OPTIONAL FORM NO. 10
5010-108

UNITED STATES GOVERNMENT

Memorandum

TO : E. R. Price, Assistant Director, Division of Licensing and Regulation, HQ.

DATE: February 28, 1963

FROM : R. S. Cleveland, Radiation Specialist (Review) Region I, Division of Compliance

SUBJECT: TRANSMITTAL OF LICENSE COMPLIANCE INSPECTION REPORT - 10 CFR 20 - 30

CO:I:JRR

Transmitted herewith is the following inspection report involving noncompliance:

MARTIN-MARIETTA CORPORATION
Baltimore, Maryland

License No. 19-1398-29 w/amend. 4

With regard to the items of noncompliance noted during the 8/28/62 inspection (items (1), (2) and (3)), corrective action has been described in a 9/12/62 letter to L&R from R. D. Bennett. During the 11/27/62 inspection, it was noted that corrective action had been taken as set forth in this letter. Items 3 and 4 of the licensee's 9/12/62 letter were discussed at the completion of the 8/28/62 inspection. However, during the 11/27/62 inspection, citations for these items were found not to be in order.

With regard to the item of noncompliance detected during the 11/27/62 inspection (item (4)), it was noted during the 1/3/63 inspection that this deficiency has been corrected.

With regard to the items of noncompliance noted during the 1/3/63 inspection (items (5), (6) and (7)), R. H. Boutelle, Chief of the Health Physics Section in Baltimore, reported by telephone item (6) had been corrected by installation of a locked gate at the bottom of the stairs leading to the top of the cells. This corrective action is in accordance with the exception granted by Condition 14. With regard to item (5), amendment number four, dated 2/12/63, was added to the license. This amendment incorporated a 2/5/63 letter from the licensee, which requested exemption from transferring combustible materials in a closed metal container. However, this letter makes no reference to the removable sheet metal covers, which, as of the 1/3/63 inspection, had not been installed.

Noncompliance item (5) is a failure to observe the SOTS transfer procedures contained in an 11/16/62 letter to L&R, which originated in Baltimore. As noted in the report details, the contents of this letter were never made known to the Quehanna personnel, hence our recommendation for noncompliance item number (7). This is just another example of the apparent lack of cooperation and/or communication between Baltimore and Quehanna regarding licensing matters.

As noted in the report details, dose rates up to 4.5 r/hr exist in the area of the SOTS on top of the cells. We believe that these dose rates could be considerably reduced by the addition of a small amount of shielding, inasmuch as the majority of the radiation is bremsstrahlung. (See paragraphs 46 and 47 of the report details.) The advisability of this was discussed at length with Cochran.

Pages 9, 10, and 11 "Control of Radiation Areas", contained in Part V "Administrative Control" as part of the licensee's 3/27/62 letter to the Commission, is an exemption from 20.203(c)(2). As it is now written, Page 11, paragraph c., states "Areas greater than 25 R/hr-Supervisor access only with the concurrence of the Facility Manager or the resident Health Physicist in charge and with their physical presence". It was reported by Cochran that experience has shown that the clause "with their physical presence" is too restrictive. Anytime a cell contains two or three pellets, the dose rate exceeds 25 r/hr. This necessitates the physical presence of the Facility Manager or the resident Health Physicist during second and third shift operations if a cell entry is to be made. We believe that the physical presence of these particular persons is not necessary and a request by the licensee for a modification should be granted, provided adequate health physics coverage is assured during cell entries.

The items of noncompliance noted during the 8/28/62 inspection do not adequately reflect the concern that was felt by the inspector after completion of this inspection. For example: 1) It was felt that the radiation exposures to personnel were building up too high and too quickly after only six weeks of operation. It appeared at that time that some personnel would exceed 3 rem before the first quarter was completed. However, as noted during the subsequent inspections, no personnel exceeded 3 rem during the first quarter. 2) A distinct lack of cooperation between hot cell operators and health physics personnel was noted. This was apparently caused by the differences which usually exist between safety and operations personnel and personality differences between the operators and health physics personnel. During subsequent inspections the relationship appeared to have improved. 3) In order to better distribute the radiation doses, Quehanna was calling upon part-time help from Baltimore to assist in some decontamination activities and hot cell entries. It was feared that these persons, who were not totally familiar with the Quehanna operations, would possibly cause a serious incident, or themselves receive a dose of radiation in excess of prescribed limits. The use of these persons was

subsequently discontinued. 4) Concern was felt because no bioassay results had as yet been received after approximately six weeks of operation. This was of particular concern inasmuch as there were a few instances of persons' hands, faces, and noses becoming contaminated. As noted in the report details, this situation has been rectified. 5) It appeared that morale was extremely low. This was apparently being caused by frequent equipment malfunctions (particularly the overhead transfer box and manipulator boots), together with demands for production by Baltimore. As noted in subsequent inspections, these deficiencies have been corrected and the morale is much improved. 6) Health Physics coverage and recordkeeping was felt to be somewhat below standard. However, this was attributed to lack of personnel and the fact that Health Physics was so busy "putting out fires" that some of the routine work was not being performed. As noted during subsequent inspections, additional health physics coverage was supplied. 7) Contamination in the cells was building up at a much higher rate than anticipated. This was caused by a) a leaking valve in a reagent addition line, which permitted contaminated acid to drip down the walls of Cell 1, and b) frequent difficulties with the overhead transfer box, which, during each use, caused a spread of contamination. This has been alleviated to some degree by the installation of the SOTS.

As noted in paragraphs 53 - 55 of the report details, the water cooling for the furnace has failed. Operations are still being conducted in spite of this failure. However, it should be noted that there is apparently no restriction against this in the license, as discussed in paragraph 54 of the report details. It also appears that an adequate evaluation of the outside temperature of the furnace has been made. We believe, however, that continued operation of this furnace is not desirable.

The majority of the information contained in this report and in this memo concerns deficiencies in the licensee's program. However, we would also like to discuss that which is good about the facility: 1) It has been apparent to the inspector that Martin management has a sincere desire to operate safely and comply with the regulations. Whenever noncompliance or other undesirable situations were pointed out, these were, in almost all instances, immediately rectified. 2) The inspector has enjoyed complete cooperation with all Martin personnel involved in the Quehanna operation, from the Hot Cell Operators up to and including Dr. Bennett. Many frank discussions have been held with both operational personnel and management concerning the problems inherent to an operation of this scope. 3) As of 1/63, Martin has successfully processed approximately one quarter of a million curies of Sr-90. In addition, during 1/63, SNAP-7B was loaded with the first isotopic fuel ever processed by private industry.

On 12/4/62, a meeting was held with Dr. Ralph D. Bennett, Vice President and General Manager of the Nuclear Division. The items of noncompliance noted during the 8/28/62 and 11/27/62 inspections and all other aspects of the Quehanna operation were discussed at length with Dr. Bennett. Bennett again, as on previous occasions, expressed his desire to rectify all existing defficiencies. The results of the 1/3/63 inspection, with the exception of the 20.206(a) citation, were discussed with Cochran and by telephone with Dr. A. Schneider, Cochran's supervisor.

The only item of noncompliance felt to be of any significance is the existence of the high radiation area on top of the cells. However, as previously noted, this has reportedly been rectified. This matter will be reviewed during the next inspection, tentatively scheduled in about two weeks. We do not believe that a hazard exists, however, this office will continue to inspect the Quehanna Facility at whatever frequency is felt necessary. This report is being forwarded for appropriate enforcement action.

Copies of this report and its memo of transmittal may be of interest to Mr. Alex Aikens, Chief of the Fuels Processing Branch, Mr. Donovan Smith of the Materials Standards Branch, and Mr. Warren Eister of the Division of Isotopes Development.

Enclosure:
1 cy rpt

cc: CO:HQ
w/orig of rpt

Form AEC-... (4-58)

UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee MARTIN-MARIETTA CORPORATION Baltimore, Maryland	2. Date of inspection 8/28/62 - 8/30/62 11/27/62 - 11/30/62 1/3/63 - 1/4/63
	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
19-1398-29	(Initial)	6/26/62	6/30/64
amendment 1		8/9/62	Same
amendment 2	(amends the license in its entirety)	12/4/62	Same
amendment 3		1/2/63	Same
amendment 4		2/12/63	Same

See report details for scope and conditions of the license.

6. Inspection findings (and items of noncompliance)

The Martin-Marietta Corporation's Radioisotope Production Facility (RPF) in Quehanna, Pennsylvania is actively engaged in the production of Sr-90 TiO_3 from Sr-90 CO_3. The Sr-90 TiO_3, in the form of rock-hard pellets, is placed inside Hastelloy-C capsules which in turn are placed inside SNAP generators. As of 1/3/63, the licensee had received four shipments of Sr-90 CO_3 from Hanford, Washington. These shipments were of 130,000 curies, 170,000 curies, 94,000 curies and 170,000 curies. As of 1/3/63, approximately one-quarter of a million curies of Sr-90 had been processed, with the successful loading of the SNAP-7B generator with about 225,000 curies. J. S. Cochran is the Facility Supervisor. Twenty-two other persons are employed in the three shift, seven day a week operation. All five hot cells are being utilized. During the inspections, conducted on 8/28/62, 11/27/62 and 1/3/63, the licensee's organization and administration, facilities and equipment, production records, personnel monitoring program, waste disposal and instrumentation were reviewed. The only items of noncompliance noted during these three inspections are as follows:

(CONT'D)

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

DISTRIBUTION:
Orig - CO:HQ
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Jack R. Roeder
(Inspector)

Approved by: R. S. Cleveland
R. S. Cleveland, Radiation Specialist
(Review) Region I, Division of Compliance
(Operations office)

February 26, 1963
(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.

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

ITEM 6 CONT'D

The 8/28/62 Inspection

(1) 20.201(b) - in that no evaluations had been made of the air effluents leaving a) The Decontamination Room and b) The Radiochemistry Laboratory, to establish compliance with 20.106. (See paragraphs 76 and 77 of report details.)

(2) 20.401(b) - in that records of air concentrations leaving the main stack were not kept in units of uc/ml. (See paragraph 80 of report details.)

(3) Condition 12 of the license - in that no weekly summaries of health physics activities were being mailed at the end of each working week to the Chief, Health Physics Section in Baltimore, as required by Part V of the 3/27/62 letter. (See paragraphs 82 and 83 of report details.)

The 11/27/62 Inspection

(4) Condition 12 of the license - in that monthly fire and safety inspections had not been conducted at prescribed intervals and that the results of the inspections conducted were not maintained on the prescribed forms. (See paragraphs 112 - 114 of report details.)

The 1/3/63 Inspection

(5) Condition 12 of the license - in that transfers of combustible materials, using the SOTS, were not conducted in closed metal containers and that removable sheet metal covers are not available for the SOTS windows. These requirements are set forth in an 11/16/62 letter to the Commission. (See paragraphs 42 and 43 of report details.)

(6) Condition 12 of the license or 20.203(c)(2) - in that a high radiation area on top of the cells, in the vicinity of the SOTS, was not equipped with an interlock or locked in accordance with the licensee's 3/27/62 letter. (See paragraphs 45 - 50 of report details.)

(7) 20.206(a) - in that employees in the RPF were not adequately instructed in the provisions of the license (i.e., the 11/16/62 letter to the Commission), which resulted in noncompliance with this letter during use of the SOTS. (See paragraph 43 of report details.)

PART 30 INSPECTION

MARTIN-MARIETTA CORPORATION
Baltimore, Maryland

Dates of Inspection: 8/28/62 - 8/30/62 (Announced)
11/27/62 - 11/30/62 (Announced)
1/3 /63 - 1/ 4 /63 (Announced)

Persons Accompanying Inspector:

8/28/62 - Mr. Thomas Gerusky, Radiation Physicist, Commonwealth of Pennsylvania
11/27/62 - Mr. Joel Lubenau, Junior Assistant Sanitary Engineer, Central Office, Commonwealth of Pennsylvania
1/3 /63 - None. (State not notified)

Persons Contacted and Titles:

8/28/62

A. Quehanna Personnel

Mr. J. S. Cochran, Supervisor
Mr. W. Stringham, Assistant Supervisor
Mr. M. Bowles, Plant Engineering and Purchasing
Mr. D. Spangler, Production Supervisor
Mr. J. F. Bresson, Chief Health Physics
Mr. H. Cross, Shift Supervisor
Mr. W. Goodman, Shift Supervisor
Mr. R. Duff, Shift Supervisor
Mr. J. Meade, Shift Supervisor
And various Hot Cell Operators

B. Baltimore Personnel

Dr. A. Schneider, Nuclear Chemistry Manager
Mr. T. S. Weissman, Nuclear Components Department Director
Mr. R. H. Boutelle, Chief Health Physics

11/27/62

A. Quehanna Personnel

Same As Above with addition of:
Mr. G. F. Pierson, Process Chemist
Mr. G. L. Torgison, Process Engineer

B. Baltimore Personnel

Dr. A. Schneider, Nuclear Chemistry Manager
Mr. R. H. Boutelle, Chief Health Physics

1/3/63

Same persons as contacted during the 11/27/62 inspection.

