NRC FORM 464 Part I (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

RESPONSE TO FREEDOM OF INFORMATION ACT (FOIA) / PRIVACY ACT (PA) REQUEST

FOIA/PA	RESPONSE NUMBER
2000-0101	3

RESPONSE TYPE ☐ FINAL ☑ PARTIAL

REQUESTER: Denise Wilt

DATE: AUG 10 2000

PART I. -- INFORMATION RELEASED

☐ No additional agency records subject to the request have been located.

☐ Requested records are available through another public distribution program. See Comments section.

☐ APPENDICES ____ Agency records subject to the request that are identified in the listed appendices are already available for public inspection and copying at the NRC Public Document Room.

☑ APPENDICES D,E Agency records subject to the request that are identified in the listed appendices are being made available for public inspection and copying at the NRC Public Document Room.

☐ Enclosed is information on how you may obtain access to and the charges for copying records located at the NRC Public Document Room, 2120 L Street, NW, Washington, DC.

☐ APPENDICES ____ Agency records subject to the request are enclosed.

☐ Records subject to the request that contain information originated by or of interest to another Federal agency have been referred to that agency (see comments section) for a disclosure determination and direct response to you.

☑ We are continuing to process your request.

☐ See Comments.

PART I.A -- FEES

AMOUNT *

$

* See comments for details

☐ You will be billed by NRC for the amount listed.

☐ You will receive a refund for the amount listed.

☐ None. Minimum fee threshold not met.

☐ Fees waived.

PART I.B -- INFORMATION NOT LOCATED OR WITHHELD FROM DISCLOSURE

☐ No agency records subject to the request have been located.

☑ Certain information in the requested records is being withheld from disclosure pursuant to the exemptions described in and for the reasons stated in Part II.

☑ This determination may be appealed within 30 days by writing to the FOIA/PA Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Clearly state on the envelope and in the letter that it is a "FOIA/PA Appeal."

PART I.C COMMENTS (Use attached Comments continuation page if required)

Enclosures to recorsd E/8, E/84 and E/85 contain copyrighted material and therefore are available for inspection only at theNRC's Public Document Room.

SIGNATURE - FREEDOM OF INFORMATION ACT AND PRIVACY ACT OFFICER

Carol Ann Reed

NRC FORM 464 Part II (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

RESPONSE TO FREEDOM OF INFORMATION ACT (FOIA) / PRIVACY ACT (PA) REQUEST

FOIA/PA 2000-0101

DATE AUG 1 0 2000

PART II.A -- APPLICABLE EXEMPTIONS

APPENDICES E

Records subject to the request that are described in the enclosed Appendices are being withheld in their entirety or in part under the Exemption No.(s) of the PA and/or the FOIA as indicated below (5 U.S.C. 552a and/or 5 U.S.C. 552(b)).

- Exemption 1: The withheld information is properly classified pursuant to Executive Order 12958.
- Exemption 2: The withheld information relates solely to the internal personnel rules and procedures of NRC.
- Exemption 3: The withheld information is specifically exempted from public disclosure by statute indicated.
  - Sections 141-145 of the Atomic Energy Act, which prohibits the disclosure of Restricted Data or Formerly Restricted Data (42 U.S.C. 2161-2165).
  - Section 147 of the Atomic Energy Act, which prohibits the disclosure of Unclassified Safeguards Information (42 U.S.C. 2167).
  - 41 U.S.C., Section 253(b), subsection (m)(1), prohibits the disclosure of contractor proposals in the possession and control of an executive agency to any person under section 552 of Title 5, U.S.C. (the FOIA), except when incorporated into the contract between the agency and the submitter of the proposal.
- Exemption 4: The withheld information is a trade secret or commercial or financial information that is being withheld for the reason(s) indicated.
  - The information is considered to be confidential business (proprietary) information.
  - The information is considered to be proprietary because it concerns a licensee's or applicant's physical protection or material control and accounting program for special nuclear material pursuant to 10 CFR 2.790(d)(1).
  - The information was submitted by a foreign source and received in confidence pursuant to 10 CFR 2.790(d)(2).
- Exemption 5: The withheld information consists of interagency or intraagency records that are not available through discovery during litigation. Applicable privileges:
  - Deliberative process: Disclosure of predecisional information would tend to inhibit the open and frank exchange of ideas essential to the deliberative process. Where records are withheld in their entirety, the facts are inextricably intertwined with the predecisional information. There also are no reasonably segregable factual portions because the release of the facts would permit an indirect inquiry into the predecisional process of the agency.
  - Attorney work-product privilege. (Documents prepared by an attorney in contemplation of litigation)
  - Attorney-client privilege. (Confidential communications between an attorney and his/her client)
- [√] Exemption 6: The withheld information is exempted from public disclosure because its disclosure would result in a clearly unwarranted invasion of personal privacy.
- Exemption 7: The withheld information consists of records compiled for law enforcement purposes and is being withheld for the reason(s) indicated.
  - (A) Disclosure could reasonably be expected to interfere with an enforcement proceeding (e.g., it would reveal the scope, direction, and focus of enforcement efforts, and thus could possibly allow recipients to take action to shield potential wrongdoing or a violation of NRC requirements from investigators).
  - (C) Disclosure would constitute an unwarranted invasion of personal privacy.
  - (D) The information consists of names of individuals and other information the disclosure of which could reasonably be expected to reveal identities of confidential sources.
  - (E) Disclosure would reveal techniques and procedures for law enforcement investigations or prosecutions, or guidelines that could reasonably be expected to risk circumvention of the law.
  - (F) Disclosure could reasonably be expected to endanger the life or physical safety of an individual.
- OTHER (Specify)

