Part 30

FEB 21 1961

Donald E. Warner, Act. Asst. Dir. for
Materials, Division of Compliance, HQ.

Robert W. Kirkman, Director
Compliance Division, RTCO

TRANSMITTAL OF LICENSE COMPLIANCE INSPECTION REPORT-10 CFR 30, 40 AND 70

CMP:PDK:JES

Transmitted herewith is the following inspection report involving noncompliance:

RICHARD INDUSTRIES, INCORPORATED
D. E. Makepeace Division
Attleboro, Massachusetts

License Nos.: SNM-105 as amended
C-5161
20-5216-1 w/amends. 1 & 2 (Clear report)

The following items of noncompliance were discussed with Mr. C. A. Canham, Plant Manager, and Morton M. Weiss, Health and Safety Manager, who volunteered to take the necessary action to comply with the regulations:

SNM-105 and C-5161

20.103 "Measures to be Taken After Excessive Exposures"
- in that the licensee failed to limit the exposure of the melt operator to 10% of the permissible weekly dose after the operator had received a 13 week exposure in excess of the permissible limits established in 20.101. (See item 15D of Part 70 report details.)

20.101(a)(2)(ii) "Exposure of individuals in restricted areas"
- in that film badge records of E. Bodwell, melt operator, showed that he has exceeded 3 rems for several 13 week periods during 1960. (See item 15D of Part 70 report details.)

COMPLIANCE

KLEVIN:eg SEARS KIRKMAN
2/17/61

20.201(b) "Surveys"
- in that no physical evaluations or air sampling were made to determine the extent of uranium airborne contamination in the unrestricted areas adjacent to the plant during incineration of uranium-contaminated waste. (See item 15s(3) of Part 70 report details.)

- in that no breathing zone samples were taken during the furnace operation to adequately evaluate the furnace melt operator's exposure to radioactive aerosols. (See item 15b of Part 70 report details.)

SNM-1852

20.203 "Caution signs, labels and signals"
(f) "Containers" (4) - in that a shipping container, which contained 5 kgs U-235, was not labeled as to type and amount of material. (See item 18 of Part 70 report details.)

(f) "Containers" (1) and (4) - in that a one gallon can containing 1162 grams of uranium, 25% enriched, was not labeled with any "Caution - Radioactive Materials" sign or symbol or enrichment. (See item 18 of Part 70 report details.)

C-5161

20.203 "Caution signs, labels and signals"
(f) "Containers" (2) and (4) - in that six containers each containing 600 pounds of depleted uranium were not labeled with the proper radiation caution sign and symbol or the type and amount of material. (See item 9.1 of Part 40 report details.)

FEB 21 1961

It was pointed out to both Canham and Weiss that the items of noncompliance under 20.203(f)(1), (f)(2), and (f)(4), "Containers", were found in the previous inspection. It was also pointed out that most of the containers, with the exception of those found during this inspection, were properly labeled. Weiss said that he would try to prevent a recurrence of this citation.

With regard to the other citations found under Licenses SUM-185 and C-5161 jointly, Canham was informed that the 20.201(b) citation, "Surveys", although not exactly the same as that reported in the previous inspection, indicated a lack of adequate evaluation of air samples for the melting operation. Canham was informed that the melting operation has appeared to be a source of trouble as evidenced by the noncompliance items noted during the November 19, 1959 inspection and our Class "B" investigation of July 19, 1960. Both Weiss and Canham stated that they would take all necessary action to correct these items of noncompliance and to minimize exposures to personnel. Weiss also stated that he would arrange to have glasses worn by the melt operators and other individuals who may receive an exposure to the eyes as a result of working directly with or close to special nuclear and source materials.

The citations under 20.101 and 20.105 were discussed with both Canham and Weiss. It was pointed out to Weiss that he completely overlooked several excessive biweekly doses to the melt operator, and that he did not reduce exposures to 10% of the permissible limit set forth in Appendix A (old Part 20) after the melt operator received 13 week exposures in excess of 3 rems. Weiss said that he would be more careful in his review of the records so that he could take immediate appropriate action when necessary to keep the personnel exposures within the permissible levels as set forth in Part 20.

It was pointed out to both Canham and Weiss that all of the aforementioned citations were being made under the old Part 20.

No significant hazard exists from the above item of noncompliance, and no follow-up inspection will be made.

Both Canham and Weiss appeared to be sincere in their desire to operate in a safe manner in accordance with the federal regulations. We recommend that a letter be sent to Mr. F. Mittendorf, with copies to C. A. Canham, Plant Manager, and Norton M. Weiss, Health and Safety Manager, setting forth the items of noncompliance and requiring corrective action to the satisfaction of the Commission.

There were no items of noncompliance noted during the inspection as far as criticality control is concerned. However, we do feel there are many areas for improving criticality control in this plant. We observed two areas in which fairly simple changes could be made, so that the control would be by an always-safe geometry rather than by batch control. One of these areas was noted in the body of the report as being the trough under the power hacksaw; the other area is the trough under the lathe. The graphite crucibles which are used in the furnaces are not of always-safe geometry. In some other plants we have visited, such crucibles are of 5" inside diameter. We feel that this is also an area that could stand exploration for making it always geometrically safe.

Our general impression of the management and operation of this plant is that the top management does not have a keen appreciation of the possibility and extent of a nuclear catastrophe. There seems to be a tendency in this plant to burden the Health and Safety Department members with a multitude of jobs. This is unfortunate

because we feel that there are areas, as noted before, where safe geometry could be studied, and we also note that there are areas in the keeping of health physics records which might be simplified if time were available to study the method of record keeping. We feel that Weiss, the Criticality Engineer, does an adequate job of indoctrination of new employees on criticality and health physics. However, as one tours the complete plant, that is, first the non-nuclear plant where ordinary materials are being processed, and then the section of the plant where uranium is being processed, there is very little to make one aware in the nuclear plant that there is always the possibility of a major catastrophe. Since control depends strictly on discipline, because safe geometry is not employed, there is a need for this discipline to be reaffirmed by the top management of the organization. We feel that, by a definite statement of the top management that no violations of safe criticality control procedures will be countenanced, the job of the criticality engineer in enforcing these procedures would be considerably lightened. We discussed these points briefly with Mr. C. A. Canham, the present Plant Manager, and Canham seemed quite receptive and cooperative.

As noted above, we requested that letters be sent to Mr. F. Nittendorf, Vice President of Engelhard Industries, and General Manager of D. E. Makepeace Division. This office had contacted Nittendorf immediately after the inspection and at least half a dozen times during the months of December and January in attempts to set up a suitable meeting date so that the items of noncompliance and our impressions of his plant operations and organization could be fully discussed with him. We have not been successful in setting up a meeting because of Nittendorf's other company appointments and travel. This office feels that there should be no further delay in submitting this report or in taking enforcement action. We still hope to set up a suitable date

for discussing the aforementioned points with Mr. Rittendorf. When this meeting takes place, any additional information resulting from our meeting will be forwarded to Headquarters.

Enclosure:
4 cys Rpt.

Form AEC-417 (4-59)

UNITED STATES ATOMIC ENERGY COMMISSION

# COMPLIANCE INSPECTION REPORT

1. Name and address of licensee

[redacted] INDUSTRIES, INCORPORATED
[redacted], Nuclear Division
[redacted]bro, Massachusetts

2. Date of inspection
December 12, 13, 1

3. Type of inspection Reinspection

4. 10 CFR Part(s) applicable
30-10-40-70

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

| License No. | Date | Exp. Date |
|---|---|---|
| [redacted]-185 | | |
| As amended | 7/15/60 | 9/30/62 |

SCOPE: 1180 kgs of U-235 contained in uranium enriched in the U-235 isoto
for the fabrication of reactor fuel elements and related activitie
using the procedures described in the licensee's application of
7/30/57, as amended 3/5 & 12/9/58; 1/13 & 20, 3/3, 4/9 & (2) of
of 4/17, 5/20 (2), 6/3, 7/31, 8/3, 9/23 & 25, 10/8, 14 & 30,
11/2, 5 & 6 and 12/15 & 28/59 and 1/6 & (2) of 1/22 (1. incinerati
and 2. fabrication not including shipping procedures), 2/16 & 19
and 3/8, 11 & 24/60.

CONDITIONS: The licensee's fuel element processing plant located on
Route No. 152, Plainville, Massachusetts, is the authorized place
of use.

(CONT'D)

6. Inspection findings (and items of noncompliance)

Part 70

An inspection of the licensee's facilities under license SNM-185 revealed that
some operations were in progress. These operations were concerned with the
manufacture of PRDC fuel elements. 1019 kg enriched U (25.6%) and 42.7 kg
enriched U (93.3%) were on hand as licensed SNM materials. 23 kg of 93.5%
enriched U was on hand as contract material. An inspection was made of the
manufacturing area and inspection area by the inspectors in the company of a
criticality engineer to determine whether the criticality control procedures
in effect were adequate. Administrative control procedures, procurement,
handling, processing and storage of nuclear material were reviewed, as were
security, medical, fire and health programs. Records, which include waste
disposal, medical, personnel monitoring, surveys, air dust surveys, and exami
were reviewed.