DETAILS

Background Information

9. Three inspections have been conducted of the Quehanna Facility since license 19-1398-29 was granted to the Martin Marietta Corporation on 6/26/62. These inspections were conducted during the weeks of 8/28/62, 11/27/62 and 1/3/63, each inspection of two to three days duration.

10. Prior to this, seven pre-licensing visits were conducted by J. R. Reeder on 8/9/61, 9/12-14/61, 11/1-2/61, 1/16-19/62, 1/30/62, 4/16-20/62 and 5/16-17/62. In addition, a 2/28/62 and a 12/4/62 meeting were held with Dr. Ralph D. Bennett, Vice President and General Manager of the Nuclear Division of the Martin-Marietta Corporation. The purpose of the 2/28/62 visit was to discuss the pre-licensing visits and the purpose of the 12/4/62 visit was to review the items of noncompliance noted during the 8/28/62 and 11/27/62 inspections.

11. The report which follows is a summation of the 8/28/62, 11/27/62 and 1/3/63 inspections.

Present Organization and Administration

12. Since the issuance of the license on 6/26/62, there have been several changes in the organizational structure of the Nuclear Division. These changes are set forth in letters of 6/28/62 and 7/20/62 from R. D. Bennett to the Commission. It was confirmed during these inspections that the organizational charts submitted with the letters are correct. In short, these changes are: 1) that administrative authority previously delegated to the Nuclear Chemistry Department Director (Dr. C. E. Crompton, who has left the company) is now assigned to the Nuclear Components Department Director (Mr. T. S. Weissman); and 2) that administrative authority previously delegated to the Isotope Production Section Manager (M. Pobereskin, who is now Principal Scientist in Process Development) is now assigned to the Nuclear Chemistry Manager (Dr. A. Schneider).

13. The Quehanna Facility is under the management of J. S. Cochran, Supervisor, who replaced W. Stringham during the first week of September, 1962. Cochran, as manager of the Quehanna Facility, reports to Dr. A. Schneider in Baltimore; Schneider reports to Mr. T. S. Weissman; and Weissman in turn reports to Dr. Ralph D. Bennett. The Health Physics Group at Quehanna was headed by J. F. Bresson until 1/21/63, at which time he left and joined the staff of Region I, Division of Compliance. Bresson's temporary replacement is Donald L. Peters, formerly of the Health Physics Group in Baltimore. The chief of Health Physics at Quehanna reports directly to the chief of Health Physics in Baltimore, R. H. Boutelle.

14. Exhibit "A" is a chart of the organizational structure of Quehanna.

Receipt of Material

15. As of the date of the writing of this report, four HAPO II Casks have been received from Hanford. The first was received at the Quehanna Site on 7/13/62. This cask, designated HAPO II-2, contained approximately 130,000 curies of Sr-90 as strontium carbonate. In a letter dated 6/14/62 from R. E. Smith of the CPD Program of Hanford, the following analysis was listed:

Curies Sr-90	130,000
Curie Ratio-Isotope to Sr-90	
Sr-89 (as of 5/1/62)	0.10
Ce-144	1×10^{-3}
Ru-106	6×10^{-4}
Zr-Nb-95	7×10^{-4}
Gram Ratio-Cation to Strontium	
Calcium	0.19
Barium	0.005
Iron	0.05
Manganese	0.005
Sodium (estimate)	0.10

16. The second cask, designated HAPO II-1, was received at Quehanna on 8/10/62. The analysis of this shipment is as follows:

Curies Sr-90	170,000
Curie Ratio-Isotope to Sr-90	
Sr-89	0.07
Ce-144	2×10^{-3}
Ru-106	3×10^{-4}
Zr-Nb-95	3×10^{-4}
Gram Ratio-Cation to Strontium	
Calcium	0.15
Barium	0.02
Iron	0.06
Manganese	0.001
Sodium	0.05

17. The third cask, designated HAPO II-3 was received at Quehanna on 10/9/62. The analysis of this shipment, as contained in a letter from R. E. Smith, is as follows:

Curies Sr-90	94,000
Curie Ratio-Isotope to Sr-90	
Sr-89 (as of 9/1/62)	5.0×10^{-3}
Ce-144	$< 3.0 \times 10^{-3}$
Ru-106	$< 6.0 \times 10^{-4}$
Zr-Nb-95	$< 8.0 \times 10^{-4}$
Gram Ratio-Cation to Strontium	
Calcium	0.01
Barium	0.002
Iron	0.0032
Manganese	0.018

18. It should be noted that the possession of the above amounts of material is in accordance with a 3/27/62 amendment to the license, Part 1, "Quantity of Radioisotopes To Be Licensed." In summary, this part of the application requires, 1) receipt of no more than 170,000 curies in any one shipment, 2) possession of no more than 500,000 curies of Sr-90 at any one time, 3) not more than 0.30 curie Sr-89/curie Sr-90, and 4) not more than 0.005 curie Ce-144/curie Sr-90.

19. A fourth cask was received about 1/7/63 with approximately 170,000 curies Sr-90. Amendment #3 to the license was issued on 1/2/63 authorizing storage of the material in the unopened cask. As of the date of this report, processing of this material had not begun.

Discussion of Receipt of First Cask

20. From discussions with Quehanna personnel (Cochran, Bowles, Spangler, Bressen and the hot cell operators) and an examination of the various process records and logs, it was determined that the receipt and installation of the first cask into Cell 1 occurred without incident. Smears taken on the cask exterior were all below 500 dpm and the dose rates were 1 mr/hr at 2" from the exterior of the cask. The subsequent processing of this shipment is discussed later in the report. The "empty" cask was sent back on 7/27/62, containing residual contamination of Sr-90 estimated by Bressen at about 500 curies. This return of the cask occurred without incident.

Discussion of Receipt of Second Cask

21. From discussions with Quehanna personnel (Cochran, Bowles, Bresson, Spangler, Pierson and the operators) and an examination of the process records and logs, it was determined that some difficulty was encountered when the initial dissolution of the Sr-90 CO_3 in the cask was to begin. Martin personnel discovered that the cask was slightly different from the others in that some of the cooling coils were reversed and a vent valve was of a different design and opened 90° more than indicated. In addition, a pressure indicator leaked and it was discovered that the wrong blue prints were sent with the cask. These difficulties, which caused considerable delay in production, were eventually resolved through numerous telephone conversations between Quehanna and Hanford.

22. The "empty" second cask was sent back to Hanford during the last week of September. On 10/18/62, Mr. C. Baxter of the Division of Reactor Development of the New York Operations Office sent this office a copy of a TWX dated 10/17/62, from A. T. Gifford, AEC, Richland, Washington to the New York Operations Office, to the attention of W. Herbert Pennington, Assistant Manager for Technical Operations. (It should be noted that, although the Quehanna Operation is a licensed one, the work is being performed under a contract administered by NYOO. Baxter has technical contractual responsibility for the Quehanna operation and has accompanied Roeder on several inspections of the Quehanna facility.) The TWX is quoted as follows:

"HAPO-II CASK USED FOR STRONTIUM-90 SHIPMENT TO MARTIN-MARIETTA COMPANY'S QUEHANNA CELLS WAS RETURNED EMPTY AND RECEIVED AT HANFORD OCTOBER 5, 1962. ON OCTOBER 12, CASK WAS MONITORED IMMEDIATELY FOLLOWING REMOVAL FROM BUFFER. A NOTE WAS APPENDED TO CASK ON ARRIVAL STATING THAT "CASK IS CONTAMINATED". SMEAR READINGS TAKEN FROM EXTERNAL SURFACES OF CASK WERE FROM 50 TO 75 MILLIRADS PER HOUR WITH A 150 MR READING ON WOODS METAL FLANGE. MONITORING AND DECONTAMINATION CONTINUE. WE HAVE CALLED MR. JOE COCHRAN AT QUEHANNA AND SUGGESTED IMMEDIATE MONITORING OF TRUCK USED FOR QUEHANNA TO PHILIPSBURG SHIPMENT AND ENVIRONS. LATER SMEARS SHOWED 200 TO 300 COUNTS OR LESS THAN ONE MR/HR AT HOLES IN BOTTOM OF BUFFER AND NOTHINGABOVE BACKGROUND ON CAR. ALTHOUGH IT APPEARS THAT NO SR-90 ESCAPED TO ENVIRONS IN THIS CASE, WE WOULD APPRECIATE YOUR ARRANGING FOR MONITORING OF NEXT HAPO-II CASK NOW AT QUEHANNA PRIOR TO ITS BEING LOADED IN BUFFER FOR RETURN TO HANFORD AND ASSURING THAT ASSEMBLY MEETS ICC SHIPPING REGULATIONS FOR EMPTY CASKS."

23. On 10/18/62, Bresson, the Health Physicist at the Quehanna facility, was contacted by telephone. Bresson stated that, when the cask left Quehanna, it had been decontaminated to less than 1,000 dpm on all external surfaces. He added that several fittings were also decontaminated to a level of approximately 10,000 dpm per wipe, but that each one of these fittings was subsequently covered. He said that the "buffer", which serves as an outer container and in which the cask resides, was not contaminated either on the inside or the outside when it left Quehanna. He further stated that a subsequent telephone conversation with Hanford revealed that the buffer was clean when it arrived at Hanford. For this reason, this office agreed that no survey need be conducted of the truck in which the cask was transported from Quehanna to Philipsburg, Pennsylvania.

24. Exhibit "B" is a copy of a 10/22/62 letter from Bresson to Mr. Peter Loysen, HASL, NYOO. It was determined that Loysen had initiated an independent investigation at the request of the Manager, NYOO. During a 10/24/62 telephone conversation with Roeder, Bresson said that Loysen was at the Quehanna facility that day to monitor the third HAPO cask that was to be returned to Hanford in the near future.

25. The last line of the TWX to NYOO states in part, "...and assuring that assembly meets ICC shipping regulations for empty casks". It is worth noting that these casks are not "empty" when they are sent back to Hanford. The first "empty" cask that was sent back to Hanford from Quehanna, as previously noted, contained about 500 c of unreacted Sr-90 carbonate. Bresson estimated that the cask in question contained a few hundred curies of Sr-90.

26. Records of all the above transactions are maintained by the Health Physics Section and were reviewed by the inspector.

Brief Description of Quehanna Facilities

27. The Radioisotope Production Facility (RPF) at Quehanna, Pennsylvania was formerly owned by the Curtiss-Wright Corporation. In late 1960, Curtiss-Wright donated the RPF and its associated swimming pool reactor to Penn State University. The Martin-Marietta Corporation leases the five Hot Cells and the associated facilities, rooms, etc. from Penn State.

28. The work at Quehanna is being performed under Contract AT(30-1)-3602, which is administered by NYOO for the Division of Isotopes Development. Personnel from NYOO-HASL and NYOO-Reactor Development Division have on several occasions visited the RPF. HASL personnel (with the exception of P. Loysen's visit cited in paragraph 24) have been assisting in shielding studies, and Reactor Development Division personnel have been interested in the contractual aspects of the operation.

29. Detailed descriptions of the RPF are contained in Revision A of MMD-2410, which was submitted to the AEC by letter of 11/28/61. Pre-licensing visits were made prior to the issuance of the license to check out the facility to ensure that it was constructed as described and that all instrumentation, ventilating systems, dry runs, etc. were operating or performed properly. Findings of these visits and other visits and discussions with Martin personnel were set forth in reports dated 8/21/61, 10/17/61, 10/25/61, 11/21/61, 1/10/62, 1/29/62, 2/19/62, 3/7/62, 4/10/62, and 5/7/62, copies of which were sent to Headquarters.