PART II.B -- DENYING OFFICIALS

Pursuant to 10 CFR 9.25(g), 9.25(h), and/or 9.65(b) of the U.S. Nuclear Regulatory Commission regulations, it has been determined that the information withheld is exempt from production or disclosure, and that its production or disclosure is contrary to the public interest. The person responsible for the denial are those officials identified below as denying officials and the FOIA/PA Officer for any denials that may be appealed to the Executive Director for Operations (EDO).

DENYING OFFICIAL	TITLE/OFFICE	RECORDS DENIED	APPELLATE OFFICIAL EDO	SECY	IG
Hubert J. Miller	Regional Administrator, RI	Appendix E	√		

Appeal must be made in writing within 30 days of receipt of this response. Appeals should be mailed to the FOIA/Privacy Act Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, for action by the appropriate appellate official(s). You should clearly state on the envelope and letter that it is a "FOIA/PA Appeal."

APPENDIX D
RECORDS BEING RELEASED IN THEIR ENTIRETY

NO.	DATE	DESCRIPTION/(PAGE COUNT)
1.	10/20/82	Letter to S Marcy from K Abraham (2 pages)
2.	8/10/82	Letter to T Brauch from J Feldman (1 page)
3.	9/28/81	Memorandum from L Hibbinbotham, Subject: Review of Fromerly Used Sites TI-2690 WR Grace Co (1 page) **NOTE: INFORMATION BLACKED OUT IN RECORD IS THE VERSION IN THE NRC'S FILES**
4.	10/27/82	Letter to J Dooley from J Kinneman (1 page)

APPENDIX E
RECORDS BEING WITHHELD IN PART

NO.	DATE	DESCRIPTION/(PAGE COUNT)EXEMPTIONS
1.	02/13/73	Ltr from G Ashby to USAEC, re: Final Report Regarding Overexposure of Personnel to Airborne Radioactivity (24 pages) Exemption#6
2.	11/07/72	Notification Pursuant to 10 CFR, Part 20.405(a) (1) (9 pages) Exemption#6
3.	10/04/67	Application for Renewal and Amendment of Special Nuclear Materials License (41 pages) Exemption#6
4.	10/04/60	Ltr from W. Gage to USAEC (7 pages) Exemption#6
5.	05/28/64	Ltr from W O'Loughlin to D Nussbaumer (4 pages)Exemption#6
6.	09/10/65	Ltr from R Mandle to USAEC, J McBride (9 pages) Exemption#6
7.	04/17/82	Permission to perform a radiological survey (1 page)Ex#6
8.	04/30/82*	Letter to Gentlemen from Individual (1 page) EX. 6attaching article from The News, North Jersey, 4/30/82 (2 pages)
9.	05/18/82	Ltr from J Kinneman on Well Water Analysis (1 page) Ex#6
10.	05/21/85	Ltr from J Kinneman to an individual (1 page) Ex#6
11.	05/29/82	Ltr from Individual to Mr. Bradley (1 page)Ex#6
12.	05/30/82	Ltr from Individual to Senator Bradley (1 page)Ex#6
13.	06/01/82	Ltr from Individual to Senator Bradley (1 page)Ex#6
14.	06/01/82	Ltr from Individual to Senator Bradley (1 page)Ex#6
15.	06/02/82	Ltr from Individual to Senator Bradley (1 page)Ex#6
16.	06/03/82	Ltr from Individual to Senator Brady (1 page)Ex#6
17.	06/03/82	Ltr from Individual to Senator Bradley (1 page)Ex#6