Part 40

Under license C-5161, a few operations involving source material (PRDC) were

(CONT'D)

7. Date of last previous inspection

| | |
|---|---|
| SNM-185 | 7/19/60 |
| C-5161 | 7/19/60 |
| 30-5216-1 | 11/19/59 |

8. Is Company Confidential information contained in this report? Yes ☐ No ☒
(Specify page(s) and paragraph(s))

DISTRIBUTION
4 cys - Div of Cap. Eq.
3 cys - Cap Div. NYOO

Paul E. Klevin - John R. [redacted]
(Inspector)

Approved by: Robert W. Kirkman
New York
(Operations office)

February 17, 1961
(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 he
format, leaving sufficient margin at top for binding, identifying each item by number and noting "Continued on the face of form und
appropriate item.

U.S. GOVERNMENT PRINTING OFFICE

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

ITEM 5 (CONT'D)

| License No. | Date | Exp. Date |
|---|---|---|
| C-5161 | 7/15/60 | 12/31/60 |

SCOPE: 60,000 pounds of source material for research and development and fuel element fabrication, in accordance with the procedures outlined in connection with your applications for a special nuclear material license - Docket 70-139.

CONDITIONS: Compliance with Part 20, non-exceptional.

| | | |
|---|---|---|
| 20-5216-1 | 5/14/59 | 5/31/61 |

SCOPE: A. 20 mc of C-14 contained in iron for the manufacture of iron strips.

CONDITIONS: #11-Compliance with Part 20. #12-Byproduct material shall be used by, or under the direct supervision of, Norton Weiss. #13-Byproduct material shall not be used in products distributed to the public. #14-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 April 29, 1959. #15-Written administrative instructions, entitled "Health and Safety Manual" and submitted with W. F. Mittendorf's letter dated February 5, 1958, shall be followed and a copy of these instructions shall be supplied to each individual using or having responsibility for use of byproduct material. Any changes in these administrative instructions shall have the prior approval of the Isotopes Branch, Division of Licensing and Regulation.

| | | |
|---|---|---|
| 20-5216-1 amend. 1 | 10/5/60 | 5/31/61 |

SCOPE: B. 5 mc of Co-60 as sealed source (Tracerlab, Inc., Model SO-31) to be used for calibration of instruments.

CONDITIONS: #16-Sealed sources shall be tested for leakage and/or contamination in accordance with the following:

A. Leak test shall be performed by Tracerlab, Inc., or by other persons specifically licensed by the Commission to perform such tests.

B. Each sealed source containing Cobalt 60 shall be tested for leakage and/or contamination as follows:

ITEM 5 (CONT'D)

| License No. | Date | Exp. Date |
|---|---|---|
| 20-5216-1 amend. 1 | | |

CONDITIONS:

(1) An appropriate test for leakage and/or contamination shall be performed on the sealed source surface, or on the accessible surfaces of the device in which such a sealed source is permanently or semipermanently mounted. The test shall be performed upon receipt of a source from another person, unless the licensee receives certification from the person making the transfer that the sealed source had been tested within thirty (30) days prior to transfer and found free of any removable radioactive material.

(2) Following completion of the test prescribed in B(1), each sealed source shall be tested for leakage and/or contamination at intervals not to exceed six (6) months.

C. The test performed pursuant to B shall be sufficiently sensitive to detect 0.05 uc of removable beta and/or gamma emitting radioactive material. Records of leak test results shall be maintained by the licensee.

D. If the test performed pursuant to B(1) or B(2) reveals removable radioactive material, the licensee shall take immediate action to prevent spread of contamination and, within thirty (30) days after completion of the test shall notify the Isotopes Branch, Division of Licensing and Regulation, U. S. Atomic Energy Commission, Washington 25, D. C.

E. Repair of sources shall be performed by the manufacturers of the sources or by persons specifically licensed by the Commission to perform such repairs.

| License No. | Date | Exp. Date |
|---|---|---|
| 20-5216-1 amend. 2 | 10/19/60 | 5/31/61 |

SCOPE: No change.

CONDITIONS: #12-Byproduct material shall be used by, or under the direct supervision of, Morton Weiss or Raymond Diffley.

ITEM 6 (CONT'D)

in progress at the time of the inspection. A total of 53,000 pounds of depleted source material was on hand as licensed material. A total of 21 kgs of normal uranium was on hand as contract material. Organization and administration, security, health and safety are the same as reported in the Part 70 report details. Records of inventory, receipt, urine, air samples, film badges, and direct radiation surveys are maintained.

Part 30

Under License 20-5216-1, the licensee possesses a 5 mc Co-60 sealed source, Tracerlab Model RG-30, for the purpose of instrument calibration. To date, the licensee has not utilized this sealed source for calibration. The source is stored in the X-ray Room in a properly locked container. Records of procurement, receipt, and leak testing are available. No C-14 was on hand at the time of inspection. There were no items of noncompliance observed under License 20-5216-1.

The only other items of noncompliance observed or noted during the course of the inspection are as set out below:

SNM-185 and C-5161

20.105 "Measures to be Taken After Excessive Exposures"
- in that the licensee failed to limit the exposure of the melt operator to 10% of the permissible weekly dose after the operator had received a 13 week exposure in excess of the permissible limits established in 20.101. (See item 15D of Part 70 report details.)

20.101(a)(2)(ii) "Exposure of individuals in restricted areas"
- in that film badge records of R. Bodwell, melt operator, showed that he has exceeded 3 rems for several 13 week periods during 1960. (See item 15D of Part 70 report details.)

20.201(b) "Surveys"
- in that no physical evaluations or air sampling were made to determine the extent of uranium airborne contamination in the unrestricted areas adjacent to the plant during incineration of uranium-contaminated waste. (See item 15E(2) of Part 70 report details.)

- in that no breathing zone samples were taken during the furnace operation to adequately evaluate the furnace melt operator's exposure to radioactive aerosols. (See item 15D of Part 70 report details.)

SNM-185

20.203 "Caution signs, labels and signals"
(f) "Containers" (4) - in that a shipping container, which contained 5 kgs U-235, was not labeled as to type and amount of material. (See item 18 of Part 70 report details.)

(f) "Containers" (1) and (4) - in that a one gallon can containing 1162 grams of uranium, 25% enriched, was not labeled with any "Caution - Radioactive Materials" sign or symbol or enrichment. (See item 18 of Part 70 report details.)

C-5161

20.203 "Caution signs, labels and signals"
(f) "Containers" (2) and (4) - in that six containers each containing 600 pounds of depleted uranium were not labeled with the proper radiation caution sign and symbol or the type and amount of material. (See item 9.1 of Part 40 report details.)

PART 70 INSPECTION

ENGELHARD INDUSTRIES, INCORPORATED
D. F. Makepeace Division
Attleboro, Massachusetts

Dates of Inspection: December 12 and 13, 1960 (Announced)

Persons Accompanying Inspectors:

None.

Persons Contacted:

C. A. Canham, Plant Manager
Norton M. Weiss, Health and Safety Manager
Chet Lis, Accountability

DETAILS

9. Background Information

A report of 11/19/59, an initial inspection of Licenses SNM-185, C-3719, C-4237 and 20-5216-1 of D. F. Makepeace Division, Engelhard Industries, was transmitted to Inspection Headquarters (M. M. Mann) on 1/18/60. A memorandum from Inspection Headquarters (M. M. Mann) to DL&R (H. L. Price), dated March 2, 1960, transmitted the inspection report with a note of concurrence as to the recommendations made by the New York Inspection Division.

On 8/22/60, a letter from DL&R (Lyall Johnson) to F. Mittendorf, General Manager, D. F. Makepeace Division, Engelhard Industries, informed the licensee that there were no items of noncompliance noted for Licenses 20-5216-1 and C-4237, and that the following items of noncompliance were found with respect to Licenses C-3719 and SNM-185:

"1. Insufficient surveys were performed to determine compliance with the Commission's regulation 10 CFR 20, Sections 20.101, 20.102 and 20.103, as required by Section 20.201(b), 'Surveys'.

2. The entrance to the Fabrication Facility in which licensed materials are processed was not posted as required by Section 20.203(e), 'Caution signs, labels and signals'.

"3. Licensed material containers in the vault areas and in the pickling areas were not labeled as required by Section 20.203(f)(1), (f)(2), and (f)(4), 'Caution signs, labels and signals'.

4. Records of air sample results were not maintained in the units specified in Section 20.201(b), as required by Section 20.401(c), 'Records of surveys, radiation monitoring and disposal'.

5. A total of 59,762 pounds of depleted source material was received when License No. C-3419 authorized receipt of only 10,000 pounds, in violation of Section 40.10, 'Restriction on transfers'."

The DL&R letter stated that with respect to items 1 through 4, the licensee was requested to notify DL&R within 30 days of the steps taken or to be instituted to correct the alleged violations, and the date on which such correction will be achieved.

In a 9/16/60 letter to DL&R, the licensee (C. A. Canham) stated that the following corrective action had been instituted:

"Concerning Item 1, daily surveys of fabrication areas have been initiated as of July 29, 1960. A system has been setup to assure that every area within the fabrication section is surveyed at least once a week. When survey results so indicate, corrective action is taken to reduce personnel exposure either through shielding or removal to safe distances.

