."

REGISTERED MAIL
RETURN RECEIPT REQUESTED

Pursuant to the provisions of Section 2.201(a), "Notice of violation," of the AEC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, you are requested to notify this office, within thirty days of your receipt of this notice, of the steps taken or to be instituted to achieve correction of the alleged violations and the date when such correction has been or will be achieved.

With regard to Item 2, we understand that you use a Technical Operations Model 492 "Gamma alarm" in connection with your radiographic operations. Your survey procedure utilizing this device does not meet the requirement of License Condition No. 16, that a physical radiation survey be made immediately after each radiographic exposure to determine that the source is returned to its storage condition. Under certain conditions of use, the exposed source could be shielded from the "Gamma alarm", thus eliminating the protection offered by it. The source could be shielded by the radiography projector itself or by some other object placed between the source and the "Gamma alarm". For this reason, it is necessary that a portable survey instrument be used in determining that the source is safely returned to its storage condition.

Very truly yours,

James R. Mason, Chief
Isotopes Branch
Division of Licensing
and Regulation

Enclosures:
1. 10 CFR 20
2. 10 CFR 2

bcc: Compliance Division, HQ
Compliance Division, NYOO
Public Document Room

OFFICE ▶	DLR:RSB	CO	DLR:IB			
	RGP:lrm:LRR		JRMason			
SURNAME ▶			Buchanan			
DATE ▶	11-18-60	11-28-60	11/29/60			

rewritten

DLR:RGP

National Lead Company
1050 State Street
Perth Amboy, New Jersey

Attention: Mr. G. L. Stukenbrocker

Gentlemen:

This refers to the inspection conducted on July 18, 1960 of your activities authorized under AEC Byproduct Material License No. 29-6033-1.

It appears that certain of your activities were not conducted in full compliance with a condition of your license and the requirements of the AEC's "Standards for Protection Against Radiation," Part 20, Title 10, Code of Federal Regulations, in that:

1. The high radiation area existing in the Standardization Laboratory during the use of your Cobalt 60 sources was not equipped with an interlock or warning system meeting the requirements of Section 20.203(c)(2), "Caution signs, labels and signals."

2. A physical radiation survey was not made after the completion of each radiographic exposure to determine that the 5i curie Cobalt 60 source was returned to its storage condition as required by License Condition No. 16, "Radiation surveys."

3. Survey records were incomplete, in violation of Section 20.401(c), "Records of surveys, radiation monitoring and disposal."

REGISTERED MAIL
RETURN RECEIPT REQUESTED

Pursuant to the provisions of Section 2.201(a), "Notice of violation," of the AEC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, you are requested to notify this office, within thirty days of your receipt of this notice, of the steps taken or to be instituted to achieve correction of the alleged violations and the date when such correction has been or will be achieved.

Very truly yours,

James R. Mason, Chief
Isotopes Branch
Division of Licensing
and Regulation

Enclosures:
10 CFR 20
10 CFR 2

bcc: Compliance Division, HQ
Inspection Division, NYOO
Public Document Room

OFFICE ▶	DLR:RSB	CO	DLR:IB			
SURNAME ▶	RGP:hgs:LRR		JRMason			
DATE ▶	10-23-60					

Form AEC-318 (Rev. 9-53) U. S. GOVERNMENT PRINTING OFFICE 16—62761-3

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : L. R. Rogers, Assistant Director for Nuclear Materials Safety
Division of Licensing and Regulation

DATE: NOV 2 1960

FROM : Ellyson G. Outten, Acting Assistant Director for Materials
Division of Compliance

Ellyson G. Outten

SUBJECT: NATIONAL LEAD CO., PERTH AMBOY, NEW JERSEY; LICENSE NO. 29-6033-1

CO:WEK

Reference is made to the attached letter to subject licensee which was prepared by your office and sent to this division for concurrence.

As indicated in the report, and as confirmed by us in a telephone conversation with the inspection representative, it appears that licensee should not be cited for noncompliance with Condition 16 of the license. Although the licensee does not use a portable survey meter to ensure that the source is returned, a Model 492 Gamma Alarm is used, instead, and is adjusted to indicate a level in excess of 2.5 mr/hr. We believe that the Gamma Alarm meets the requirements of Condition 16. If, however, the Gamma Alarm does not meet the stated requirements of Condition 16, we suggest that consideration be given to modifying the license condition since the device appears to afford equal protection.