30. The RPF was initially designed by Martin for the processing of Cm-242 and Sr-90. The finished products, curium oxide and strontium titanate, in the form of pellets, were to be used as isotopic power sources for SNAP generators. In 5/62, two months before the license was granted, DID canceled the Cm-242 contract. Prior to the cancellation of the curium contract, Martin intended to use Cells 1 and 2 for the Sr-90 processing, Cells 3 and 4 for the Cm-242 processing, and Cell 5 for the loading of the SNAP generators.

31. When the first "hot" operations using Sr-90 CO_3 were begun on 7/18/62, Martin was using Cells 1 and 2 only. However, during the period of 7/62 thru 1/63, Martin realized that they could not successfully operate in just these two cells and began to expand the operations until, as of 1/63, all five cells are now being utilized. (See Figure III-1 in Revision A of MMD-2410 for floor plan of the RPF).

32. Cell 1 is primarily used for the dissolution of the Sr-90 CO_3 (i.e., the addition of HNO_3); Cell 2 is the cell in which the entire processing to Sr-90 TiO_3 is conducted; and Cell 3 is used for the packaging and temporary storage of contaminated items that are removed, via the Stationary Overhead Transfer System (SOTS - which is described later in paragraphs 37 - 50).

33. Cell 4 has been divided in two by a 1/8" aluminum floor to ceiling partition. This alteration was performed after the license was granted on 6/26/62. However, Condition 16 of the license permits changes in the facility provided certain conditions are met. A record of this change is maintained in the various log books, and it was Martin personnel's feelings that this was a change authorized by Condition 16.

34. The two cells are now known as Cell 4A and Cell 4B. The partition reportedly was installed to serve as a contamination barrier. The barrier is fitted with an aerosol filter. The air flow is from 4B, thru the filter, into 4A and then out a sealed duct under the viewing window through 4B and then into the normal cell exhaust. The overall differential pressure between Cell 4 and the surrounding areas has not been changed.

35. Cell 4A is used for the first decontamination of the capsules. (The capsules, made of Hastelloy C, contain the pellets of Sr-90-TiO_3). These are transferred via the alpha transfer mechanism from Cell 2 to 4A. After preliminary decontamination to about 30,000 dpm/100 cm^2, the capsules are transferred to 4B for final decontamination. (Methods of decontamination and the limits achieved are discussed later in the report).

36. Cell 5 is used primarily for storage. It is also the cell, however, in which the SNAP-7C generator was loaded with 40,000 curies of Sr-90-TiO_3 on 9/14/61 (with fuel processed by ORNL) and the SNAP-7B generator was loaded with 225,000 curies of Sr-90-TiO_3 on 1/15/63 (with the first fuel processed at the RPF).

Installation of the Stationary Overhead Transfer System (SOTS)

37. The most significant change in the facility, since hot operations were begun, has been the installation of the Stationary Overhead Transfer System (SOTS). This replaced the Top Transfer Box which is described in Revision A of MND-2410 and its amendments. (Figures III-8 and IV-2 in MND-2410 are sketches of the Top Transfer Box). The Box alone is about 15' high x 4' x 4'. The installation of the SOTS was requested by Martin under a letter of 10/24/62 from R. H. Boutelle, attached to which was a hazards evaluation, MND-2912. After more correspondence, amendment #2 to the license was granted on 12/4/62, authorizing the installation and use of the SOTS. As of 11/27/62 the 15' x 4' x 4' Top Transfer Box was bagged in polyethylene and was inside a huge steel drum, awaiting shipment to ORNL. It had been decontaminated to a residual activity estimated at less than 25 curies.

38. In order to fully understand the necessity for removing the Top Transfer Box, a short summary follows of the difficulties encountered using this mechanism.

39. In the original concept of radioisotope handling, it was contemplated that the Top Transfer Box would be used only infrequently to remove or replace large items of equipment from the large dry box in Cell 2. (It should be noted that all work in Cell 2 is conducted within a large dry box which is almost as big as the cell itself). As the result of actual experience, however, it was proven necessary to operate the Top Transfer Box several times a week, primarily to remove radioactive dry waste (consisting mostly of reagent bottles, damaged manipulator boots, and other items too cumbersome for the alpha transfer system), and only occasionally to replace equipment. This proved to be unsuccessful for several reasons:

1. The Top Transfer Box was extremely cumbersome to operate requiring the services of several operators.

2. Radiation doses to the gasketing between the door of the container box and the Top Transfer Box door deteriorated the gasketing to the point where small releases of radioactive powder occurred each time the box was employed. Furthermore, the level of contamination in Cell 2 rose rapidly after each transfer operation. It should be noted that Health Physics personnel were continually present during each use of the Top Transfer Box. Direct reading surveys, continuous air sampling, and smear surveys were necessary.

3. When the contents of the Top Transfer Box were unloaded into the Waste Disposal Dry Box, situated in the service area (see page III-16 and Figure III-8 of MND-2410), radiation exposure to operating personnel was quite high.

4. Two months after operations were begun on 8/3/62, the Top Transfer Box became stuck to the top of the Cell 2 dry box. This was caused when three "dogs" did not seat properly and one dog seated at an angle and became stuck. Inasmuch as the dose rates at the cell roof were approximately 2 - 5 r/hr, it took approximately two weeks for operators working short intervals to finally free the Top Transfer Box.

5. According to Quehanna personnel, "the last straw" with regard to the Top Transfer Box occurred during an 11/62 transfer. After the Box had been seated to the top of the dry box in Cell 2 and a contaminated item removed, the Top Transfer Box was raised. Somehow, however, the top of the dry box became disengaged and slid down into the dry box with a bang. The entire Top Transfer Box was pulled up, with one of its doors hanging down, resulting in "gross contamination" (the quote is Health Physics) of the surrounding area.

6. Because of the above difficulties, production for a period of several months was severely curtailed.

40. As soon as amendment #2 to the license was received during the week of 12/4/62, installation of the SOTS was begun. The first successful transfer was conducted on 12/7/62. In general, the SOTS consists of a series of structures, which, when bolted together, form a single continuous U-shaped (inverted) tunnel between Cells 2 and 3, the plane of the U being vertical. (A more detailed description is contained in the licensee's 10/24/62 hazards evaluation, MND-2912 and pictures of the installed SOTS are attached as Exhibit "D".)

41. The main purpose of the 1/3/63 inspection was to inspect the SOTS and observe a transfer from Cell 2 to Cell 3. On 1/3/63, the writer observed a transfer of waste material, using the SOTS, from Cell 2 to Cell 3. The transfer was conducted without incident. However, the following discrepancies should be noted.

42. When the licensee was granted amendment #2 to the license on 12/4/62, Condition 12 of the license was amended to include adherence to an 11/16/62 letter to the Commission, signed by R. J. Brisson for R. H. Boutelle. This letter states in part:

"1. When installed in the opening of Cell 2 at Quehanna, the lead and I-beam substructure will be firmly anchored to the existing concrete shielding by steel bolts.

2. Removable sheet metal covers will be placed over all windows in the SOTS to minimize damage to the windows in the event of fires external to the SOTS. The covers will be in place at all times, except possibly when a transfer operation is in progress. Since the SOTS is constructed from non-flammable materials (other than the windows), and since the transfer of potentially combustible materials (such as wipes, used manipulator boots, etc.) will be conducted only in closed metal containers, the likelihood of an internal fire being generated within the SOTS is highly improbable."

43. It should be noted that no. 1 above is complied with. However, with regard to no. 2 above, a) there were no removable sheet metal covers available or ever made to fit over the windows of the SOTS, and b) the transfer observed by the inspector on 1/3/63 was of combustible material (wipes and a boot) and was not conducted in a closed metal container, but rather in an open wooden container, with fins, inside of an open metal container. Between these two containers, borax is poured for shielding. This 11/16/62 letter was brought to the attention of Cochran (Supervisor of the Facility), Bowles, Spangler, Pierson, Torgison, Bresson, and several operators. All said they had never seen this letter. Cochran said that, since he was unaware of this letter, all transfers that he had made prior to 1/3/62 (~ 40) had been in this same type of open wooden container. Cochran was most disturbed that this restriction had been incorporated into the license without his knowledge.

44. All the other features of the SOTS, as described in MND-2912, were found to be as described. (It is of interest to note that, shortly after the SOTS was installed, it was discovered that it was not pulling enough air through a 2" 50 cfm air filter and the sides almost collapsed. This was rectified by the immediate installation of a larger 9" 500 cfm absolute filter in it. MND-2912 contains an evaluation of overpressures originating in the dry box or the SOTS).

45. Access to the vicinity of the SOTS, which is on top of and between Cells 2 and 3, is obtained by climbing a flight of stairs from the service area to the top of the cells. At the top of the stairs is a waist-high chain (which one could easily duck under or climb over), which contained a "Caution - High Radiation Area" sign and symbol. At the bottom of the stairs was a sign "Caution - Contact Health Physics before Entering Mezzanine Area."

46. The writer conducted a survey about the area of the SOTS with an AEC-NYOO Juno survey meter. The readings were checked against the licensee's NCA Cutie Pie, last calibrated on 12/13/62. A summary of these readings with the window open are as follows:

1.	Maximum dose rate on top of Cell 3 (with meter on top of cell)	- 80	mr/hr
2.	At one end of SOTS with meter held at waist height and 18" from end of SOTS	- 150	mr/hr
3.	At sealed off glove ports in SOTS at about 18" away	- 1.2	R/hr
4.	On contact with side of SOTS at waist height	- 1.8	R/hr
5.	At about 18" from side of SOTS at waist height	- 500	mr/hr
6.	At about 18" from corner of SOTS over Cell 2	- 4.5	R/hr
7.	On contact with window at end of SOTS over Cell 2 at waist height	- 3	R/hr
8.	On contact with sealed off glove ports at end of SOTS over Cell 2 at waist height	- 4.5	R/hr
9.	At about 18" from end of SOTS over Cell 2 at waist height	- 1.2	R/hr
10.	Where operator stands on top of Cell 2 during transfer operation:		
	Head Height	- 25	mr/hr
	Waist Height	- 3	mr/hr

47. The above dose rates, as measured by the inspector, were reported to be in good agreement with those previously determined by Health Physics. It is of interest to note that this radiation is quite "soft" - most likely bremsstrahlung. When a coffee can was placed over the licensee's Cutie Pie, the above figures were reduced by as much as a factor of five.

48. It should be noted that a) these dose rates exist at all times, i.e., whether a transfer is being conducted or not (the dose rates actually increase during a transfer as a contaminated item is moved through the SOTS); b) a major portion of the body is subjected to these dose rates as one stands on top of the cells; c) the area is accessible by a flight of stairs, at the top of which is a waist-high chain; d) the SOTS was installed during the week of 12/3/62 with the first transfer being conducted on 12/7/62; e) this survey was conducted on 1/3/63; f) the areas on top of the cells and the SOTS itself were posted, "Caution - High Radiation Area" (with symbol) and "Caution - Radioactive Materials" (with symbol); g) it was reported by Bresson that these dose rates have existed since the installation of the SOTS, and in a subsequent telephone conversation on or about 1/10/63 it was reported that the dose rates still existed and that the area was still accessible.

49. Pages 9, 10 and 11 "Control of Radiation Areas", contained in Part V "Administrative Control", combined as part of the licensee's 3/27/62 letter to the Commission, to which the licensee is bound by Condition 12, is an exemption from 20.203(c)(2), granted by Condition 14. The intent of this section is to exempt the licensee from interlocks on the cells and the isolation rooms. Cochran, Boutelle and Bresson stated that they would rectify the above situation (i.e., the area about the SOTS) by placing a locked gate at either the bottom or the top of the stairs, and include the key control under the exemption described above.

50. In a 2/8/63 telephone conversation with Boutelle, who reportedly had been to Quehanna the previous day, a gate with a lock had been installed at the bottom of the stairs.

Equipment Failures

51. Since hot operations were begun, the second most significant equipment trouble (the most significant being the failure of the Top Transfer Box) has been the repeated failure of manipulator boots. These failures are caused by 1) the seal

between the boot and the manipulator port not holding, causing the boot to slip down on the manipulator, and 2) the actual failure (tearing, holes, etc.) of the boot itself mostly due to radiation damage.* The boots are made of nylon reinforced polyethylene. During the first few months of operation, boots were failing every few days, requiring frequent boot changes, which at best is a time-consuming, potentially hazardous operation. According to Bresson (and verified in the Health Physics log book), at least one Health Physicist was always present during a boot change. Protective clothing used during boot changes, which were generally performed by three operators and one Health Physicist, included a set ofcoveralls, a plastic suit, head cover, assault mask, two sets of rubber gloves and two pairs of shoe covers. Direct reading surveys, air samples and smear samples are taken during the operation. The floor in the Operations Area and all surrounding equipment are covered with polyethylene to prevent spread of contamination.