With respect to Items 2 and 3, the proper signs and labels have been procured and posted in accordance with 10 CFR 20, Sections 20.203 (a), (f)(1), (f)(2), and (f)(4). This has been in effect since December 1959.

Records of air sample results have been maintained in units specified in Section 20.201(b), as required by Section 20.401(c) as of January 1960."

On November 21, 1960, DL&R (J. C. Delaney) in a letter to the licensee (C. A. Canham, Plant Manager) stated: "With respect to Items 2 and 4 of our August 22 letter, it appears that you have taken the necessary steps to correct the deficiencies." The DL&R letter further stated that with regard to Item 1, the following additional information would be required:

"In-Plant Air Surveys

1. A description of the dusty work areas that are or will be sampled.

2. The types of air samples taken (example; breathing zone, general air, etc.), and the approximate number of samples taken per day, week or month in each dusty area.

3. The type, make and volume capacity of sampling equipment used.

4. The method used to analyze air samples for radioactivity.

5. The procedure you follow in calculating the average daily and weekly exposures to airborne radioactivity for each employee who frequently or occasionally occupies areas where air concentrations exceed MPC values specified in 10 CFR 20, 20.101(b), 'Exposure of individuals in restricted areas'.

On Stack Effluent Sampling and Environmental Air Surveys

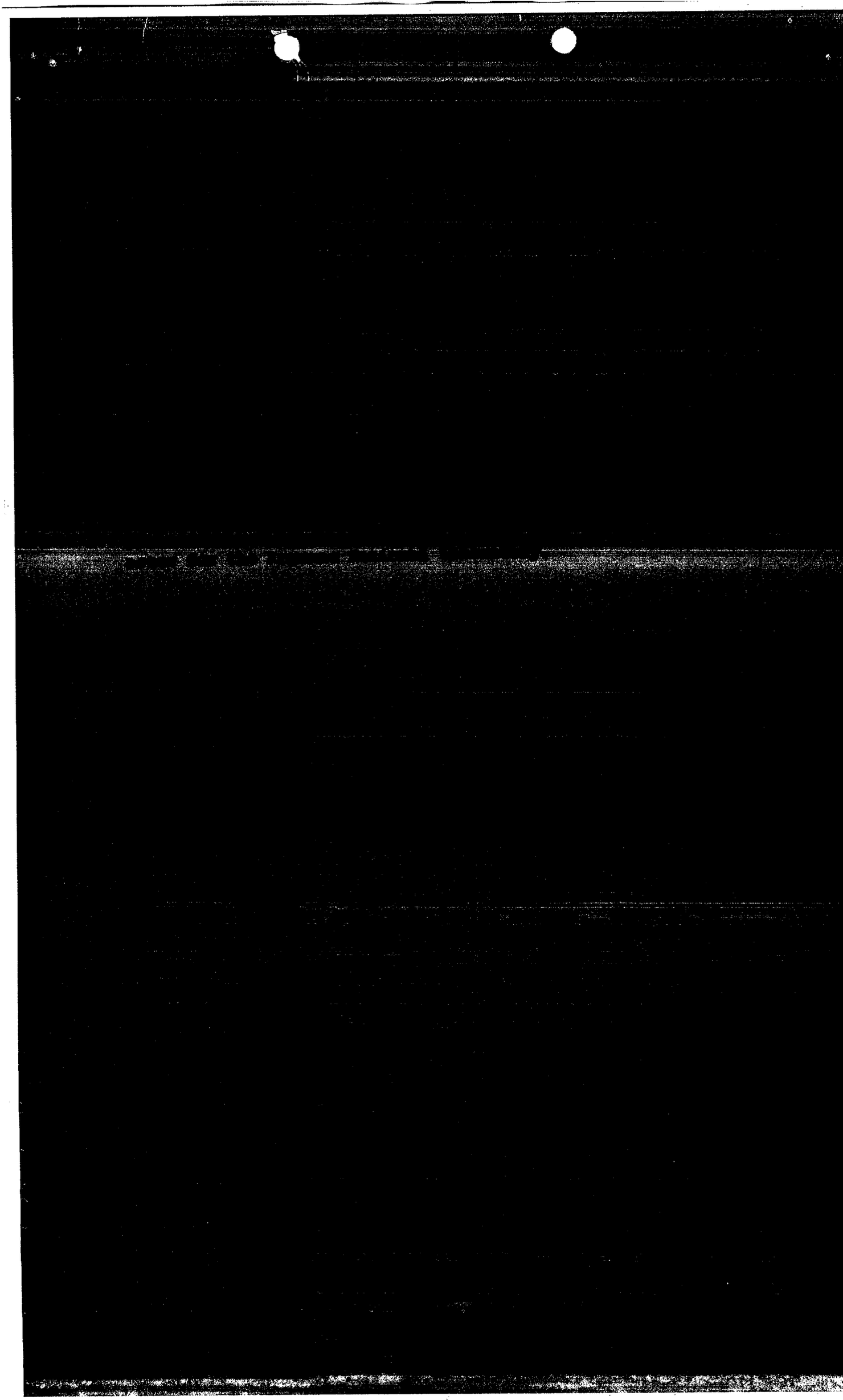
A description of the procedure you follow or will follow in determining if concentrations of radioactive materials in stack effluents discharged to unrestricted areas exceed the limits specified in 10 CFR 20, Section 20.103(b), 'Concentrations in effluents to unrestricted areas'."

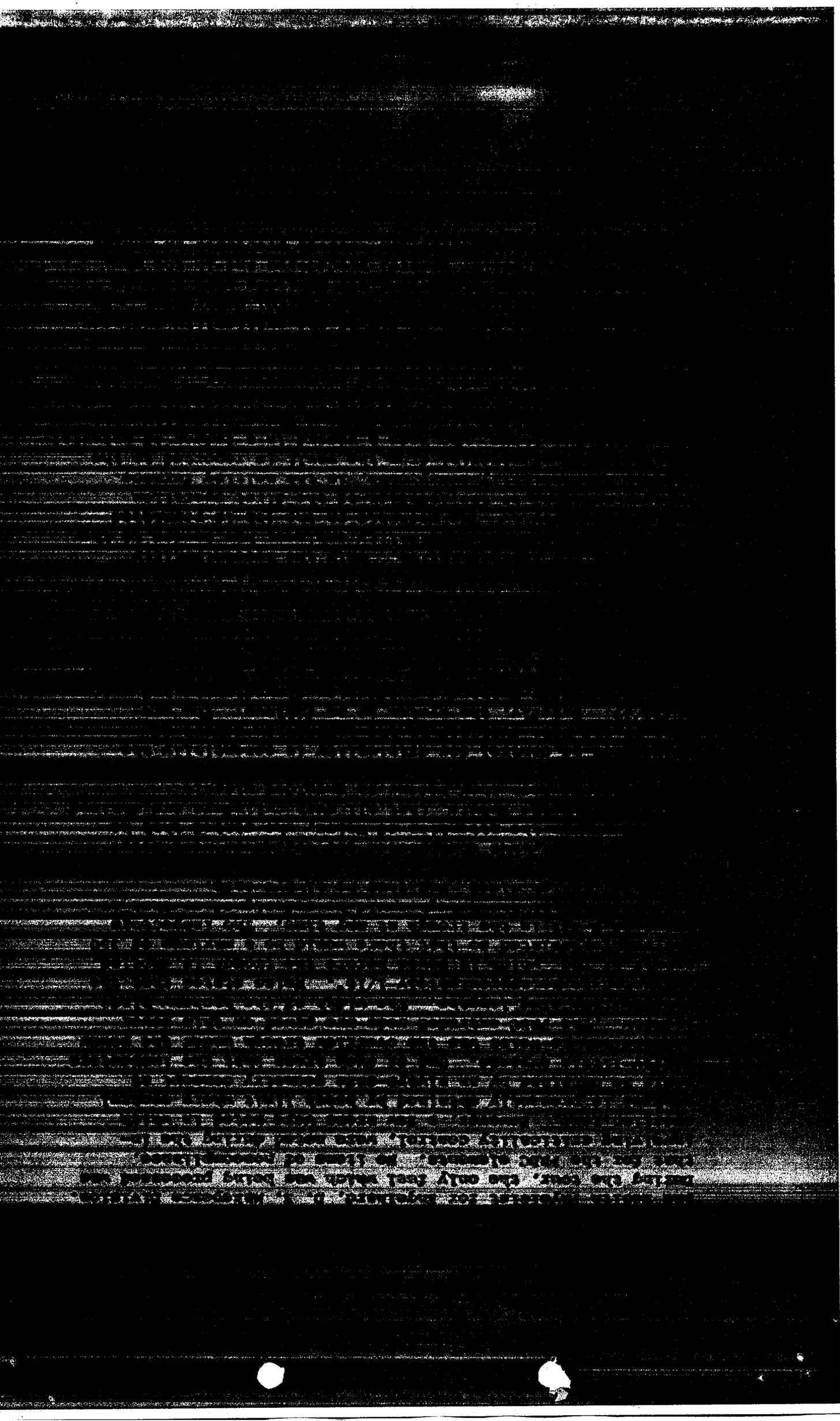
The licensee was also requested to submit the above survey information to DL&R within thirty days upon receipt of this letter.