Attachment:
Cpy ltr fm L&R
to Licensee

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

AUG 3 1 1960

TO : Harold L. Price, Director, Division of Licensing and Regulation, Headquarters

DATE:

FROM : Paul B. Klevin, Acting Director
Compliance Division, NYOO

SUBJECT: TRANSMITTAL OF LICENSE COMPLIANCE INSPECTION REPORT-10 CFR 30

SYMBOL: CMP:AJF

Transmitted herewith is the following inspection report involving noncompliance:

THE NATIONAL LEAD COMPANY
1050 State Street
Perth Amboy, New Jersey

License No.: 29-6033-1 w/amends. 1 and 2

The following items of noncompliance were noted during the course of the inspection:

20.203 "Caution signs, labels and signals"
(c) "High Radiation Areas" (2) - in that the Standardization Laboratory was not equipped with either a control device which would reduce the level of radiation upon entry of an individual to below 100 mrem in one hour, or a visible or audible alarm signal which would make an individual aware of entry into the high radiation area existing during their radiographic exposures. (See paragraph 11 of report details.)

20.401 "Records of surveys, radiation monitoring and disposal"
(c) - in that no records of direct reading surveys were maintained by the licensee. (See paragraph 12B of report details.)

(continued)

- in that records of film badges that had been used for area monitoring revealed only integrated doses. (See paragraph 12B of report details.)

The items of noncompliance were discussed with Mr. George Stukenbroeker, Resident Scientist, and Mr. Nicholas Muccilli, Plant Manager, who stated that they would take the necessary corrective action as required by DL&R.

No personnel hazard is apparent, and no follow-up inspection will be scheduled.

We recommend that a letter be sent to the licensee requiring correction of all items of noncompliance.

Enclosure:
1 cy Rpt.

cc: Div of Cmp, Hq.
w/orig. of Rpt.

Form AEC-417
(4-58)

UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee	2. Date of inspection
THE NATIONAL LEAD COMPANY 1050 State Street Perth Amboy, New Jersey	July 18, 1960
	3. Type of inspection: Initial
	4. 10 CFR Part(s) applicable: 20 - 30

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

License No.	Date	Exp. Date
29-6033-1	12/30/59	12/31/61

SCOPE: A. 52 c contained in one source of 50 c and one source of 2 c of Co-60 as Technical Operations Model A-424 sealed sources for use in Technical Operations Model 446 projector for industrial radiography.

CONDITIONS: #11-Compliance with Part 20. #12-Byproduct material shall be used by, or under the direct personal supervision of, G. L. Stukenbroeker or J. M. Ness. #13-Byproduct material as sealed sources shall not be opened. #14-Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations, and procedures contained in his application dated December 10, 1959, and in related documents and amendments as follows:

(CONT'D)

6. Inspection findings (and items of noncompliance)

Two nominal Co-60 sources of 51 and 2.07 c strengths are used by the Atlantic Branch of the National Lead Company in a gamma probe and radiography program which tests the integrity of lead products. George Stukenbroeker, Resident Scientist, initiated the program and instructed personnel at the plant in radiological safety. J. M. Nees is the present Radiation Protection Officer, and has taken an industrial radiography course from Picker X-ray Corporation. The facilities consist of an outdoor exposure area and a Standardization Laboratory. Radiation safety instructions have been issued to all personnel, and the radiation safety procedures outlined in the instructions were reviewed. Personnel monitoring is accomplished by means of pocket dosimeters and film badges which are worn by each individual. Physical radiation surveys have been made of both exposure areas. Stukenbroeker is responsible for procurement, and two sources have been obtained from Technical Operations, Incorporated. There has been no waste disposal. Posting and labeling was reviewed at the time of this inspection. The only items of noncompliance observed or otherwise noted during the course of the inspection are as set out below:

(CONT'D)

7. Date of last previous inspection	8. Is "Company Confidential" information contained in this report? Yes ☐ No ☒ (Specify page(s) and paragraph(s))
None.	

DISTRIBUTION:
1 cy - Div of Cmp, Hq.
1 cy - D L & R
2 cys - Cmp Div, NYOO

Archibald J. Fleming
(Inspector)

Approved by: Paul B. Klevin, Acting Dir.
New York
(Operations office)

August 26, 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.

16—73314-2 U. S. GOVERNMENT PRINTING OFFICE

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

ITEM 5 (CONT'D)

License No. Date Exp. Date

29-6033-1

CONDITIONS: A. "Radiation Protection Procedures", contained in application dated December 10, 1959.