52. During the inspections of 11/27/62 and 1/3/63, it was reported that the boot failure problem had been much improved by 1) redesigning the boot seat, and 2) purchase of heavier, better reinforced boots. The average boot life is now about 2 to 3 weeks or longer.

53. Another equipment failure was noted during the 1/3/63 visit. This involved the furnace which is in Cell 2 (See Figure IV-1 on Page V-9 of MND-2410; Page V-13, paragraph b. "Calcination step", and Exhibit "C"). The outer jacket of this furnace is water cooled to reduce the surface temperature to about 125° F. The inside of the furnace reaches temperatures of about 1500° C.

54. It was reported to the inspector during the 1/3/63 visit that some weeks prior to the date of inspection (exact date not known) the water cooling failed. However, the use of the furnace was continued and was in operation, without water cooling, at the time of inspection. Paragraph b, "Calcining step", Page V-13 of MND-2410 states in part:

> "Although surface cooling increases the power consumption of the furnace, it reduces heating of the containment box and precludes the possibility of melting holes in the plastic boots covering the manipulators if they should happen to brush against the furnace. An analysis indicates that if the cooling water to the furnace should fail, the equilibrium surface temperature would rise to 298° F, which would not be dangerous, but which would necessitate extra precautions in regard to the manipulator boots until the fault could be corrected."

55. It was noted during the afternoon of 1/3/63 that combustible wipes and a manipulator boot were about one foot from the furnace, inside the dry box in the cell. The advisability of 1) moving these combustibles away from the furnace, and 2) actually measuring the outside temperature of the furnace with a thermometer was discussed with Cochran and Spangler. On the morning of 1/4/63, it was noted by the inspector that both had been done, the thermometer indicating about 270° - 300° on the outside of the furnace. Cochran said that they are considering removal and replacement of the furnace.

56. The alpha transfer mechanism is also used to transfer items from cell to cell. It is also discussed and described in MND-2410 and was one of the devices frequently demonstrated during the pre-licensing visits. During a review of the Health Physics Log Book on 11/27/62, a few references to the malfunction of the alpha transfer mechanism were noted. One such instance occurred during the transfer of an Sr-90-TiO_3 pellet from Cell 2 to Cell 4. During the transfer the lid of the alpha transfer mechanism came off (reportedly due to excessive banging during seating of it) and the pellet dropped to the floor of the

* Radiation damage was reported as due to direct radiation and small particles of radioactive particles settling out on the boot itself.

isolation room. The dose rate was about 15 R/hr at one foot. Without excessive exposure to personnel, the pellet was replaced (remotely) into the mechanism and then into the cell. The lid of the alpha transfer mechanism has remotely been altered to prevent a recurrence.

Brief Description of the Processing Operation

57. Exhibit "C" is a schematic diagram of the processing of the Sr-90-CO_3 to Sr-90-TiO_3. As previously noted, the dissolution (the addition of HNO_3 to the HAPO-II cask) is performed in Cell 1. All other operations such as the precipitation, filtering, calcining, blending, pressing, sintering, weighing, measuring, calorimetry, capsule welding and initial leak testing are done in the large dry box in Cell 2.* The capsules are decontaminated in Cells 4A and 4B and the SNAP generators are loaded in Cell 5.

58. The SNAP-7B contained 14 Hastelloy-C capsules, totalling about 225,000 curies of Sr-90.

59. A more detailed explanation of the process is contained in MND-2410, and the subsequent revisions dated 3/27/62 and 6/1/62. No attempt will be made here to outline all the detail and equipment involved in the process. As of 1/3/63, the licensee had processed approximately one quarter of a million curies.

60. Condition 18 of the license requires that byproduct material be used by or under the supervision of Messrs. Howard D. Cross, Robert M. Dorl, John M. Glasgow, William K. Goodman, George W. Karl, John W. Meade, Elmer E. Shields, Donald Spangler, or William Stringham. As previously noted, Stringham has been replaced by J. S. Cochran. However, the above named persons, with the exception of Spangler, who is Production Supervisor, are all shift supervisors or hot cell operators. The operations at Quehanna are conducted three shifts per day, seven days per week. Health Physics coverage during the first shift consists of at least two technicians. The second and third shifts are covered by one technician per shift.

61. During the 1/3/63 inspection, a review of the production records, kept by D. Spangler, Production Supervisor, was made. This was done in order to establish compliance with batch limits and operating temperatures. The batch limits are set forth in "Quantity of Radioisotopes to be Licensed", under cover of a 3/27/62 letter to L&R, to which the licensee is bound by Condition 12 of the license. The operating temperatures, etc. are set forth in MND-2410 and the supplements thereto.

62. The Production records kept by Spangler reflectedcomplete step by step descriptions of all the operations. These records included the time that a given operation was performed, the initials of the shift supervisor or production supervisor, the batch size in curies, the rate of addition of sodium carbonate, the precipitation temperature, the calcining temperature, the calcining and sintering rates, the press pressure, the time at pressure, and the sintering temperature. In addition, these records contained a complete physical description of each pellet, including the diameter, height, weight, density, thermal output in watts, watts per gram, and the millivolts. A comparison of these addition rates, pressures and temperatures, with those contained in MND-2410 and its subsequent revisions, revealed that they were all within the limits set forth in these documents.

63. These process records also summarized the batch sizes for each run. It was noted that the first hot run was begun on 7/18/62 and consisted of one 5,000 curie run, one 6,000 curie run, eleven 10,000 curie runs, and one 9,530 curie run (during this latter run the pellet tray spilled in the furnace, hence, this entire run was scrapped). Run #2 began on 9/4/62 and consisted of one 2,000 curie run, ten 12,000 curie runs, and one run from the slurry left in the back-up filter. The third series of runs was begun on 12/22/62. As of 1/3/63, five 12,000 curie batches had been processed. All of the above are in accordance with "I - Quantity of Radioisotopes To Be Licensed", which is included as part of the licensee's 3/27/62 amendment to MND-2410.

* The Sr-90-TiO_3 "pellets" are rock-hard, brown colored discs about 1 1/4" in diameter and about 3/8" high. Each contain about 1200 curies Sr-90 ($\pm$ 25%) depending on the density. These pellets are placed in Hastelloy-C capsules. The capsules are placed inside the SNAP generator.

Written Procedures

64. Comprehensive written procedures for all operations have been compiled and are possessed by all persons in the Quehanna Facility. These procedures are divided into two general types, the Operating Procedures and the Health Physics Prodedures. The Operating Procedures were compiled by Cochran, Bowles and Spangler, and the Health Physics Procedures were compiled by J. F. Bresson.

65. Copies of the operating procedures are on file in this office. Among the topics covered are unloading of the HAPO-II cask, cooling of the cask, dissolving the Sr-90 carbonate, metering and precipitation, use of the SOTS, removal of manipulator boots, disposal of dry waste and contaminated equipment, metering precipitation and filtering of Sr-90 solution, changing of high efficiency filters, operation of the waste disposal building, emergency procedures, transfers of liquid wastes, leak detection of the welded capsules, and decontamination procedures. These procedures have been re-written several times since hot operations were begun.

66. This office does not possess copies of the Health Physics Procedures; however, these were reviewed in detail with Bresson prior to the granting of the license in 6/62.

Leak Tests

67. Condition 17 of the license requires that each sealed source fabricated by the licensee be leak tested. If 0.05 uc or more of removable contamination is detected upon a 100 cm^2 surface, the source shall be repaired and/or be decontaminated and retested. The sealed sources in this case are the Hastelloy-C capsules that contain the Sr-90-TiO_3 pellets.

68. After the pellets are placed in the capsules in Cell 2, the capsules are rinsed off with 1N HNO_3. After smears are taken, the capsules are then transferred, via the Alpha Transfer Mechanism, from Cell 2 to Cell 4A. Smears are again taken after the capsules are received in Cell 4A. It was reported that removable contamination on some of these capsules has been high enough to cause a reading of 950 mr/hr on a wipe of the surface of the capsule. Preliminary decontamination consists of scrubbing with brushes and cleanser and rinsing with water. Then 5N HCl is poured on the capsules and they are again rinsed with water.

69. If removable contamination is 30,000 dpm or less, they are then transferred to Cell 4B. If the initial decontamination fails to reach this limit, the process is repeated. Further decontamination using the same procedure is conducted in Cell 4B until a limit of 4,000 dpm is reached. It was reported by Spangler and Cochran during the 1/3/63 visit that 12 of the 14 Hastelloy-C capsules that were to be loaded into the SNAP-7B generator were all below 2000 - 3000 dpm for a wipe taken on the entire surface of the capsule, which has been estimated to be about 100 cm^2. Both Spangler and Cochran reported that the other two capsules would be decontaminated to this limit before 7B would be loaded. Records of all of these procedures and the results of all the wipe tests are maintained.

70. Cochran and Spangler reported that the ultrasonic cleaner and the sand blaster have been scrapped. They reported that they have had success by buffing the unloaded Hastelloy-C capsules to a shine. They have found that this results in the capsules being less easily contaminated and more easily decontaminated.

Philosophy of Containment

71. No attempt will be made in this report to summarize in any detail the ventillation system employed at the NPF. Figure IV-11 "Air Ventillation System" submitted as part of Revision A of MND-2410, is a detailed schematic diagram of the air flow system. It should be noted that during the pre-licensing visits, the ventillation system was a source of considerable trouble. (See inspection report dated 1/29/62). However, all of the discrepancies discovered during the pre-licensing visits were rectified before hot operations were begun.

72. In short, the philosophy of containment is as follows: The first containment barrier is the process equipment itself, located within the plastic-windowed steel containment box inside Cell 2. The second containment barrier is the containment box. The box is designed to have the lowest air pressure in the system and is protected by both absolute inlet and outlet air filters. The third containment barrier is the hot cell itself which also has absolute filters on both inlet and outlet streams. The operating air pressure in the cells is higher than that in the dry box, but lower than that in the operating areas. A more detailed description of pressure differentials, etc., is contained in the licensee's 3/27/62 and 6/1/62 letters to the Commission.

Surveys

73. The surveys that are conducted at the RPF consist of daily routine surveys and special surveys. The daily routine surveys, which are conducted by J. Campbell of the Health Physics staff, consist of the following: 1) taking counter backgrounds and efficiency, 2) changing and counting air monitoring filters M-1 thru M-5, 3) changing the ventillation duct samplers, 4) changing, counting, and recording the outside air samples, 5) collecting and analyzing a sample of the drinking water, 6) inspecting the Hays gauges on the cell faces, the annunciator panel and the ventillation board, 7) conducting smear surveys of the operations area, the change area, the service area and one other special area which varies from day to day, and 8) conducting direct reading surveys about the cell faces. Records of these surveys are maintained and were reviewed during the 11/27/62 inspection. Forms on which these surveys are recorded are retained as part of the licensee's file.

74. Special surveys are conducted depending upon the situation. These evaluations consist of direct readings, continuous air samples, spot air samples, smear samples, calculations, etc. For example, before a cell entry may be made, a hi-vol air sample is taken inside the cell and direct readings also taken. The results of these are then analyzed by Health Physics and appropriate protective clothing and working times established. Work permits, as described in MND-2410, are required for practically every operation. Most of the records of these spot surveys are kept in the Health Physics Log Book.

75. That which follows is a discussion of a few aspects wherein evaluations were felt to be lacking.

76. During the 8/28/62 inspection, after numerous discussions with Bresson, and a review of air sampling records, Bresson stated that no evaluations were being made of the air leaving 1) The Decontamination Room, and 2) The Radiochemistry Laboratory. With regard to #1, sampler "S", which is between Fan E-15 and the back flow damper (See Figure IV-11 of MND-2410), had not been installed and was not sampling the exhaust air from the Decontamination Room. Work involving high-level decontamination had been conducted in there prior to the 8/28/62 visit. Bresson admitted that, through an oversight, this evaluation had not been made.

77. With regard to the air leaving the Radiochemistry Laboratory, sampler "S", which is between Fans E-12 and the backflow damper (See Figure IV-11), had not been installed and was not sampling the exhaust air from this laboratory. Work in the laboratory has continued since hot operations were begun in 7/62. Bresson again admitted that through an oversight this evaluation had not been made.