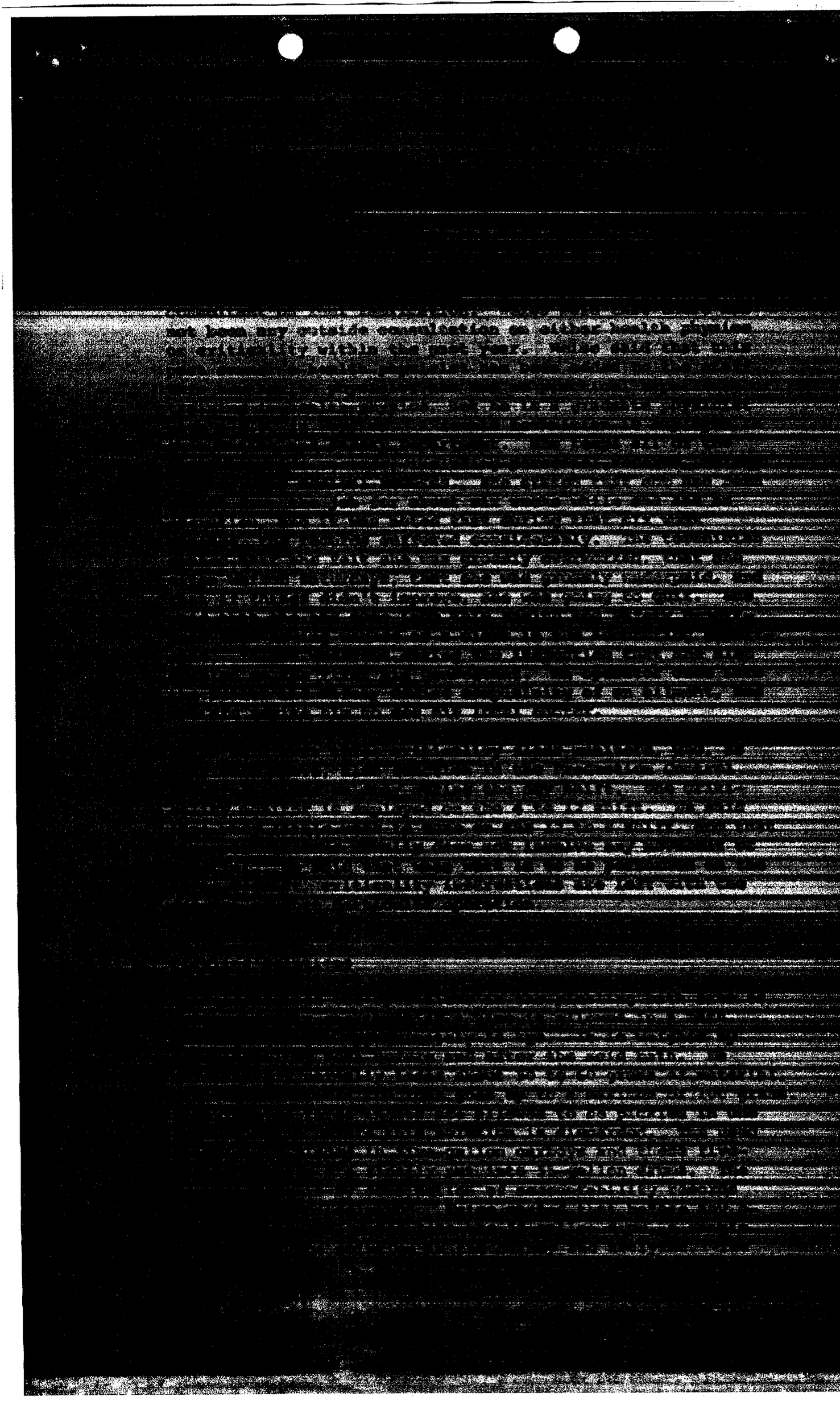
In a TWX dated July 8 to this office, the licensee, Barton M. Weiss, reported that an apparent radiation overexposure to two of their employees had been reported by their film badge supplier, Nucleonic Corporation of America. The exposures were recorded as 15 rems beta and 23 rems beta, respectively.

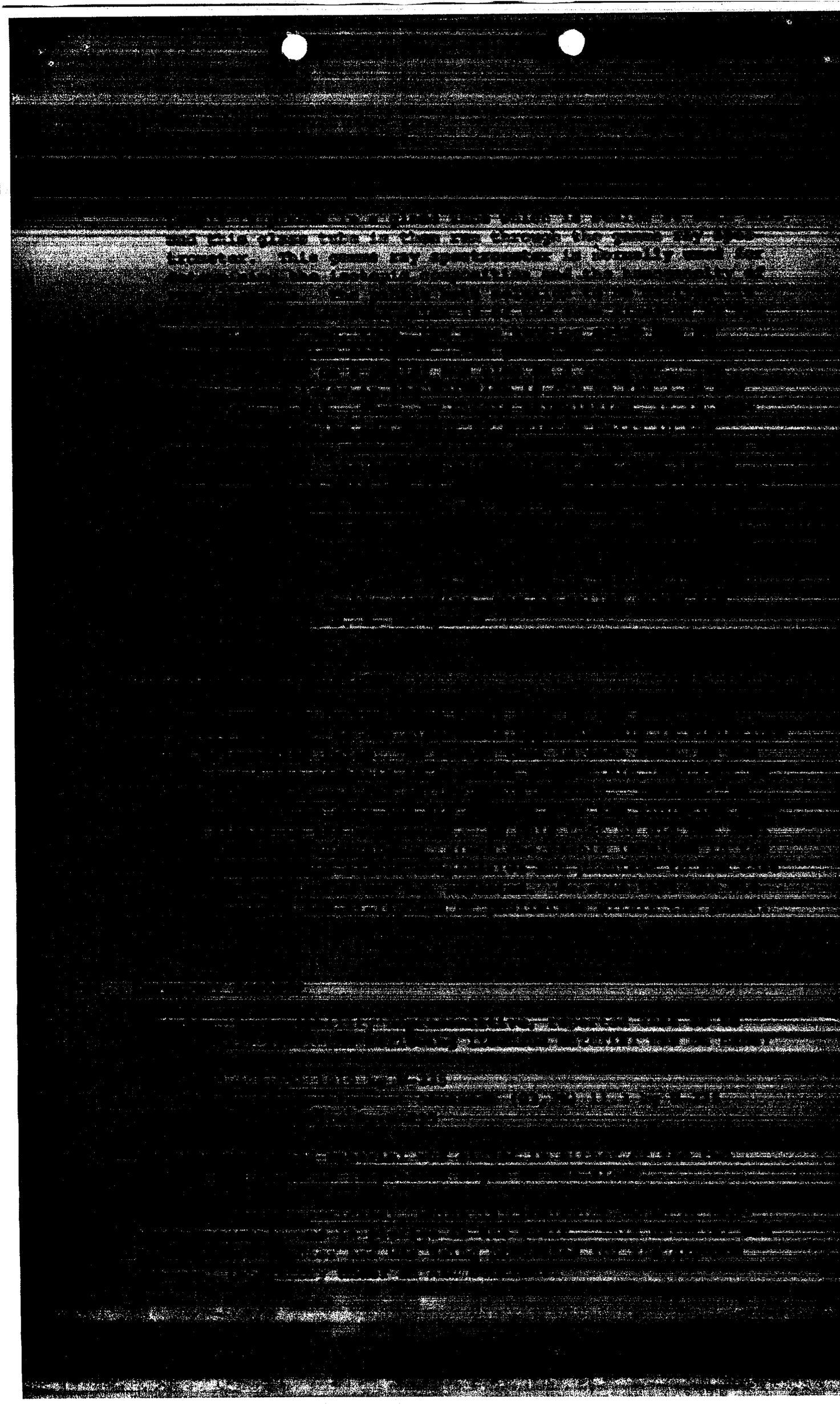
On July 19, 1960, a type "B" investigation was made at the licensee's facility in Attleboro. The investigation report was transmitted to L. D. Low, Division of Compliance, Headquarters, on 10/10/60. On 10/17/60, E. G. Cutten, Division of Compliance, Headquarters, in a memo to DL&R (Rogers) transmitted a copy of the investigation report from the New York Compliance Division, as well as the cover memorandum of October 10. Headquarters concurred with the New York Compliance Division that the exposures were not valid, and also concurred with the citations made in their investigative report, namely 20.201(b), failure to make adequate surveys, and 20.401(c), failure to maintain radiation records and evaluations of exposure times.