#15-Written administrative instructions referenced in Condition 14A covering radiological protection, control, and security of byproduct material shall be followed and a copy of instructions shall be supplied to each individual using or having responsibility for use of such material. Any changes in the administrative instructions shall have the prior approval of the Isotopes Branch, Division of Licensing and Regulation. #16-Calibrated and operable survey instrumentation is to be maintained at each site where radiographic exposures are being made. A physical radiation survey is to be made (1) to determine compliance with Sections 20.102 and 20.203 of Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation" and (2) immediately after each radiographic exposure is completed to determine that the source has been returned to its storage condition. The survey instrumentation shall have a range of a few milliroentgens per hour to at least one (1) roentgen per hour. #17-The radiographic areas are to be kept under continuous surveillance during each exposure operation. #18-The licensee shall exercise appropriate administrative control to assure that no person will use or personally supervise the use of byproduct material until such person has:

A. Received instructions in, and demonstrated a thorough understanding of, the regulations of 10-CFR, Part 20, the licensee's operating and emergency procedures; and the provisions of this license.

B. Demonstrated competency in the use of byproduct material, equipment, and survey instruments which will be used.

#19-Radiography exposure devices, portable carrying containers, shipping containers, and storage containers having a radius greater than four (4) inches shall be limited to maximum radiation levels of 200 mr/hr at the surface and 10 mr/hr at one meter from the source. Devices and containers having a radius of less than four (4) inches shall be limited to maximum radiation levels of 40 mr/hr at six (6) inches from the surface.

ITEM 5 (CONT'D)

License No.	Date	Exp. Date
29-6033-1 amend. 1	1/18/60	12/31/61

SCOPE: A. 56 c contained in one source of 53 c and one source of 3 curies of Co-60 as Technical Operations Model A-424 sealed sources.

CONDITIONS: Condition 19 is amended to read:
#19-Radiography exposure devices, portable carrying containers, shipping containers, and storage containers having a radius greater than four (4) inches shall be limited to maximum radiation levels of 200 mr/hr at the surface and 10 mr/hr at one meter from the source. Devices and containers having a radius of less than four (4) inches shall be limited to maximum radiation levels of 50 mr/hr at six (6) inches from the surface.

29-6033-1 amend. 2	4/1/60	12/31/61

SCOPE: No change.

CONDITIONS: Condition 12 is amended to read:
#12-Byproduct material shall be used by, or under the direct personal supervision of, G. L. Stukenbroeker, J. M. Nees, Julian Koerner or James J. Cullen.

#20-Sealed sources containing Cobalt 60 shall be tested for external contamination and/or leakage upon receipt from another person, except when the licensee receives certification from the person that the sources had been tested within thirty (30) days prior to transfer and found free of surface contamination. Sources shall be tested for contamination and/or leakage at intervals of not more than six (6) months thereafter. (Sources semipermanently or permanently mounted in devices may be tested by checking accessible surfaces of the devices for removable radioactive material.) The test shall be sufficiently sensitive to detect 0.05 microcuries of radioactive material on the surfaces of sources or devices.

If the test reveals removable radioactive material, the licensee shall take immediate action to prevent spread of contamination, initiate corrective action and shall notify the Manager of the nearest Atomic Energy Commission Operations Office listed in Appendix D of Title 10, Code of Federal Regulations, Part 20, within 10 days. The report shall include a statement of corrective action taken.

ITEM 5 (CONT'D)

License No.	Date	Exp. Date
29-6033-1 amend. 2		

CONDITIONS: Leak tests and/or repairs shall be performed by persons specifically licensed by the Commission to perform such tests. Records of leak test results shall be maintained by the licensee.

ITEM 6 (CONT'D)

20.203 "Caution signs, labels and signals"
(c) "High Radiation Areas" (2) - in that the Standardization Laboratory was not equipped with either a control device which would reduce the level of radiation upon entry of an individual to below 100 mrem in one hour, or a visible or audible alarm signal which would make an individual aware of entry into the high radiation area existing during their radiographic exposures. (See paragraph 11 of report details.)

20.401 "Records of surveys, radiation monitoring and disposal"
(c) - in that no records of direct reading surveys were maintained by the licensee. (See paragraph 12B of report details.)

- in that records of film badges that had been used for area monitoring revealed only integrated doses. (See paragraph 12B of report details.)