78. With regard to these deficiencies described above, it was noted during the 11/27/62 inspection that both samplers had been installed, that the filter papers were removed and counted at specified intervals, and that the results were less than 2×10^{-10} uc/ml, most of the results approaching 10^{-12} to 10^{-14} uc/ml.

79. Also during the 8/28/62 inspection, it was reported to the inspector by Health Physics personnel (Bresson was not available for the last two days of the inspection) that daily radiation surveys throughout the facility were not being conducted as required in paragraph 3A, page IV-9 of NWD 2410. A search of the records could not substantiate that these surveys were being conducted. However, during the 11/27/62 inspection, Bresson produced records that substantiated that these daily surveys had been conducted prior to the 8/28/62 inspection.

80. All air exhausted from the Quehanna Facility hot cells, dry boxes and isolation areas is exhausted through the main stack. Sampler "S", which is located between the stack and monitors M-1 and M-2 (See Figure IV-II), is the final evaluation of the air before it is exhausted. Sampler "S" consists of a filter paper that is counted daily for beta-gamma activity and alpha, and the results converted to DPM. The results of these evaluations, as noted during the 8/28/62 inspection, were recorded only in DPM for both the beta-gamma and alpha activity. No units of microcuries or any flow rate data were available. In short, the records of the exhaust were not kept in units of uc/ml.

81. During the 11/27/62 inspection, it was noted that this deficiency was rectified. The results of the sampler were being kept in units of uc/ml. None was noted to exceed 2 x 10^{-10} uc/ml, with most results again in the 10^{-12} to 10^{-14} uc/ml ranges.

82. Page 7, "Health Physics Organization"; of Part V, "Administrative Control"; contained in the 3/27/62 letter states in part under Program Monitoring:

> "The Health Physicist at the Quehanna Facility is responsible for reporting building conditions, survey results, and personnel exposure data to the Facility Supervisor for his day-to-day information. In addition to this, he provides a weekly summary to be mailed at the end of each working week to the Chief, Health Physics Section in Baltimore. This summary will contain a detailed resume of radiation and contamination conditions at the Facility, including a table of survey results and personnel exposure data."

83. During the 8/28/62 visit, the inspector requested to see these weekly summaries. Bresson said that they had never been compiled. Bresson and Boutelle admitted this oversight and said that immediate steps would be taken to correct this deficiency.

84. During the 11/27/62 visit, it was noted that these weekly summaries were being compiled by Bresson and sent to Boutelle.

85. Copies of all forms on which the survey results are recorded are on file in this office.

Independent Measurements

86. During the 8/28/62 inspection, a smear survey was conducted of "unrestricted areas" in the RPF. (It should be noted that the entire Quehanna Facility is restricted and is surrounded by a cyclone fence. Entrance to the building can only be obtained through the front door. A locked barrier, which can only be opened by the receptionist, restricts further entrance). These "unrestricted areas" in which the smears were taken were the lunch room, office areas, corridors, rest rooms, etc. A total of 40 smears were taken, the highest result being 30 DPM, as measured by NYOO-HASL. The majority were 5 DPM or below.

87. During each inspection, the inspector tested locked doors, tried to gain entrance into the isolation rooms, checked various personnel for authorized keys, quizzed personnel about emergency procedures, checked instrumentation, checked emergency fans, checked emergency equipment, checked for work permits, etc., and othewise evaluated establish procedures. However, in no instances were any discrepancies noted.

88. It should be noted that the Health Physics log book recorded a few power failures occurring at the RPF, specifically one on 8/5/62. However, it was also noted that in all instances emergency power functioned properly and no time was lost.

Whole Body Count

89. Revision A of MND-2410 was amended by a 4/24/62 letter which states:

> "A program of whole body counting for persons associated with the work at Quehanna will be instituted with a view to obtaining data which might possibly be useful in the evaluation of a suspected ingestion. Since existing data are insufficient to establish the value of such a program at this time, the whole body counting program will be experimental in nature."

90. It should be noted that, before hot operations were begun, all Quehanna personnel with one exception were given a whole body count at the NYU Bellevue Medical Center in New York City.

Film Badge Program

91. From 6/6/62 to 8/20/62 the RPF employed a bi-weekly film badge service supplied by Health Physics Services, Inc. On 8/20/62 it was changed to a weekly service supplied by the same company. However, there have been many instances when badges have been processed at less frequent intervals, i.e., when there is a suspected exposure.

92. Form AEC-4 has been compiled for all persons under the personnel monitoring program at RPF. During the 11/27/62 inspection, the first quarter results were reviewed by the inspector. These exposures, which are kept on Form AEC-5, are summarized in Table I:

Table I

Name	Title	Dose From 7/1/62 - 9/28/62 Whole Body	Hands & Forearms
		1.462 rem	0
		0.226 rem	0
		0.998 rem	0.390 rem
		0.707 rem	0.022 rem
		0.476 rem	0.288 rem
		1.170 rem	0.186 rem
		1.430 rem	2.603 rem
		2.261 rem	0.882 rem
		1.775 rem	0.662 rem
		1.255 rem	0.906 rem
		1.142 rem	1.121 rem
		0.835 rem	0.647 rem
		2.849 rem	1.860 rem
		1.161 rem	1.073 rem
		2.516 rem	2.827 rem
		2.043 rem	1.497 rem
		1.821 rem	1.005 rem
		0.821 rem	0.852 rem
		0.072 rem	0
		1.471 rem	0.789 rem
		0.965 rem	0.384 rem
		2.494 rem	0.637 rem
		0.792 rem	0.903 rem
		0.017 rem	0
		0.511 rem	0.180 rem
		0.359 rem	0.141 rem

93. The following persons are Baltimore personnel who worked part-time at the Quehanna facility:

Exhibit

Name	Title	Period of Exposure	Whole Body	Hands & Forearms
		7/1/62 - 9/28/62	0.230 rem	0
		6/30/62 - 9/28/62	0.440 rem	0.960 rem
		7/1/62 - 10/1/62	0.212 rem	0
		6/30/62 - 9/28/62	0.288 rem	0.095 rem
		6/30/62 - 9/28/62	0.637 rem	0

94. In addition to checking the above, the original film badge reports were also reviewed. A check of the totals against those on the Form -5 were made in some instances, and no discrepancies were noted. The original film badge reports go to Baltimore for review by Boutelle, with a copy for Quehanna. A clerk in Baltimore compiles the Form--5 and sends a copy to Quehanna.

95. Film badge results are maintained on Form AEC-5.

96. As of the 1/3/63 inspection, the 10/1/62 - 12/31/62 quarterly exposures had not been compiled. These will be reviewed during the next inspection.

97. Wrist badges are supplied by Health Physics as required. These are reportedly worn on the wrists and sometimes on the palm of the hand. Finger rings have been used only infrequently.

Use of Pocket Dosimeters

98. 0 - 200 mr pocket dosimeters are worn routinely with the film badges. The results are recorded daily for each person. 0 - 5 R dosimeters are issued as prescribed by Health Physics, e.g., when entries into an isolation room or hot cell is made. The Health Physics Log Book reflected several instances of 0 - 200 mr dosimeters having gone off scale. On each instance, however, notation was made that the badge was pulled and sent for analysis.

99. During the 8/28/62 inspection, the Health Physics Log Book revealed that on the same day, 8/28/62, [redacted] a part-time employee from [redacted] had assisted several operators in a decontamination job in one of the cells. His 0 - 5 R dosimeter indicated a dosage of 1.5 R. The inspector asked for [redacted] Form -4, but none had been compiled. However, in subsequent telephone conversations with [redacted] it was reported 1) that his dosimeter was not zeroed to start and 2) his film badge revealed an exposure of 900 mr. These facts were confirmed during the 11/27/62 inspection. Exh 4

Bioassays

100. On Page IV-7 of WND-2410 under paragraph (b) "Bioassay", the following is stated:

> "All facility personnel are required to submit bioassay samples prior to the start of operation and quarterly thereafter. In case of suspected body intake of radioactive materials, ..i.e., intakes by ingestion, inhalation, or penetration through the skin .. special samples are collected from personnel involved. All bioassay results and other information on intakes of radioactive materials, are filed as permanent records."

101. In a 4/24/62 letter to the Commission, this paragraph was amended to add:

> "During the first month of operation, bioassay samples will be collected and analyzed on a much more frequent schedule. The exact schedule will depend on the operations being performed and the number of individuals exposed to potential ingestion. The results obtained in these frequent samplings will be used to determine the conduct of the bioassay program at the end of the trial period."

102. In a 6/1/62 letter to the Commission, this was amended to add:

"In any case, all persons working with or exposed to radioactive material, will be sampled at least quarterly."

103. During the 8/28/62 inspection, it was reported that no bioassay results had yet been received from the processor, Controls for Radiation, Inc., even though hot operations were begun on 7/18/62. There were several instances noted in the Health Physics Log Book where ingestion may have occurred. Specifically, on 8/8/62, [redacted] a [redacted] became contaminated during the removal of a waste drum. According to the log book, his hands read about 7 mr/hr on contact, and his nose about 2 mr/hr on contact. Urine samples had been taken after the suspected ingestion and/or inhalation had occurred, but as previously noted, no results had been reported. Boutelle and Bresson said that the reason for the delay was that Con-Rad was performing a specific analysis for Sr-90, reportedly a time-consuming operation. After considerable discussion with Boutelle, Bresson, and Cochran, it was decided that Martin would ask Con-Rad for a gross beta analysis and, if the results were 100 dpm/liter or greater, a specific analysis for strontium would then be done. Ex 6

104. During the 11/27/62 inspection, it was determined that urine samples were being taken routinely approximately once a month and after each suspected intake. Most were reported as 24 hour samples, some as 12 hour samples, and some as 48 hour samples.

105. During the 11/27/62 inspection, the urine analysis results were examined. These are summarized as follows:

A. On 7/27/62, 20 samples were sent to Con-Rad. These were analyzed specifically for Sr-90 and indicated 1.47 dpm to 410 dpm/liter. The majority, however, were 50 dpm/liter or less. The 410 dpm was a sample submitted by [redacted] who reportedly was involved in a minor spill of Sr-90 in the Radiochemistry Lab. Ex 6

B. On 8/16/62, seven samples were sent to Con-Rad. These, too, were specifically analyzed for Sr-90. The results in dpm/liter are as follows: [redacted] 57.4, [redacted] 41.1, [redacted] 47.1, [redacted] 127, [redacted] 38.8 (it should be noted that it was [redacted] whose nose and arms were contaminated on 8/8/62), [redacted] 5.4, and [redacted] 9.6. Ex 6

C. On 8/28/62, 20 samples were again sent to Con-Rad. These were also analyzed specifically for Sr-90. These varied from 1.00 dpm/liter to 342 dpm/liter. The majority of these samples were 100 dpm/liter or less. The 342 dpm/liter was the [redacted] Ex 6

D. On 9/4/62, three samples were sent to Con-Rad. These were analyzed for gross beta. The results in dpm/liter are as follows: [redacted] 489, [redacted] again 11.1, and [redacted] 63.4. Ex 6

E. On 9/17/62, three samples were sent to Con-Rad. The gross beta results in dpm/liter are as follows: [redacted] 60.7, [redacted] 62.5, and [redacted] 108. The Sr-90 analysis on [redacted] revealed 131 dpm/liter. Ex 6

F. On 9/21/62, two samples were sent to Con-Rad for gross beta analysis. The results in dpm/liter are as follows: [redacted] 27.4. Ex 6

G. On 10/19/62, 26 samples were sent to Con-Rad for gross beta analysis. These samples varied from 0 to 52.0 dpm/liter.

106. During the 1/3/63 inspection, the most recent urine analysis results were not reviewed. These will be reviewed during the next inspection.

Posting and Labeling

107. Numerous "Caution - Radioactive Material" signs (with symbol), "Caution - Radiation Area" signs (with symbol), "Caution - High Radiation Area" signs (with symbol), "Caution - Airborne Radioactivity Area" (with symbol) are posted throughout the facility as the situation requires. The use of each sign, as required by Part 20, is understood by both Bresson and Battelle.

108. All storage containers, particularly the waste storage drums (discussed later in the report), were labeled "Caution - Radioactive Materials" (with symbol) and the kind, quantity and date of assay of the material contained therein.

109. Form AEC-3 is posted in the Health Physics Office and on the bulletin board in the corridor near the hand and foot counter.