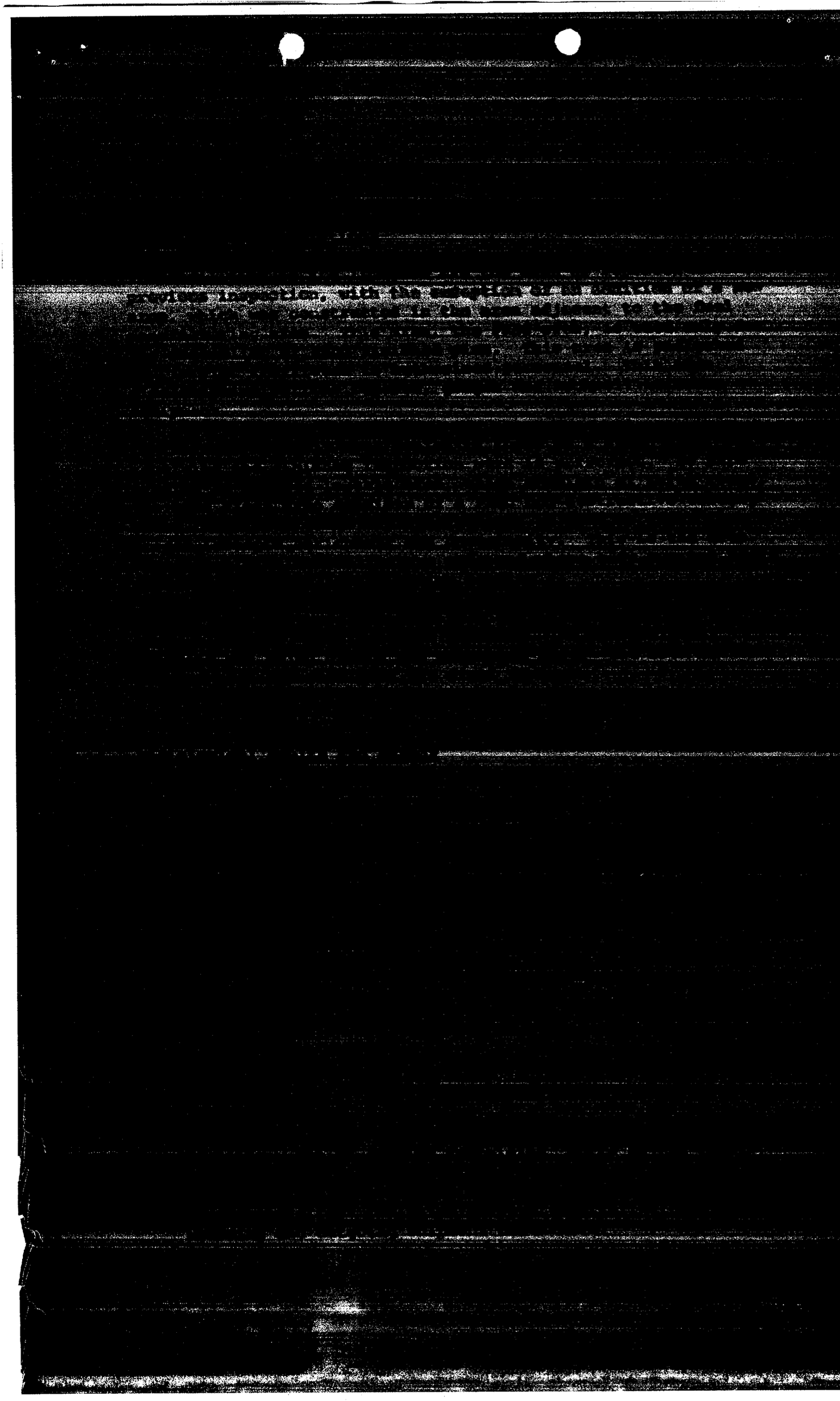
No further correspondence follows.