PART 30 INSPECTION

THE NATIONAL LEAD COMPANY
1050 State Street
Perth Amboy, New Jersey

Date of Inspection: July 18, 1960 (Announced)

Persons Accompanying Inspector:

None. Mr. John Russo of the New Jersey State Health Department was notified of the visit.

Persons Contacted and Titles:

Mr. Nicholas S. Muccilli, Plant Manager
Mr. George Stukenbroeker, Resident Scientist
Mr. James Cullen, Assistant Radiation Protection Officer

DETAILS

9. Organization and Administration

The Atlantic Branch of the National Lead Company, located in Perth Amboy, New Jersey, manufactures lead ingots, castings and paint products. The National Lead Company is a nationwide organization; the main headquarters are located at 111 Broadway, New York. Mr. N. S. Muccilli is the Plant Manager in charge of all operations at the Atlantic Branch of the company.

Mr. George L. Stukenbroeker is the Resident Scientist at the Atlantic Branch, but he also works at the Industrial Reactors Laboratory in Plainsboro, New Jersey. He initiated the byproduct material program at the Atlantic Branch and was the original Radiation Protection Officer there. His experience with radiation includes 10-1/2 years of on-the-job experience at the Oak Ridge National Laboratory working for the National Lead Company of Ohio and the University of Michigan. He engaged in various radiation projects, and also received formal course work in health physics at ORNL.

Mr. Stukenbroeker gave a training course to the other personnel at the Atlantic Branch who were engaged in the byproduct material program. According to Stukenbroeker, this course was equivalent to the 40 hour training course given by Picker X-ray Corporation. The course covers the fundamentals of radiation theory and the actual handling of isotopes.

Mr. John Nees, an authorized user, is the present Radiation Protection Officer under their license. He is a company Metallurgist, who has taken the training course in industrial radiography given by Picker X-ray Corporation. He also took the course given by Stukenbroeker and has had four months on-the-job experience in the handling of the sealed sources possessed under their license. He was on vacation at the time of this inspection.

Mr. James Cullen, an authorized user, is the Assistant Radiation Protection Officer. He took the course given at the plant and has had four months on-the-job experience. Mr. Julian Koerner, an authorized user, also took the course and has had six weeks of on-the-job training. In addition, there were two helpers, William Slater, Laboratory Technician, First Class, and Leo Jeorge, Laboratory Technician, Second Class, both of whom work under the authorized users' supervision.

11. Facilities and Uses of Byproduct Material

Stukenbroeker stated that the purpose for establishing a byproduct material program was in order to test the integrity of lead castings, which were being manufactured by National Lead for use in the fuel transfer cask car built for use in the Enrico Fermi atomic power plant in Michigan. The car is used in nuclear power work for the removal of spent fuel elements from the reactor core and for the re-charging of the reactor with fresh fuel elements.

The thicknesses of lead and steel that had to be tested for integrity ranged up to 14-3/4" of lead plus one inch of steel. Stukenbroeker pointed out that he had decided a large Co-60 sealed source was the best way of examining these thicknesses. He stated that they found radiographic film had not been suitable for their measurements, and instead adopted a gamma probe system for the testing. The detection device of the gamma probe system was a single channel Baird Atomic Model 510 scintillation spectrometer with a sodium iodide crystal one inch in diameter. The Co-60 source and detection crystal were mounted opposite each other on two vertical struts attached to a crossbar so that when the source was lowered inside the lead components of the car, the detection crystal was lowered simultaneously on the outside of the car. The amount of radiation transmitted through the lead to the crystal would indicate whether there were any voids or flaws present in the metal.

The gamma probe program of the different lead components of the fuel transfer cask car started in the middle of January and lasted until the end of April, 1960. A 51 c Co-60 source, in a T. O. Model 446 radiographic wagon, was used to gamma probe all thicknesses of lead greater than 6", while a 2.07 c Co-60 source was used for all thicknesses of lead less than 6". No exposures have been conducted since April, 1960.

Measurements were taken at points 6" apart in a square grid pattern. Each grid pattern was made up of about 300 points. The source would be wound in and out of the radiographic wagon for each determination of a grid point. Cullen reported the average time of a point determination was 30 seconds, and the interval between determinations lasted from two to three minutes. Stukenbroeker felt that the number of determinations made revealed several thousand, but he did not know the exact number.