Protective Clothing and Equipment

110. Protective clothing, consisting of coveralls, is worn routinely by operating personnel. Other protective clothing consisting of coveralls, gloves, head-covers, shoe-covers, plastic suits, respirators, fresh air supply suits, etc., are required while working in contaminated areas. Such requirements are prescribed by Health Physics as conditions change.

111. Exposure to airborne activity of Sr-90 is reportedly pro-rated for a 40 hour week. The figure used is for soluble Sr-90 contained in Table I, Column 1, Part 20, which is 3×10^{-10} uc/ml.

Fire Fighting Equipment and Procedures

112. Section III-G, Paragraph 2 "Fire Fighting Equipment" of MND-2410, is a description of the fire fighting equipment. This section has subsequently been amended by a 6/1/62 letter to the Commission and by Section IX "Fire Fighting Training Program" submitted with the 3/27/62 letter. Condition 12 requires adherence to these letters. During the pre-licensing visits, the description set forth in MND-2410 was reviewed and found to be as described.

113. During the 11/27/62 inspection, "IX - Fire Fighting Training Program" was reviewed with M. Bowles, Plant Engineering and Purchasing, who is responsible for fire safety at the RPF. It was noted that this training program is being adhered to, with the following exception. Page 2, Paragraph B "Inspections" reads as follows:

> "Weekly inspections are made by the RPF Plant Engineer (Fire Marshal) accompanied by the Penn State University Maintenance Foreman. Monthly safety inspections by the Plant Engineer and two operators serving as assistant Fire Marshals also review the status of fire fighting and auxiliary equipment. The inspection forms on which the results of these reviews are recorded are attached."

114. During the 11/27/62 inspection, Bowles reported that weekly inspections are made by him as Fire Marshal, accompanied by the Penn State University Maintenance Foreman, Mr. Harold Trebold. However, Bowles stated that the safety inspections by himself and two operators have not been conducted monthly. The actual dates, since hot operations were begun, has been on 7/2/62 and 9/11/62. In addition, it was also noted that the inspection forms being used to write up the results of these inspections were not as prescribed as noted above. The written summations were actually in the form of memos from Bowles to Cochran. (It should be noted that on 11/28/62, the day after this deficiency was pointed out to Bowles, he did conduct an inspection and wrote the results on the prescribed form). During the 1/3/63 inspection, it was noted that inspections had been conducted monthly thereafter (i.e., 11/28/62 and 12/27/62) and the results of these inspections were recorded on the prescribed form.

115. The only fire which ever occurred at the RPF was on 6/1/62, before the license was granted. This was a small fire in the roughing filter of Cell 5 which, according to a record, was put out in approximately 45 seconds using CO_2. The fire was caused by a welder's sparks igniting the filter. This resulted in the following corrective action: 1) all filters are now reportedly coated with an asbestos blanket if welding should be done in the vicinity, and 2) cutting and welding permits are required before any cutting and welding operations are done.

116. Bowles reported that a NEPIA representative visits the facility every three months and that records of these visits are kept. He also said that he had the Karthaus Fire Department up to the facility to ensure that their pumper could hook up to the Quehanna hydrants. In addition, Bowles said that 1) the emergency fire pump is started every Tuesday morning and run for about 10 minutes, 2) the hoses have been checked and pressure tested, 3) the northwest hydrant will be enclosed and about 300' of hose added, and 4) each generator is checked each Friday for approximately 13 minutes.

Environmental Sampling

117. Page IV - 11, Paragraph 4 "Environmental Monitoring" of MND-2410 describes the environmental monitoring program that is conducted at the Quehanna Facility. With regard to the soil and vegetation samples described in paragraph c of this section, it was reported that these samples have been taken and stored and will only be analyzed in the event of an incident.

118. With regard to environmental air samples, it was reported that these have been taken daily using a small sampler outside the building. These were reviewed by the inspector and the highest sample noted was 8.5×10^{-11} uc/ml. The majority of the results, however, were in the 10^{-12} to 10^{-14} uc/ml range.

119. It was also noted that weekly grab samples from Reactor Run, Meeker Run, Mosquito Creek and Wykoff Run have been taken and analyzed. These results have all been in the 10^{-8} and 10^{-9} uc/ml range. Daily drinking water samples are taken and analyzed. Most of the results are in the 1×10^{-14} uc/ml range with one unexplained sample revealing 1.78×10^{-6} uc/ml on 10/5/62. A subsequent sample taken on the next day was in the 10^{-14} uc/ml range.

Waste Disposal (General)

120. Waste disposal is discussed in Section III-F "Waste Treatment", Pages V-20, -21, and -22 and Page IV-13 of MND-2410. In addition, it is also discussed in "VII Waste Handling and Ultimate Disposal" of the licensee's 3/27/62 letter. A significant change was included in the 6/1/62 amendment, Page 14, which amends Page III-14 of MND-2410 as follows:

> "Responsibility for the discharge of liquid wastes from the facility remains with Pennsylvania State University. Samples of water in the storage tanks and the treated water, ready for discharge, will be sampled and analyzed by technicians under the supervision of the University Health Physics Officer".

Low Level Liquid Wastes

121. The procedure for the handling of low-level liquid waste is discussed in detail on Pages III-18, -19, -20, and -21 of MND-2410. In short, it is essentially the same system employed by Curtiss-Wright when they occupied the facility. These procedures were reviewed during the 11/27/62 inspection and found to be as described. As noted above, "Responsibility for the discharge of liquid wastes from the facility remains with Pennsylvania State University."

122. During the 11/27/62 inspection, the inspector requested that Rodger W. Granlund, Penn State's Health Physicist, be present and bring the records of liquid disposals, which are kept at Penn State. On 11/28/62, the inspector discussed with Granlund the procedures for liquid waste disposal and reviewed the records.

123. When one of the underground 3000 gallon tanks becomes full, the contents are mixed by a circulatory pump that runs for 30 minutes. According to Spangler, who has responsibility for this operation, a few gallons are then metered off and a 100 ml aliquot sample is removed. This aliquot is then sent to Penn State where it is

analyzed. According to Granlund, this aliquot is evaporated, resulting in a 10 mg residue. This residue is then counted with an NMC 2 pi proportional counter for gross beta and gross alpha activity. Granlund said that he feels that there is no self-absorption of the betas from the residue. He said that the alpha count is done as merely a check. (By letter dated 12/10/62 to this office, Granlund enclosed a copy of "Analytical Procedures for the Analysis of Liquid Wastes from the Curtiss-Wright Nuclear Laboratory - R. W. Granlund - November 30, 1962").

124. Granlund said that if the results are 1×10^{-8} uc/ml or less, he telephones Quehanna and gives permission to release the waste. (Table II, column 2 of Part 20 lists 1×10^{-7} uc/ml for soluble Sr-90. An additional factor of 10 is reportedly imposed by the State of Pennsylvania.)

125. Granlund stated that if the results are greater than 1×10^{-8} uc/ml, a specific Sr-90 analysis is then done. He said that his technique for this operation is contained in KAPL-A-HP-3 (TID 4500). He said that both the gross beta and the specific analysis (if required) are done by him and a lab technician.

126. Granlund said that, as of 11/27/62, the gross beta and specific Sr-90 analyses have been in good agreement. When results greater than 1×10^{-8} uc/ml are encountered, the contents of the tank are diverted to the evaporator. Quehanna personnel reported that they have encountered difficulty with the evaporator inasmuch as it has only reduced their activity by a factor of 5 to 7. In the instances where the evaporator has not reduced the activity to 1×10^{-8} uc/ml, dilution is then required before permission to release is granted. Granlund said that he calculates the amount of water that must be added to the contaminated water in order to reach the 1×10^{-8} uc/ml level. After this calculation is made, the tank containing the activity is opened at a calculated trickle into a manhole and at the same time a calculated amount of water from the reservoir is also released. These two streams meet in a quarter mile pipe that empties into Meeker Run, which empties into Mosquito Creek, which in turn empties into the West Branch of the Susquehanna River.

127. Records of these releases are kept by Granlund. Releases from 5/17/62 to 11/5/62 were reviewed. However, the results from 5/17/62 to 7/25/62 revealed no Sr-90 present in the water. The first release of Sr-90 was on 8/6/62. That which follows is a summary of the releases as of the 11/27/62 inspection. Note that most of the results in uc/ml are approximately 1×10^{-7} uc/ml and not 1×10^{-8}.

Table II

Date Of Release	Diluted Volume (Total Release In Gallons)	Total Activity (uc)	Approximate Concentration uc/ml
8/ 6/62	2,400	0.67	7.45×10^{-8}
8/24/62	5,000	0.76	4×10^{-8}
8/25/62	5,000	0.76	4×10^{-8}
8/26/62	5,000	0.76	4×10^{-8}
8/27/62	5,000	0.76	4×10^{-8}
8/28/62	5,000	0.76	4×10^{-8}
8/15/62	8,175	2.6	8.4×10^{-8}

Table II Cont'd

Date Of Release	Diluted Volume (Total Release in Gallons)	Total Activity (uc)	Approximate Concentration uc/ml
8/10/62	10,000	4.4	1×10^{-7}
8/11/62	10,000	4.4	1×10^{-7}
8/12/62	10,000	4.4	1×10^{-7}
8/13/62	10,000	4.4	1×10^{-7}
8/14/62	10,000	4.4	1×10^{-7}
8/23/62	6,900	2.5	1×10^{-7}
9/7 /62	22,000	8.2	1×10^{-7}
9/19/62	45,000	16.8	1.4×10^{-8}
9/10/62	37,500	14.0	1×10^{-7}
9/11/62	37,500	14.0	1×10^{-7}
9/12/62	37,500	14.0	1×10^{-7}
9/13/62	37,500	14.0	1×10^{-7}
9/18/62	7,000	2.6	1×10^{-7}
9/17/62	7,000	2.6	1×10^{-7}
10/9/62	22,932	8.7	1×10^{-7}
10/8/62	36,660	13.9	1×10^{-7}
10/7/62	36,660	13.9	1×10^{-7}
10/6/62	36,660	13.9	1×10^{-7}
10/5/62	22,932	8.7	1×10^{-7}
10/24/62	5,000	1.8	1×10^{-7}
10/23/62	25,000	9.0	0.95×10^{-7}
11/5/62	42,000	15.4	0.98×10^{-7}
11/7/62	31,500	11.6	1×10^{-7}
11/18/62	31,500	11.6	1×10^{-7}

High Level Liquid and Solid Waste

128. Part VII "Waste Handling and Ultimate Disposal" as set forth in the licensee's 3/27/62 letter, is a description of the handling of high-level liquid and solid waste. This was reviewed during the inspection and no discrepancies were noted. It should be noted that paragraphs 5 and 6 are no longer applicable since the installation of the SOTS.

129. As of 11/27/62, 117 drums of solidified high-level liquid waste and solid waste had been sent to ORNL. Transfer records reflected the drum number, the date of transfer, the contact dose rate at 1 meter, and the estimated amount of material. It was noted that the drums contained from less than 1 uc to 10 c of Sr-90.

130. As of 11/27/62, 89 drums were in storage in the back of the facility, which is less than the maximum of 120 permitted by Part VII. During the 1/3/63 inspection, about 100 drums were on hand. The area was roped off, posted "Caution - Radiation Area" (with symbol) and each drum labeled in accordance with 20.203(f)(1) and (4).

Instrumentation and Calibration

131. A list of the following instrumentation was supplied to the inspector by J. F. Bresson on 11/27/62:

a. Air Particulate Monitors
   4 NMC AM 22R alpha, beta, gamma instruments, alarming on a ratio
   1 NMC AM 2 AP - beta, gamma detector

b. Counting setups
   3 end window geiger detectors and scaler setups
   2 NMC PCC 10-A flow proportional alpha, beta, gamma detectors and scalers
   1 Eberline PC-4-4 large area flow counter with Eberline PC-6-1 scaler for counting hi-vol samples

c. Portable Instruments
   4 Eberline E-500B geiger counters 0 - 2 r/hr range
   1 Victoreen gamma survey meter - Model 592 - 0 - 1 r/hr
   1 Victoreen Thyac II Survey Meter - range 0 - 20 mr/hr
   2 NRD Model CS-40 beta gamma survey meters 0 - 20 r/hr
   2 NCA Model CS-40A - beta gamma survey meters - 0 - 50 r/hr
   1 Victoreen Model 740 - 0 - 10 r/hr
   1 Victoreen Model 740-A - 0 - 5 r/hr
   1 Nuclear Chicago Geiger Counter, Model 2612 - 0 - 20 mr/hr
   2 Victoreen Model 720 - survey meters - 0 - 500 r/hr

d. Count Ratemeters and Geiger Detectors
   1 RIDL CRM
   2 Eberline RM3
   2 Tracerlab SU-3C
   1 NMC CRM-1

e. Area Monitoring System
   3 Jordan RAMS 0 - 1 r/hr channels
   2 Jordan RAMS 0 - 10 r/hr channels

f.
   1 Victoreen Condenser R-meter Model 510 and various probes
   1 Victoreen Roentgen Ratemeters - Model 613 and various probes

132. In accordance with Page IV-5 and -6 of MND-2410, a card file is maintained which indicates the date of each calibration and maintenance procedure for each instrument. According to Bresson, a 25 mg Ra-226 source is used for calibration. Each instrument is calibrated about once each month and three readings are reportedly taken on each scale.