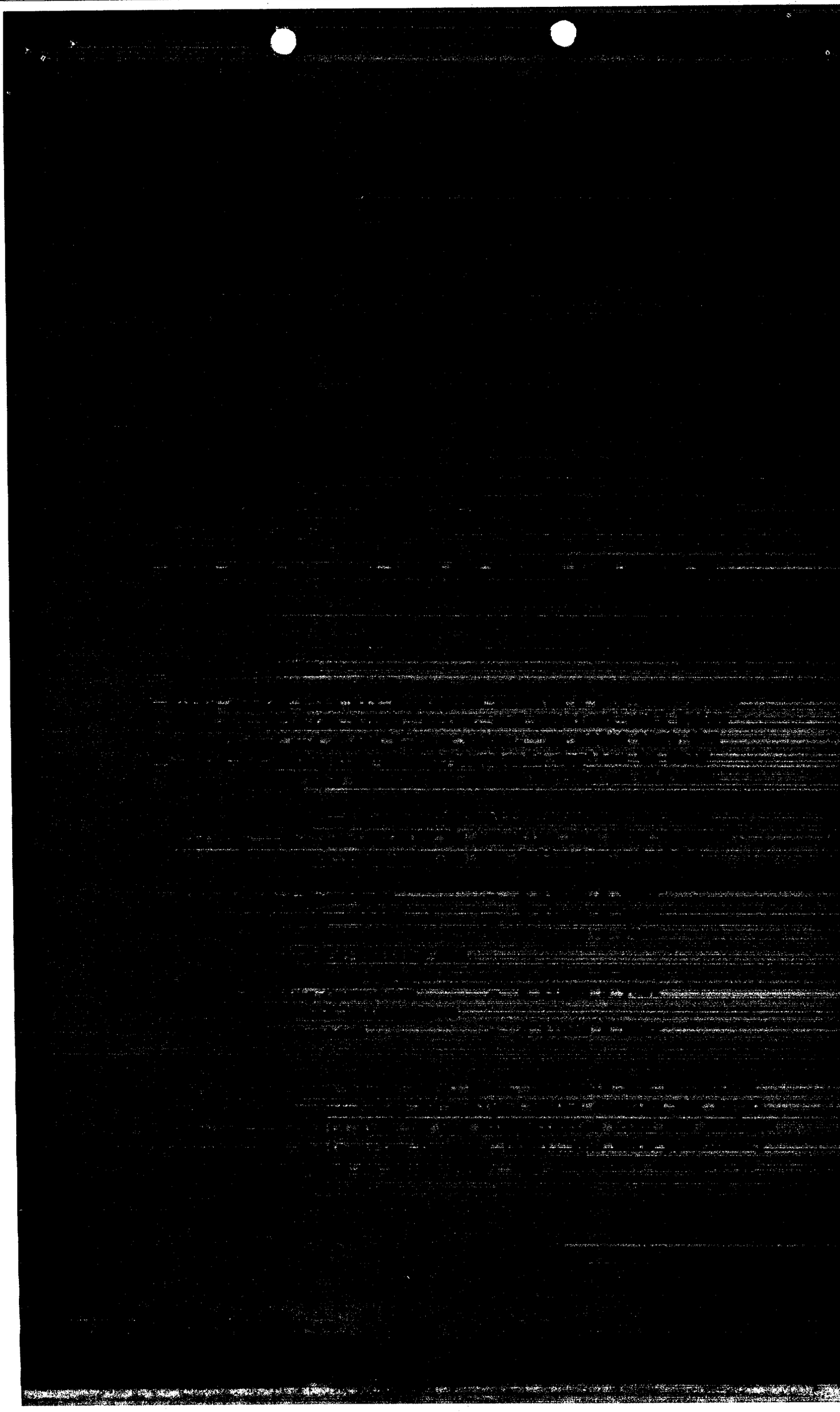


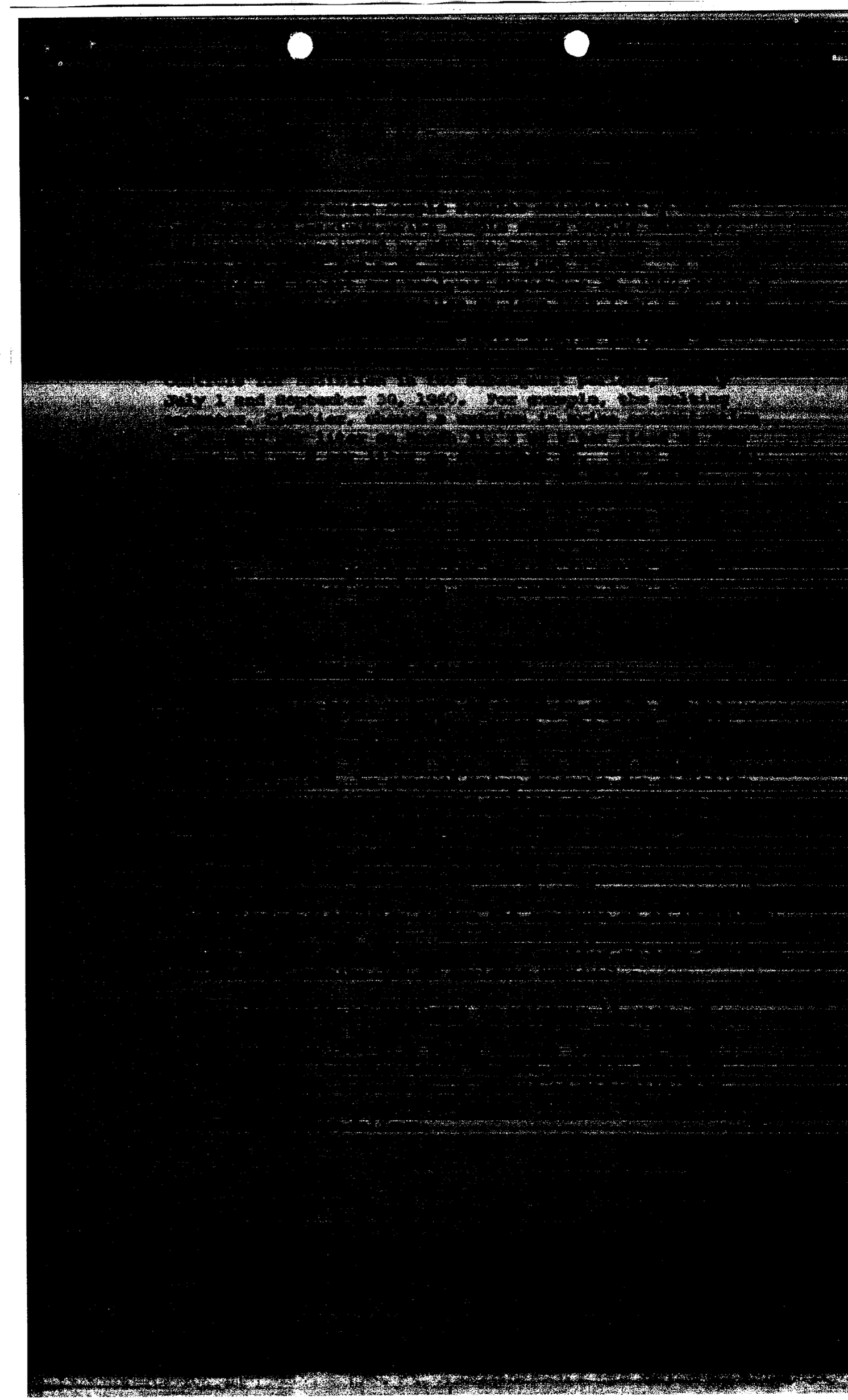












Everett Bodwell - Welter - Class "B"

| Date | Biweekly Beta | Biweekly Gamma | Biweekly Total | Cumulative Total |
|---|---|---|---|---|
| 1/9/60 | 300 | 20 | 320 | 320 |
| 1/23/60 | 1100 | 0 | 1100 | 1420 |
| 2/6/60 | 1100 | 300 | 1400 | 2820 |
| 2/20/60 | 250 | 80 | 330 | 3150 |
| 3/5/60 | 440 | 20 | 460 | 3610 |
| 3/19/60 | 220 | 0 | 220 | 3830 |
| 4/2/60 | 370 | 0 | 370 | 4200 |
| 4/16/60 | 150 | 55 | 205 | 4405 |
| 5/1/60 | 150 | 20 | 170 | 4575 |
| 5/14/60 | 175 | 0 | 175 | 4750 |
| 5/28/60 | 450 | 35 | 485 | 5235 |
| 6/11/60 | 330 | 0 | 330 | 5565 |
| 6/25/60 | 130 | 0 | 130 | 5695 |
| | 26 week total | - | 5695 | |
| 7/9/60 | 15 | 0 | 15 | 5710 |
| 7/23/60 | 10 | 40 | 50 | 5760 |
| 8/6/60 | 55 | 0 | 55 | 5815 |
| 8/20/60 | 30 | 0 | 30 | 5845 |
| 9/2/60 | 190 | 0 | 190 | 6035 |
| 9/16/60 | 0 | 0 | 0 | 6035 |
| 9/23/60 | 375 | 50 | 425 | 6460 |
| | 39 week total | - | 6460 | |
| 9/30/60 | 375 | 50 | 425 | 6885 |
| 10/14/60 | 420 | 110 | 530 | 7415 |
| 10/30/60 | 940 | 0 | 940 | 8355 |
| 11/13/60 | 1400 | 0 | 1400 | 9755 |

The 1959 personnel monitoring records which were reviewed during the initial inspection were reported by Weiss to be stored with other 1959 records in "dead storage". These records could not be readily made available to the inspector, and therefore, no attempt was made to review Bodwell's exposure for the 13 week period prior to 1/23/60.

The review of the above record showed that Bodwell received the following doses, which are in excess of 3000 mrem, the limit specified in Appendix A for any period of 13 weeks:

(1) 1/9/60 through 4/2/60 - 4040 mrem
(2) 1/23/60 through 4/16/60 - 3983 mrem
(3) 2/6/60 through 5/1/60 - 3070 mrem
(4) 9/2/60 through 11/13/60 - 3605 mrem

Inasmuch as a biweekly film badge program is in effect, one-half of Bodwell's biweekly dose of either the first or the seventh biweekly period was used to determine the above 13 week period overexposures. The highest excessive dose per 13 week period is noted.

On December 22, 1960, a letter from Norton M. Weiss sent to the Director, Division of Civilian Application, reported an exposure of 1400 mrem beta for the two week period of October 31, 1960 to November 14, 1960 to Everett Bodwell (age 48), a melter in their Nuclear Department. (This letter and attached report are included as Exhibit "A".) The information supplied by Weiss with regard to the overexposure to Bodwell is essentially the same as reported in his letter to DL&R dated December 22, 1960.

At the time of inspection, Weiss was asked whether or not Bodwell wore any protective glasses or whether he normally wore glasses in performing his work as a melting operator. Weiss replied that Bodwell does not wear glasses. Weiss was informed of Appendix A, "Permissible weekly dose", of the old Part 20 which contains the following: 300 mrem is the permissible weekly dose for the blood-forming organs, gonads and lense of the eye for any radiation with a half value layer greater than 1 mm of soft tissue.

When asked whether or not radiation measurements were taken of the PRDC melt operation, Weiss stated that radiation measurements had been taken. From the survey records maintained by the Health Physics Group, it was determined that such direct radiation contact measurements were made using a Juno survey meter on the floor of the furnace, on both sides of the furnace and on the top port inside of the furnace induction coil. Radiation levels on the floor ranged between 4 and 45 mrad/hr. The sides of the furnace revealed radiation levels from 10 to 120 mrad/hr. The top port inside the furnace induction coil showed the highest amount of radiation. Radiation levels ranging from 160 to 2300 mrad/hr were found here during the period of October 15 through November. The highest radiation measurement, 2300 mrad/hr found on 11/4/60, was reduced to 400 mrad/hr the following day. It was pointed out to Weiss that these levels were high and could contribute to the melter's exposure. It was also pointed out that these radiation levels could also contribute to the melter's internal exposure inasmuch as the material was not fixed contamination. Weiss agreed that this could be true.

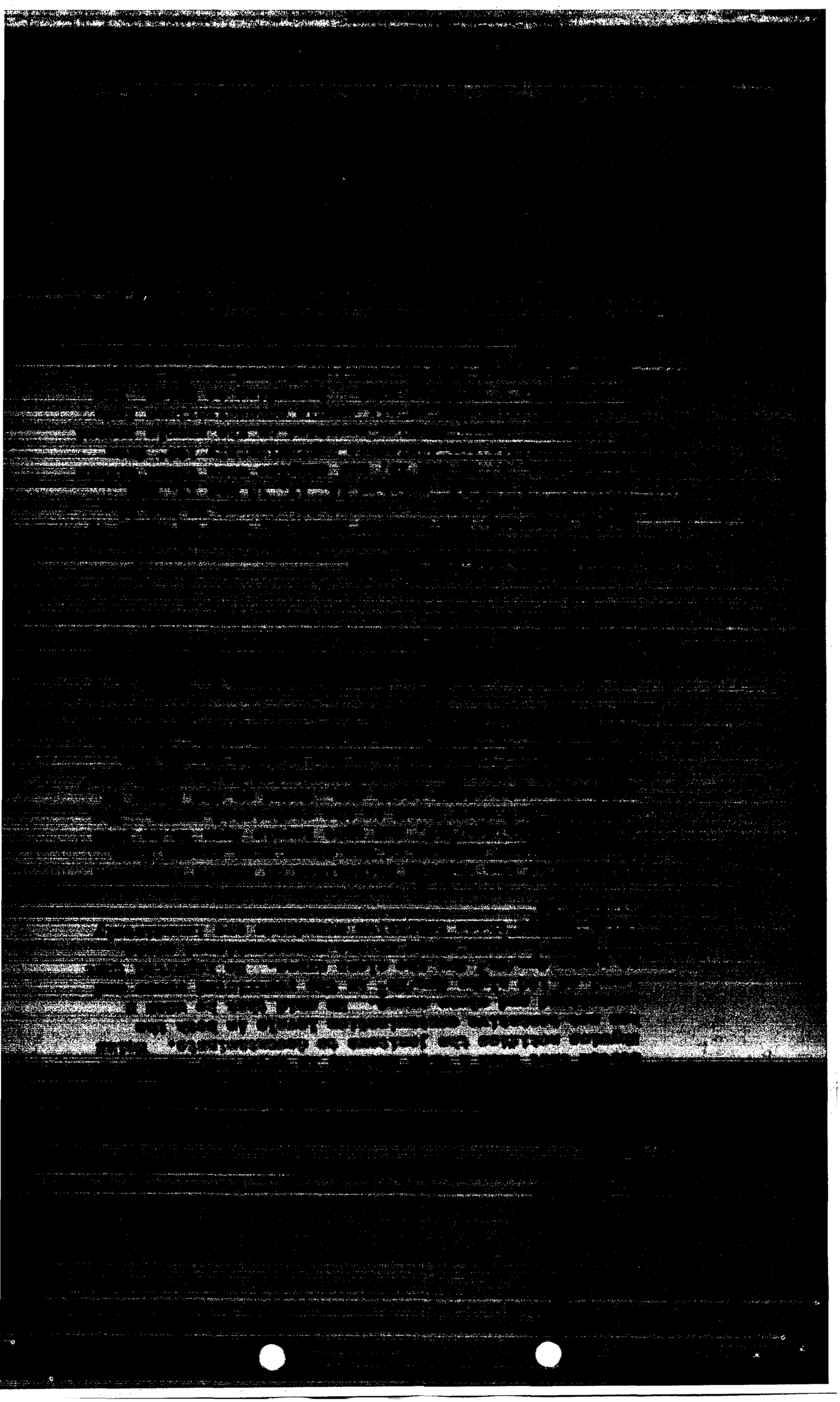
It was pointed out to Weiss that a previous investigation had been made on July 19, 1960 by P. R. Nelson of this office regarding the overexposures which were found on two film badges worn by George Cloutier and George Walker, the melt operators. These badges showed radiation dosages of 23 rems and 15 rems of beta radiation, respectively, for