Two exposure areas were used by the licensee. They are described as follows:

1. Standardization Laboratory

The Standardization Laboratory for the calibration of sources is located on the second floor of the Lined Products Building (Building No. 20). The original Standardization Laboratory was located in the acid recovery area of the plant as described by the licensee in their initial application for the license. Stukenbroeker reported that operating and personnel problems necessitated the move to Building No. 20. The present Standardization Laboratory (see Exhibit "A") is a permanent facility 32' long by 18' wide. The walls are made out of 8" thick blocks, which are filled with sand. The inside walls of the room are lined with lead plates 1/4 of an inch thick and 8' high. The floor is covered with lead 1/4 of an inch thick, and the area directly underneath their exposure table is covered by an additional lead plate 2' square and 2" thick. Stukenbroeker stated that the following precautions are taken for security in the restricted area in the vicinity of the Standardization Laboratory: The freight elevator which services the laboratory is shut off; the entire second floor area is cleared of personnel not engaged in the program; and the area directly underneath the Standardization Laboratory is restricted by order of the Plant Manager. Continuous surveillance is also maintained during exposures. A trial exposure of the 51 c Co-60 source was requested by the inspector. Both Cullen and Stukenbroeker felt that this would involve considerable inconvenience since no exposures had been made since April, and shielding would have to be erected by them. They stated they would contact this office during their next standardization measurements in order to arrange for an independent evaluation of the radiation levels which existed in their restricted and unrestricted areas. From records of film badges that had been posted on the inside walls of the Standardization Laboratory, it was determined by this office that levels of radiation in excess of 100 mr/hr existed during the source calibrations.

No control device was noted to be present in the Standardization Laboratory which, upon entry of an individual into the area, would either return the source to the radiographic wagon or which would energize a conspicuous visible or audible alarm signal so as to make the individual or licensee aware of entry.

A gamma alarm radiation monitoring system, Model No. 492, which had a visible alarm consisting of a red and green light, was located at the door to the Standardization Laboratory. The detection level of the gamma alarm had been set at 2.5 mr/hr, and when this radiation level was exceeded, the red light went on. (The gamma alarm was also used to monitor field exposures.)

2. Backyard of the Plant

The second exposure area (see Exhibit "B") was in the backyard of the plant. The large 51 c Co-60 source was used in the yard from February 9, 1960 until April 21, 1960. The heavy lead components which had to be tested were brought out on railroad flat cars which ran on spur tracks servicing the backyard of the plant. The lead components were gamma probed on the tops of the flat cars.

A shielding barrier was erected at a distance of about 50' from the exposure site for the operating personnel in the field. The barrier was 8' high and was made out of sand and concrete blocks about 3' thick. The top of the barrier was covered with additional shielding in order to protect personnel from reflected "skyshine" radiation.

Cullen stated that the test area within the backyard of the plant was roped off and prescribed caution signs had been posted. He indicated the general area which had been roped off and this corresponded to an area roughly 150' in radius within the plant. There were some additional shielding factors, which included a pile of coal about 15' high and 50' deep between the tracks and the property fence. Other shielding was provided by a pile of cans about 8' high on the near side of the tracks. The nearest unrestricted area was their property fence about 100' away.

Cullen felt the lead components of the cask car provided the best shielding of all as the radiation levels with the source inside of the cask car were only a few mr/hr at the surface of the car as measured by their survey meter. He stated the only noticeable exposure levels occurred when the source was being wound in and out of the projector. This operation took about 10 seconds. Stukenbroeker estimated that the reading on their survey meter during this time was 5 mr/hr behind the barrier in the field. (The same operation in the Standardization Laboratory resulted in a radiation level of 25 to 30 mr/hr at the outer door to the laboratory.)

Exposures were made during their day shift, and the shifts sometimes lasted for periods of up to ten hours. Stukenbroeker reported at least two persons were always present when handling byproduct material, and, as previously mentioned, all exposure areas were maintained under continuous surveillance during the exposures.

11. Instrumentation and Calibration

A Model 414 Baird Atomic survey meter with a logarithmic scale and ranges of a few mr to 3 r/hr was noted to be on hand and operable. Stukenbroeker reported that calibration is accomplished by means of a radioactive source located in the instrument, although he could not state what the kind or strength of the source was. A gamma alarm, Model No. 492, previously mentioned, was also maintained as a monitoring instrument.