Area Monitoring Systems

133. Three low level area monitoring systems, with ranges from 1 mr/hr to 1 r/hr, are located in the Operations Area, the Service Area and the Radiochemistry Laboratory. These units are tied into the annunciator panel and actuate both a horn and light when they alarm. Two high level systems, which range from 10 mr/hr to 10 r/hr, are located in the Operations Area and Service Area. These units are tied into the building evacuation alarm siren.

Constant Air Monitors

134. There are five constant air monitors at the RPF. These are described as follows:

1. Monitor No. 1

This monitor, designated M-1 in Figure IV-11 of MND-2410, is a Nuclear Measurements Corporation Model AM 22 R constant air monitor. It samples the air in the combined discharge duct from the dry box exhaust fans and measures the alpha and beta activity. An alarm is sounded on the annunciator panel upon a change in the ratio between the alpha and the alpha plus beta countrate. Such an alarm starts fan E-14 and stops fan E-13. The sampler consists of a filter paper that is changed and counted daily. Only a sudden increase in the beta activity causes an alarm. Although the air is sampled continuously, it has been noted that the alpha plus beta to alpha ratio remains fairly constant (reportedly about 3 - 7 to 1 depending on conditions) during a 24 hour period.

2. Monitor No. 2

Monitor No. 2 is the same type as described above and functions in the same manner. However, this monitor samples the air in the combined cell exhaust duct. An alarm on this monitor starts fan E-4, stops fans E-5 through E-10, closes all normal exhaust dampers, and opens the auxiliary exhaust dampers. In addition, air supply fans UC-1, S-1, SH-2, UC-2 and E-11 are shut down.

3. Monitor No. 3

Monitor No. 3 is the same type as described in No. 1 and functions in the same manner. It samples the air entering the cell air locks from the Service Area. Upon alarm, this monitor shuts off supply fans UC-1, S-1, SH-2, UC-2 and E-11.

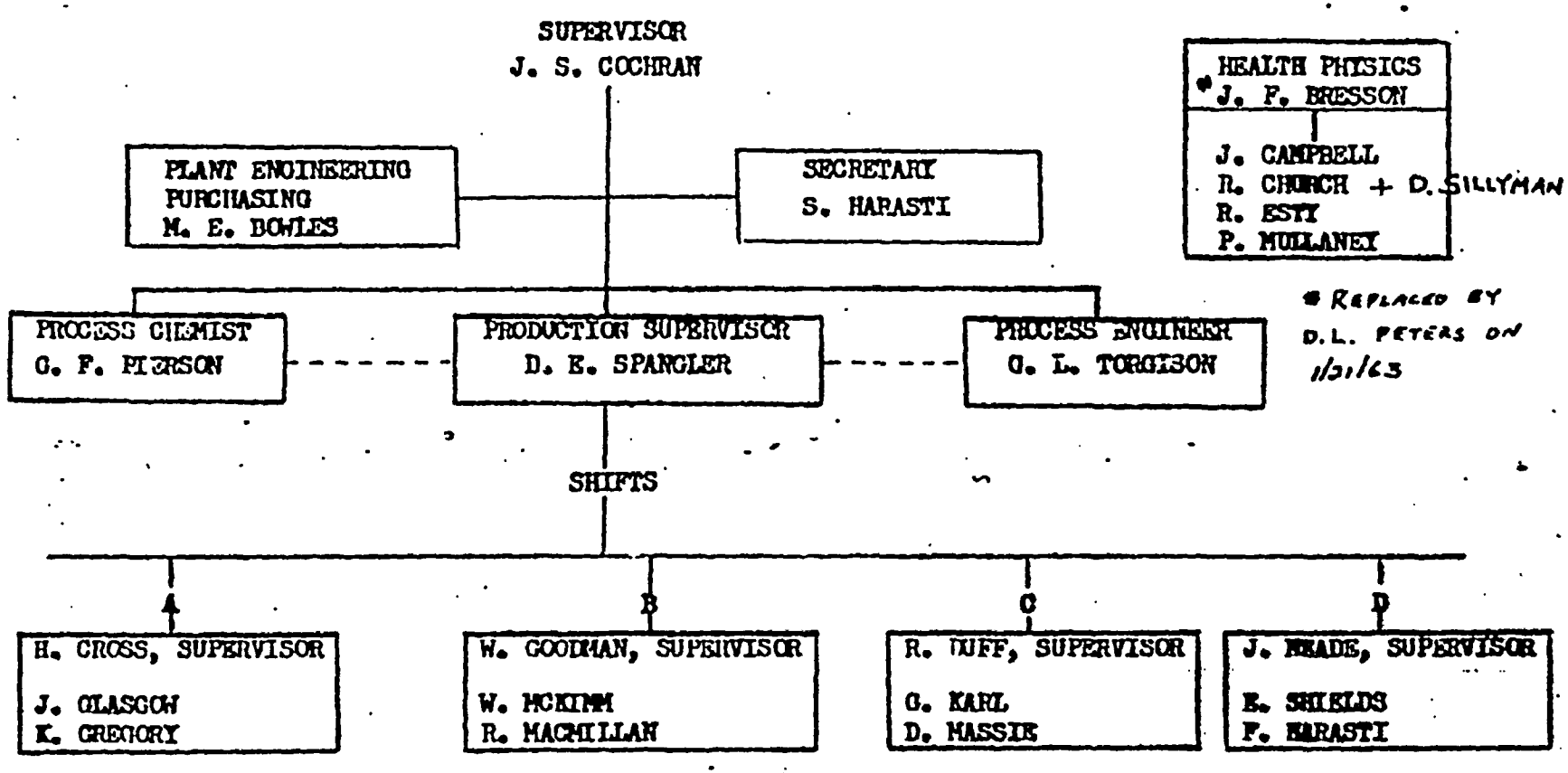
4. Monitor No. 4

This is also the same type as described in No. 1 and functions in the same manner. It samples the air in the recirculating duct in the Operations Area. Upon alarm, this monitor shuts off supply fans UC-1, S-1, SH-2, UC-2 and E-11.

5. Monitor No. 5

This is an NMC flow proportional beta counter. It is located in the Radiochemistry Laboratory and monitors the air in that room. (It does not monitor the exhaust air). Upon alarm, it shuts off fan UV-2.

QUEHANNA ORGANIZATIONAL CHART



1. PRODUCTION SUPERVISOR - Responsible for all shift activities and records.

2. PROCESS CHEMIST - Responsible for all chemistry and calculations plus assistance to Production Supervisor on in-cell chemical technique.

3. PROCESS ENGINEER - Responsible for all process equipment plus assistance to Production Supervisor on operator training and mechanical technique. Plus Shop.

EXHIBIT A

P. O. Box 788
Clearfield, Pennsylvania
October 22, 1962

Mr. Peter Loysen
United States Atomic Energy Commission
376 Hudson Street
New York 14, New York

Dear Mr. Loysen:

I would like to send you the results of our Smear and Radiation Surveys conducted on the Hapo II cask, shipped to Hanford from our Quehanna site on September 15, 1962. I have discussed this problem at length with Jack Roeder and am sending him a copy of this also. Included is information passed on to us via a phone call on October 18, 1962 by Wes Smith at Hanford. The results are taken from the Health Physics' logbook which is available for inspection at Quehanna.

I. Smearable Contamination

Maximum contamination level on cask exterior was brought down from about 32,000 DPM to less than 1000 DPM on all external surfaces. The well containing the three fittings was decontaminated to a level of approximately 10,000 DPM and the well cover was put in place.

II. Radiation Readings

The top of the cask read 100-110 mr/hr. After being placed in the bumper* the reading was less than 1 mr/hr. The bumper was not contaminated.

III. Follow Up

It was suggested to us by a call from J. Roeder, U.S. A.E.C., that the truck be smeared. However, after talking to Wes Smith from Hanford, it was decided not to excite the trucking company for the following reasons:

* OR BUFFER

EXHIBIT B

a. The exterior of the bumper was "clean" when it left and both exterior and interior were "clean" on arrival at Hanford.

b. The flat car was smeared at Hanford and was not contaminated. This discussion was passed on to J. Roeder via a second phone call.

IV. Cause

An investigation of this cask problem is being carried out at Hanford. The cask has a previous history of allowing material to escape at the locations in question. However when the cask left Quehanna, it was in satisfactory shipping condition as shown above. If we can be of further service, please call.

Sincerely yours,

MARTIN COMPANY

J. Bresson

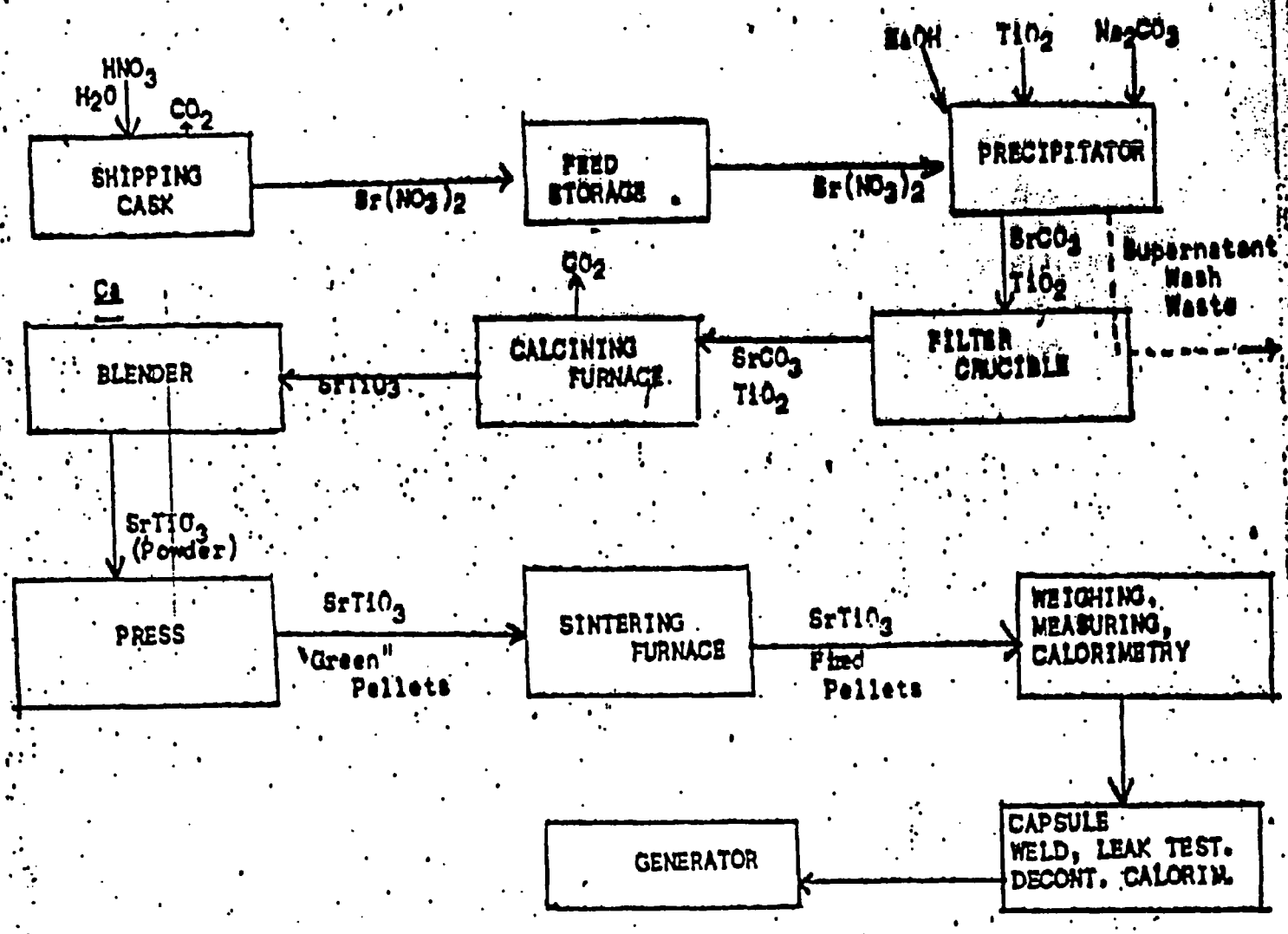
J. F. Bresson
Health Physicist

JFB:sh

CC: Messrs.:

J. Roeder
R. Boutelle

EXHIBIT B'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CO2
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Sr(NO3)2
FEED STORAGE
Sr(NO3)2
NaOH
TiO2
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PRECIPITATOR
SrCO3
TiO2
Supernatant
Wash
Waste
FILTER CRUCIBLE
SrCO3
TiO2
CO2
CALCINING FURNACE
SrTiO3
BLENDER
Ca
SrTiO3
(Powder)
PRESS
SrTiO3
"Green"
Pellets
SINTERING FURNACE
SrTiO3
Fired
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WEIGHING, MEASURING, CALORIMETRY
CAPSULE
WELD, LEAK TEST.
DECONT. CALORIM.
GENERATOR

EXHIBIT C

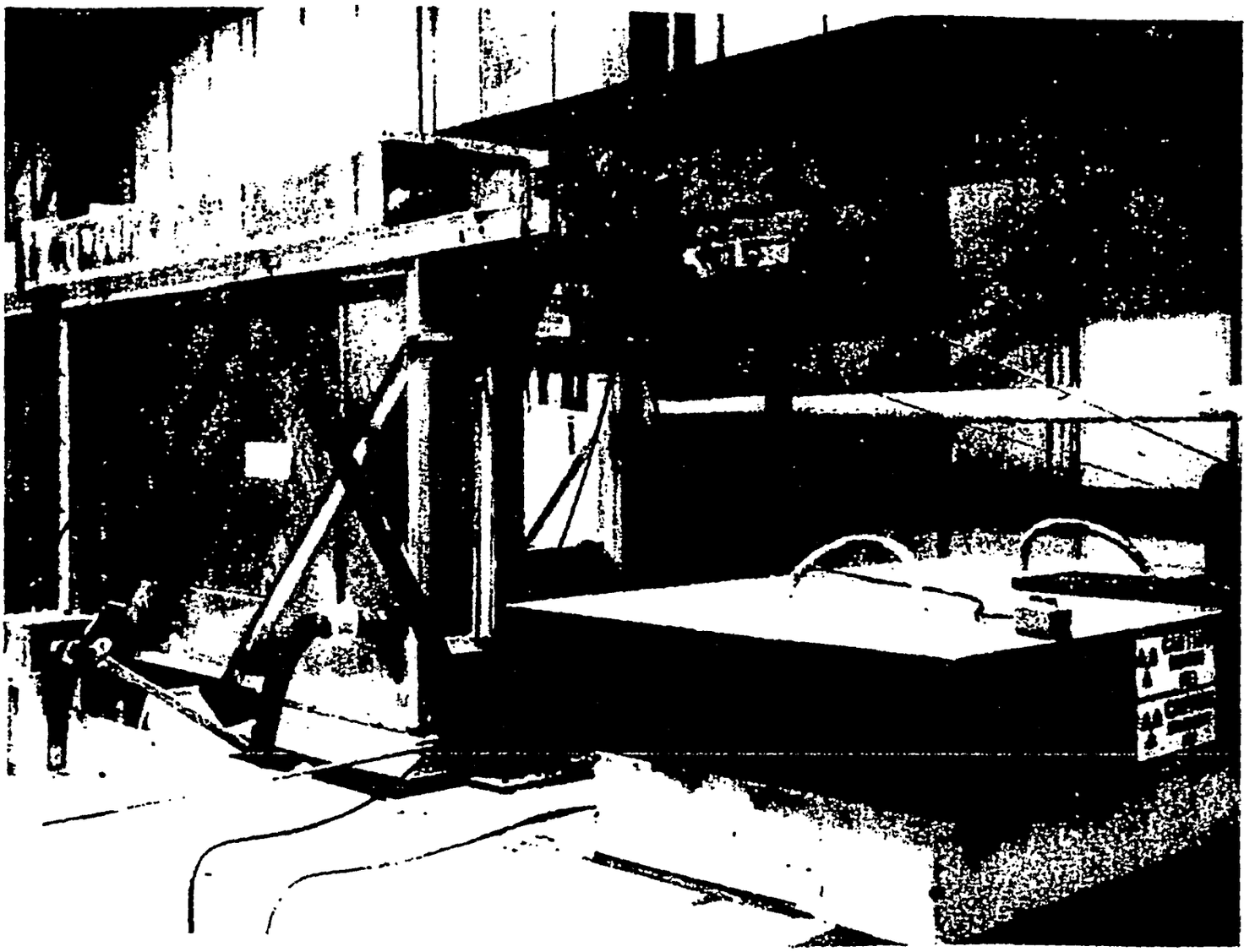
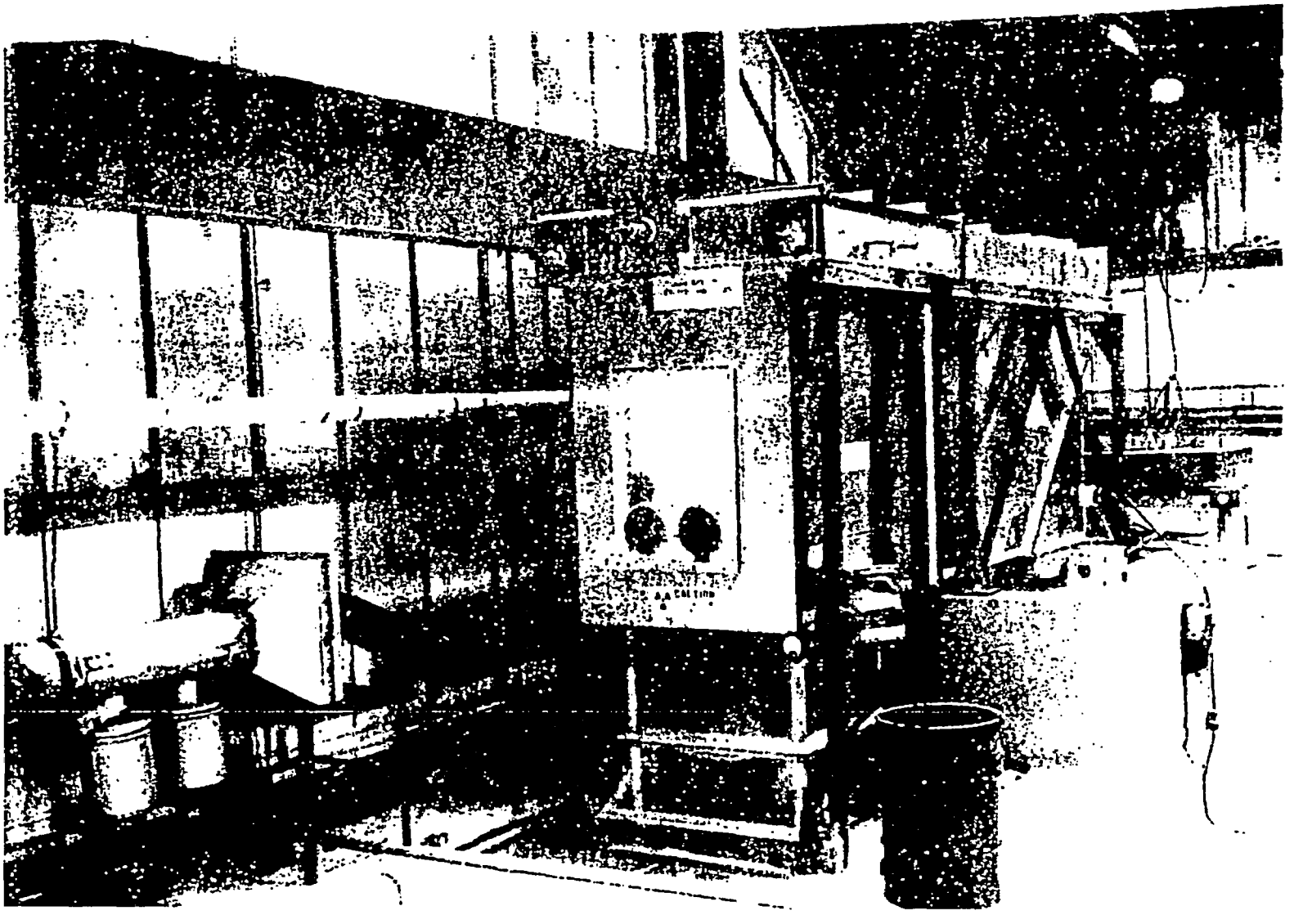


EXHIBIT D



NUCLEAR
DIVISION
Baltimore 3,
Maryland

MARTIN COMPANY

RALPH D. BENNETT,
Vice President and General Manager

September 12, 1962

United States Atomic Energy Commission
Division of Licensing and Regulation
Washington 25, D. C.

Attention: Mr. Robert Lowenstein
Director

Gentlemen:

During the week of August 7th, the licensed activities at our Quehanna, Pennsylvania Facility were inspected by Mr. Jack Roeder of the Compliance Division. At the close of his visit, Mr. Roeder pointed out several items of non-compliance:

1. At the time of Mr. Roeder's visit, we were in non-compliance with Paragraph 20.201 (b) in that there was no evaluation of air leaving the Radiochemistry Laboratory and Decontamination Room. This non-compliance occurred because the equipment had been diverted just prior to actual use of this facility and had not been replaced. The equipment was replaced and sampling procedures established on the day following Mr. Roeder's departure. We believe it can be shown that activity release was actually in compliance with regulations by examination of the absolute-type filter.

2. At the time of Mr. Roeder's visit, we were in non-compliance with Paragraph 20.106 in that records of release of contamination to the environment from the main ventilation stack were not kept in units of microcuries per milliliter. Since all of the information needed to do this was present, the records were corrected immediately and will be kept properly in the future.

THE AEROSPACE
DIVISION OF
MARTIN
MARIETTA

3. At the time of Mr. Roeder's visit, it appeared that we were in non-compliance with Paragraph 20.101 (b)(3) in that the dosimeter record indicated a total of about 1.5 R for a worker on 8/28/62; and that, as of that date, we had failed to complete a Form AEC-4. Subsequently, however, the film badge worn on the day in question indicated that the worker had actually received less than 1.25 R. Although we believe non-compliance did not actually occur in this case, we are taking steps to assure that proper records are obtained before exposure to radiation.

4. At the time of Mr. Roder's visit, it appeared that we were in non-compliance with Condition 12 of our license in that routine direct radiation surveys were not evident. Since the resident Health Physicist was not present at the time this deficiency was pointed out, it was not possible to make a definite determination. Subsequent investigation shows that these surveys were made as part of a routine work sheet; however, in order to avoid future uncertainties, the recording system is being altered so that all information is easily available for audit.

5. Non-compliance with Condition 12 of our license occurred in that weekly summaries of Health Physics activities at the facility were not written to the Chief Health Physicist in Baltimore. This occurred because the Resident Health Physicist at Quehanna was in almost daily telephone contact with his supervision in Baltimore and did not realize that a statement in our license application binds him to issue a written summary. Such written summaries will be sent in the future.

The pattern of non-compliances suggests that our record system should be simplified in order to provide rapid access to the information, thus assuring continued proper record keeping. This will be done.

In addition to the specific items of non-compliance pointed out by Mr. Roeder, his visit disclosed somewhat less than satisfactory conditions in certain areas. In particular, he was concerned that results from the

Mr. Robert Lowenstein September 12, 1962

analysis of urine samples had not yet been received from the contractor. We have altered the urinalysis system so that gross analyses will be performed in cases of suspected ingestion, thus allowing early reporting of results. The specific strontium analysis requires several weeks but is considerably more accurate. We will continue to analyze for strontium routinely and in cases where positive results are received on the gross analysis.

We appreciate Mr. Roeder's comments and expect to be able to benefit from them again in the near future.

Yours very truly,

Ralph D. Bennett

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