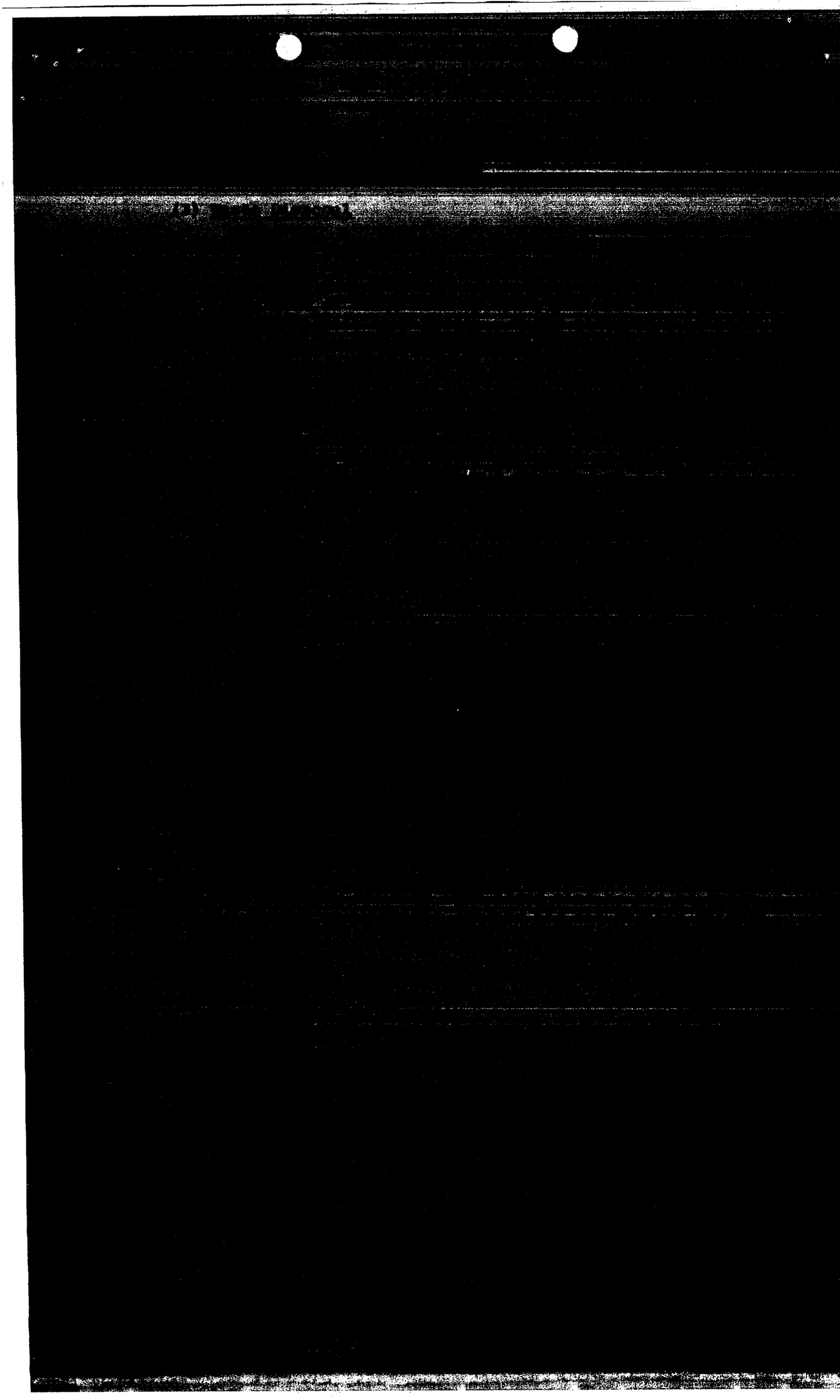
the period of June 13 to June 24, 1960. It was also pointed out to Weiss that on 1/23/60 and on 2/6/60, Bodwell received biweekly film badge exposures of 1100 mrem beta, and 300 mrem gamma, respectively. Weiss stated that he completely overlooked these reports when they were sent in by the Nucleonic Corporation of America. The inspector informed Weiss that for the period 1/9/60 through 4/2/60, he exceeded the level of 3000 mrem for a 13 week period as specified in Appendix A (old Part 20), which is contained in Section 20.101 "Exposure of individuals in restricted areas", and that he failed to limit Bodwell's weekly exposure to 10% of the permissible limit as required by Section 20.105 "Measures to be taken after excessive exposures."

When questioned as to air sampling conducted in the furnace area during the furnace operation, Weiss supplied records which indicated that the general air samples were taken with either a Gelman air sampler, flow rate 20 to 30 liters per minute, or a Cast Pump, flow rate 5 to 15 liters per minute, using Whatman 41 filter paper as the aerosol collector. The results follow:

| Date | Sample Result (uc U/ml) |
|---|---|
| 1/17/60 | $11.3 \times 10^{-11}$ (2-1/2 hour sample) |
| 9/10/60 | $7 \times 10^{-11}$ (1-1/2 hour sample) |
| 9/26/60 | $6.03 \times 10^{-11}$ (1 hour sample) |
| 10/2/60 | $20.88 \times 10^{-11}$ (1 hour sample) - sample taken at top of furnace |
| 10/2/60 | $1.95 \times 10^{-11}$ - sample taken at operator's position |
| 10/23/60 | $10.6 \times 10^{-11}$ - Kinney furnace |
| 10/26/60 | $9.3 \times 10^{-11}$ - Belt sander |
| 11/7/60 | $9.06 \times 10^{-11}$ - Top of the greasing hood |

When questioned on air sampling procedures, Weiss stated that no air sampling evaluation has been made of the furnace operation with respect to air concentrations received by the furnace operator during the performance of his job. The infrequency of air sampling was also discussed with Weiss. It was pointed out that between January 11 and August 10, 1960, no air samples were taken at the furnace operation, and that few samples were taken between the period of August 10 through November 10, 1960. A copy of the Standard Procedures for Assessing Air Contaminant Exposures by Paul E. Klevin and William E. Harris, NYOO 4644 was supplied to Weiss by the inspector.