12. Radiological Safety Precautions and Procedures

A. Instructions

A copy of the safety instructions entitled "Radiation Protection Procedures" has been supplied, as required by Condition 15, to each person having responsibility for use of byproduct material. Mr. W. Loud, Mr. J. Panko and Mr. B. Sabat, listed as individual users in the "Radiation Protection Procedures", did not engage in the program. Stukenbroeker stated that he gave the formal training course and quiz described in their "Radiation Protection Procedures" to each of the authorized users, Nees, Cullen and Koerner, at the start of their program.

B. Surveys and Records of Surveys

Stukenbroeker stated that the original radiation surveys had been made "relative to the Standardization Laboratory and surrounding area and actual working area during radiographic inspection" as required by their "Radiation Protection Procedures". These surveys consisted of measurements of the existing radiation levels during their operating procedures. No records of these surveys are maintained.

Physical radiation surveys were also made during their exposure program as required by Condition 16 of the license. There was no record of these required surveys.

Cullen stated that a survey was made with their portable survey meter at the end of each day's set of exposures in order to determine that the source had been returned to its storage condition. Cullen reported that during the day, however, the 51 c Co-60 source would be wound in and out of the projector several hundred times with the result that they relied on their visible gamma alarm to indicate whether the source was in or out of the projector.

Nine film badges were hung up at points inside and outside of the Standardization Laboratory and at the rope and barrier in the outside yard in order to monitor the integral radiation dose. Records were maintained of these weekly integrated exposures, but Stukenbroeker stated that no recorded estimate had been made of the radiation levels in mr/hr involved in the exposures.

C. Leak Tests

Stukenbroeker reported that no leak tests have been made since they acquired the source in January of 1960. License Condition 20, dated April 1, 1960, required in part that: "Sealed sources containing Co-60 shall be tested for external contamination and/or leakage upon receipt from another person except when the licensee receives certification from the person that the sources had been tested within 30 days prior to transfer and found free of surface contamination." Stukenbroeker thought that a contamination test had been made by Technical Operations, Incorporated, Burlington, Massachusetts prior to transfer of material in December of 1959, but there was no record possessed by the licensee of any leak test.

D. Locking of Areas

Both doors to the Standardization Laboratory are locked when not in use. There are two sets of keys; the Plant Manager, Mr. Muccilli, possesses one set, Mr. Cullen, the other set. Cullen keeps the latter set since he lives closest to the plant and can reach the plant earliest in case of an emergency.

13. Procurement Procedures and Control

Stukenbroeker is responsible for procurement and for ensuring that the license limit is not exceeded. Stukenbroeker said he originally ordered a 50 c and a 2 c source from Picker X-ray Corporation. After receipt of the byproduct material, January 8 and 12, 1960, it was noted by the licensee that they had received a 51 c and a 2.07 c Co-60 source, respectively, which exceeded their original procurement request and license limit. Nees contacted DL&R by telephone on January 8, 1960 and in a letter of January 12, 1960 to DL&R, Nees, the present Radiation Protection Officer, requested an amendment to Item 8 of their license which would permit them to possess the two sealed sources they had received. The amendment was given by DL&R on January 18, 1960 and allowed them possession of one source of 53 c and one source of 3 c of Co-60.

14. Storage and Security of Material

The storage area is located in the Standardization Laboratory. (See Exhibit "A"). The area was roped off and posted. At the time of this inspection, the 51 c Co-60 source was in storage in a Technical Operations, Incorporated, Model 446 radiographic wagon, and the 2.07c Co-60 source was in storage in the Technical Operations Model 488 source changer. Both containers are locked, and the Standardization Laboratory is locked when not in use. Keys are maintained by Cullen and Muccilli.

The highest radiation level noted by the inspector at the surface of the Model 446 radiographic wagon was 80 mr/hr using a Juno ionization chamber, serial No. 1637, calibration date, June 22, 1960. The radiation level a meter away from the wagon using the Juno was noted to be 5 mr/hr. The radiation level at the surface of the source changer containing the 2.07 c Co-60 source was 4 mr/hr using the Juno.

15. Waste Disposal and Records of Waste Disposal

Stukenbroeker stated that no byproduct material had been disposed of as waste. He reported that there had been one transfer of the 51 c Co-60 source back to Picker X-ray Corporation. The cable, which was attached to the radiographic wagon, had snarled, and they had to return the equipment for repairs. A record of this transfer was maintained.