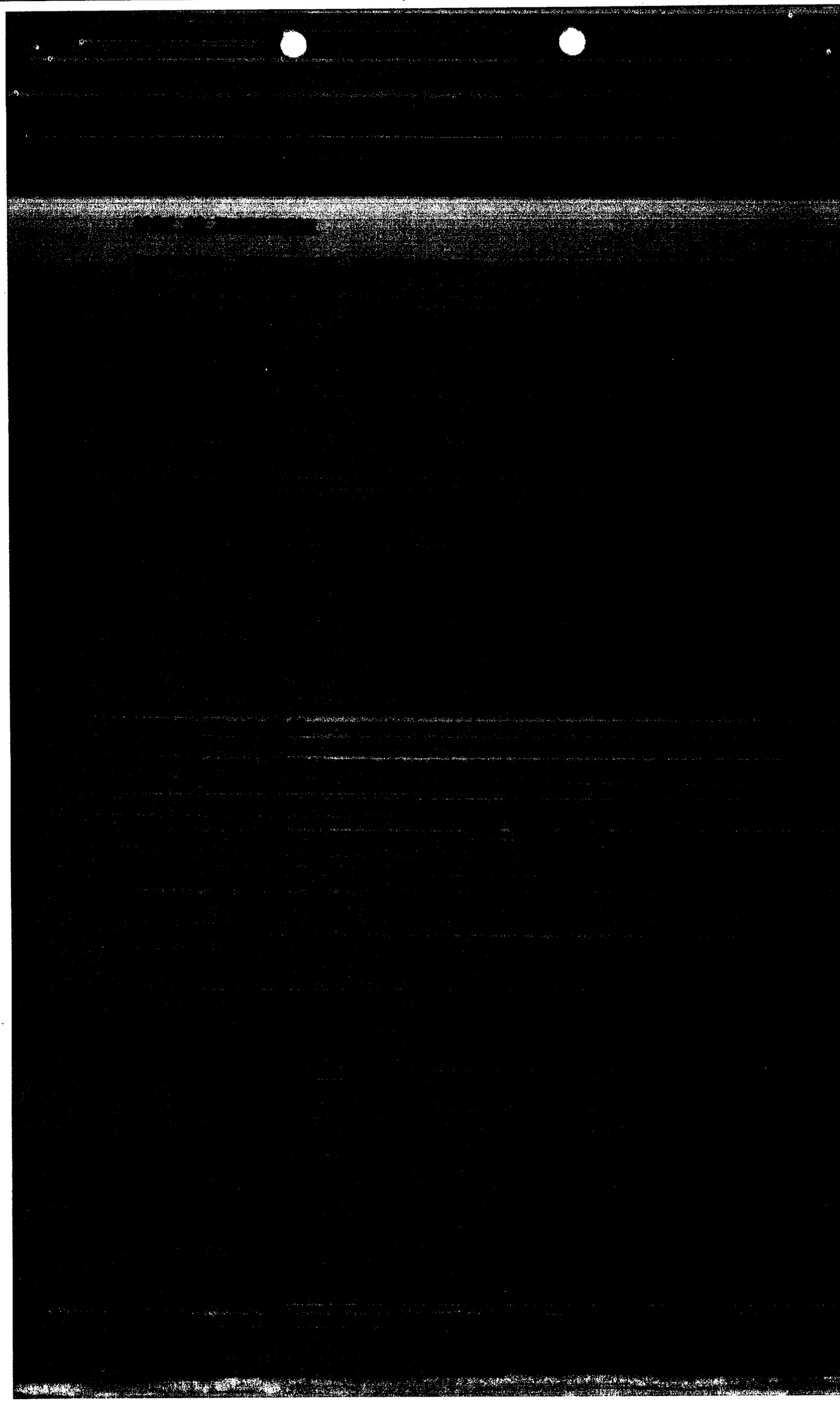


1. A shipping container, holding 140 pins which contained 5 kgs U-235, although labeled with the proper caution sign and symbol, was not labeled as to the type and amount of the material. The pins were 4" diameter and on 16" centers.

2. In a storage vault, a one gallon can containing 1162 grams of enriched uranium was found not to be labeled with any "Caution - Radioactive Materials" sign or symbol. In addition, no enrichment was noted on the container. It was found that upon checking, the material contained 25% U-235.

19. Records

Records of purchase, procurement, inventory, transfer, smears, air and direct radiation surveys, disposal and film badges were reviewed.



were not labeled with any radiation caution sign or symbol or type and amount of material. All other containers were properly labeled, and all areas were properly posted with the proper radiation caution sign and symbol.

Organization and administration, radiological health and safety, security, records and fire and safety are the same as noted under the Part 70 inspection.

Records of receipt, transfer and inventory are maintained.

PART 30 INSPECTION

ENGELHARD INDUSTRIES, INCORPORATED
D. E. Makepeace Division
Attleboro, Massachusetts

Date of Inspection: December 13, 1960 (Announced)

Persons Accompanying Inspector:

None.

Persons Contacted:

C. A. Canham, Plant Manager
Norton M. Weiss, Health and Safety Manager
Chet Lis, Accountability

DETAILS

9.2 License No. 20-5216-1

Weiss reported that he procured a 5 mc Co-60 sealed source, Tracerlab Model RG-3I, on November 19, 1960 from Tracerlab, for the purpose of calibrating his instruments. He stated that to date, he has not utilized the Co-60 source, but he intends to use it in the near future.

The 5 mc Co-60 sealed source was noted to be stored in the X-ray Room in a locked container. The container was labeled with a proper radiation caution sign and symbol, and showed the type, quantity and date of assay of the material. A level of less than 5 mr/hr at one foot was measured with an NMC survey meter, #5576, calibrated November 30, 1960.

A leak test of the sealed source was made by Tracerlab, Inc. within 30 days prior to source transfer to the licensee in compliance with License Condition 16. A wipe taken of the source container by the inspector revealed no evidence of leakage or contamination.

The licensee is also licensed to possess 20 mc C-14 as contained in iron for the manufacture of iron strips. No C-14 material was possessed by the licensee at the time of the inspection. Weiss stated that the last time he manufactured iron strips containing C-14 was in 1959. As noted in the previous inspection report, sheets of iron strips containing approximately 20 mc of C-14 had been shipped to the Sunbeam Equipment Company in Mandeville, Pennsylvania.

ENGELHARD INDUSTRIES, INC.

PINE & DUNHAM STREETS
ATTLEBORO, MASS.
ATTLEBORO 1-0090

MYrtle-5-2358

December 22, 1950

Director, Division of Civilian Application
U. S. Atomic Energy Commission
Washington 25, D. C.

Gentlemen:

Attached you will find a report pertaining to an investigation of a radiation overexposure which recently occurred at our facility. This is in accord with requirements stated in Title 10, Part 20, Section 20.403 (C.)

We feel that the corrective actions to be taken will prevent a reoccurrence of this type in the future. Additional information will be supplied upon request.

Very truly yours,

Norton Weiss
Health & Safety Manager

NW/sl

Cc:

CMP

Exhibit "A"
Page 1

Report of Radiation Exposure at Engelhard Industries, Inc., Wakefield Division, for the Period from Oct. 31, 1960 to Nov. 14, 1960.

On Nov. 25, 1960, a radiation exposure report from our film badge supplier, Nucleonic Corporation of America, was mailed to Engelhard Industries, D.E. Wakefield Division, Plainville, Mass. This report contained an exposure of 1,400 mrems beta radiation for the two week period of Oct. 31, 1960 to Nov. 14, 1960 to Everett Hodwell (age 48) a melter in our Nuclear Department. Upon receipt of the report, Mr. Hodwell was removed from his job as a melter and transferred to the vacuum annealing furnace. He will be returned to his regular job in the melting area Jan. 1, 1961.

Uranium 238 and 235 are the principal sources of radioactivity in our plant. High beta exposures in our Nuclear Department come from the decay products of $U^{238}$ i.e. $UX_1$ ($Th^{234}$) and $UX_2$ ($Pa^{234}$) with a maximum energy level of 2.31 Mev.

The higher levels of radiation in our plant come from the melting area and more particularly from the Kinney vacuum furnace, where most of our melting is done, and from the melting hoods, where used crucibles are cleaned.

Much of our melting is performed in a vacuum induction type furnace. It is sometimes necessary for the melters to enter the furnace shell for certain periods of time to charge the furnace or to remove crucibles and molds. A procedure is now in effect which permits the melters to charge the furnace without entering it. This was a previous source of high exposure which was eliminated by incorporating a hoist mechanism to load the furnace. The only time persons enter the furnace for any appreciable time is when the furnace is cleaned, which is usually once a week, depending on how heavy the melt schedule is. This cleaning is not done by either the melters or helpers, but by personnel employed in the Nuclear Department who clean on a rotating basis.

The crucible cleaning is done in three melt hoods, which are exhausted through an absolute filter. The hoods have plexi glass fronts with circular armports. These hoods are cleaned at the end of each shift and a technician checks out the flow rates of the hoods with a velometer. The flow rates are checked every week and filters are changed whenever necessary.

The maximum concentration of radioactive material in the melt area is approximately 350 pounds of $U^{238}$ which is a melt charge for PBC depleted melts.

Levels of airborne activity in our Nuclear Department are obtained through air sampling. The results of these breathing zone air samples have revealed concentrations continuously below MPC of airborne activity for a restricted area.

Exhibit "A"

Page 2

Crucibles are monitored before and after cleaning and results show that this is the major area where high radiation levels are encountered. Radiation surveys in the melt area are a weekly routine. Crucibles which are cleaned and do not show adequate decontamination are removed to the backyard area for a cooling off period.

It is felt that the underlying cause of the incident was increasing the PADC three ingot melt schedule for that biweekly period to double prior weekly melt schedules. Also it would seem that the primary exposure was to the hands and arms of the person with lesser amounts affecting the upper part of the body. This we feel was due to the cleaning operations and entering the furnace.

Present procedures seem to be adequate for normal plant operations and normal melt schedules. In the future stringent control procedures for the melt area and the cleaning operations in particular will be employed. These procedures along with current Health Physics controls in the area will consist of:

1. A complete radiation survey of the melt area every week.

2. At least two air samples in the melt area every week.

3. Accurate account of radiation levels in crucibles through monitoring before and after cleaning operations.

4. Monitoring of gloves in the melt area.

5. Ventilation check of hoods with a velometer every week. Also cleaning of hoods after each shift.

6. Timestudy of the three ingot PADC melt operation.

7. Weekly notification to the Health Physics department of the melting schedule.

Exhibit "A"
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