16. Posting of Areas - Labeling of Containers - Tagging of Sources

A chain with a sign worded "Caution - Radiation Area" and radiation symbol was noted at the foot of the stairs leading up to the Standardization Laboratory. The second floor area was restricted during an exposure by use of this chain. The door to the Standardization Laboratory was also chained off and posted with a sign worded "Caution - High Radiation Area". The storage area was posted with the words "Caution - Radioactive Materials" and radiation symbol. Both source containers were labeled with the words "Caution - Radioactive Materials" and radiation symbol together with the kind, quantity and date of measurement of the byproduct material.

The backyard area was not posted at the time of this inspection since they were not using the sources.

18. Personnel Monitoring and Records of Personnel Monitoring

The licensee supplies a film badge and pocket dosimeter, which are worn by each person engaged in the radiography program. Picker X-ray Corporation, Des Moines, Illinois supplies the film badges on a weekly basis. Records of film badge and pocket dosimeter results are maintained in their log book. The highest exposure noted was a pocket dosimeter value of 60 mr to (b)(6) for the week of 2/16/60 to 2/23/60. Average weekly exposure was 25 mr. Most of the film badge results were noted to be below 10 mr.

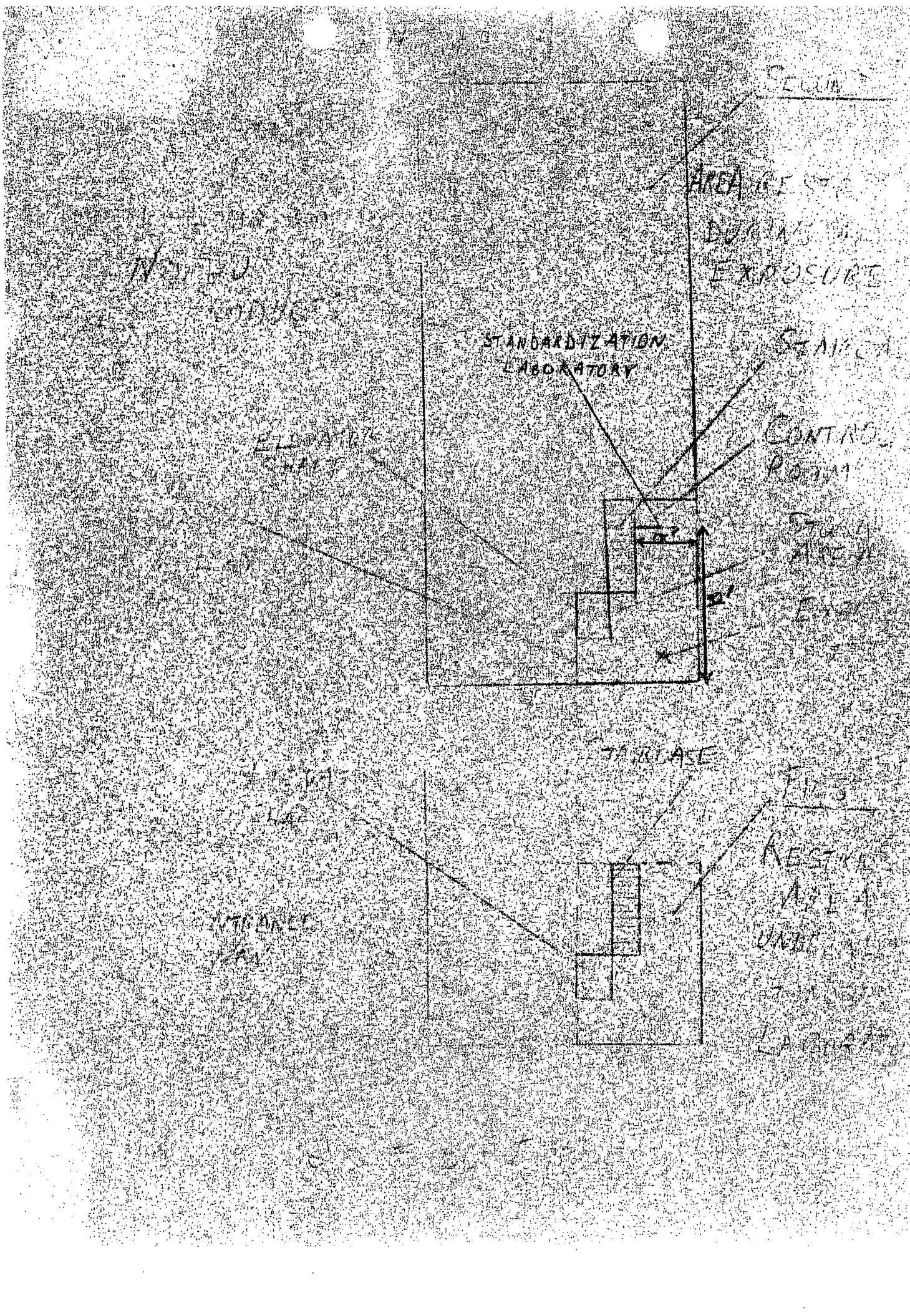
STANDARDIZATION
LABORATORY

EXHIBIT B - Du…
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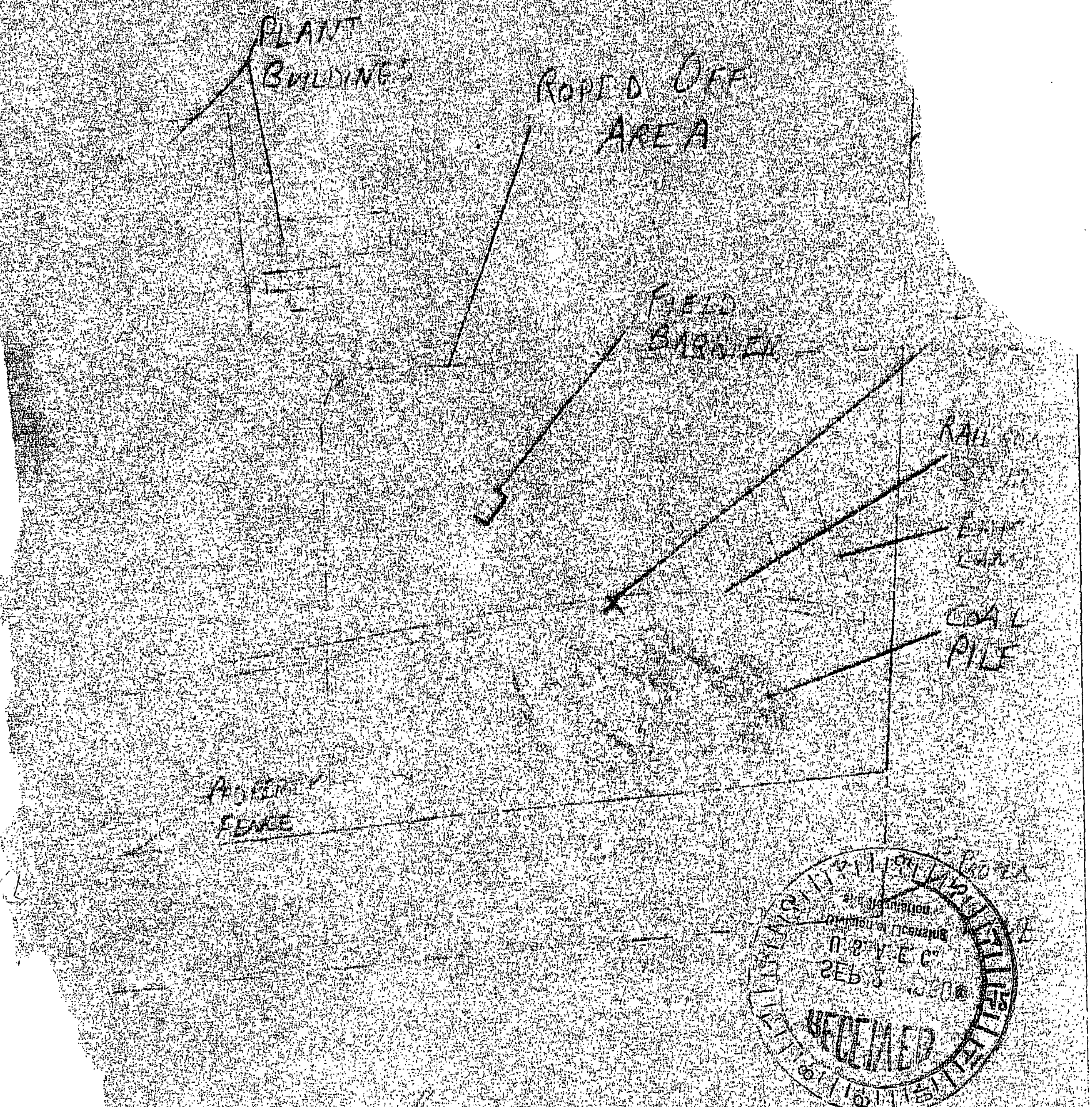

1" = 60 FEET