APPENDIX E
RECORDS BEING WITHHELD IN PART

NO.	DATE	DESCRIPTION/(PAGE COUNT)EXEMPTIONS
18.	06/04/82	Ltr from Individual to The President (1 page)Ex#6
19.	06/07/82	Ltr from Individual to The President (1 page)Ex#6
20.	06/08/82	Ltr from J Kinneman to Individual (2 pages)Ex#6
21.	06/14/82	Ltr from B Bradley, US Senator to C Kammerer(2 pages)Ex#6
22.	06/14/82	Ltr from N Brady, US Senator to USNRC (5 pages) Ex#6
23.	07/01/82	Ltr from R Haynes to Individual (3 pages) Ex#6
24.	07/08/82	Ltr from J Feldman to Individual (1 page) Ex#6
25.	08/02/82	Ltr from J Kinneman to Individual (1 page) Ex#6
26.	08/11/82	Ltr from K Lieberman to Honorable N Palladino (4 pages) Ex#6
27.	08/27/82	Ltr from P Frame to Individual (3 pages) Ex#6
28.	08/27/82	Ltr from P Frame to Individual (2pages) Ex#6
29.	09/23/82	Ltr from J Kinneman to Individual (1 page) Ex#6
30.	09/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
31.	10/18/82	Ltr from J Kinneman to Individual (1 page) Ex#6
32.	10/18/82	Ltr from J Kinneman to Individual (1 page) Ex#6

APPENDIX E
RECORDS BEING WITHHELD IN PART

NO.	DATE	DESCRIPTION/(PAGE COUNT)
33.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
34.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
35.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
36.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
37.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
38.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
39.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
40.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
41.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
42.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
43.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
44.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
45.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
46.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
47.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
48.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
49.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
50.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6

APPENDIX E
RECORDS BEING WITHHELD IN PART

NO.	DATE	DESCRIPTION/(PAGE COUNT)EXEMPTIONS
51.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
52.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
53.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
54.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
55.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
56.	10/27/82	Ltr from J Kinneman to Individual (1 page) Ex#6
57.	10/29/82	Ltr from J Kinneman to Individual (1 page) Ex#6
58.	10/29/82	Ltr from J Kinneman to Individual (1 page) Ex#6
59.	10/29/82	Ltr from J Kinneman to Individual (1 page) Ex#6
60.	10/29/82	Ltr from J Kinneman to Individual (1 page) Ex#6
61.	10/29/82	Handwritten Note to Ann (4 pages) Ex#6
62.	11/08/82	Ltr from N Brady, US Senator to C Kammerer (2 pages) Ex#6
63.	12/01/82	Ltr to J Kinneman re: request for two references (1 page)Ex#6
64.	12/23/82	Ltr from J Kinneman re: request for documents (1page) Ex#6
65.	02/01/83	Ltr from J Kinneman to Individual (1 page) Ex#6
66.	02/01/83	Ltr from J Kinneman to Individual (1 page) Ex#6
67.	02/01/83	Ltr from J Kinneman to Individual (1 page) Ex#6
68.	02/01/83	Ltr from J Kinneman to Individual (1 page) Ex#6
69.	02/01/83	Ltr from J Kinneman to Individual (1 page) Ex#6
70.	04/16/82	Sample Record Sheet (1 page) Ex#6

APPENDIX E
RECORDS BEING WITHHELD IN PART

NO.	DATE	DESCRIPTION/(PAGE COUNT)EXEMPTIONS
71.	No date	Ltr from Individual to the President (2 pages) Ex#6
72.	07/14/82	Ltr from K Lieberman to W Dumont, US Attorney General, (1 page) Ex#6
73.	No date	Ltr from J Kinneman to Individual (1 page) Ex#6
74.	No date	Permission Ltrs (14 pages) Ex#6
75.	2/1/83	Letter to Councilman F Bauer from J Kinneman (1 page) EX. 6
76.	2/1/83	Letter to Councilman G Webb from J Kinneman (1 page) EX. 6
77.	11/10/82	Letter to J Glenn from C Collica (2 pages) EX. 6
78.	10/29/82	Letter to Councilman G Webb from J Kinneman (1 page) EX. 6
79.	10/29/82	Letter to Councilman F Bauer from J Kinneman (1 page) EX. 6
80.	10/29/82	Letter to Council D Waks from J Kinneman (1 page) EX. 6
81.	12/16/74	Statement from P Garino (1 page) EX. 6
82.	10/27/82	Letter to Individual from J Kinneman (1 page) EX. 6
83.	Undated	Handwritten List (2 pages) EX. 6
84.	5/4/82*	Letter to M Campbell from P Frame (1 page) attaching 7/11/82 Article from The Star-Ledger (2 pages); 6/4/82 The Herald News with handwritten note (EX. 6) (1 page); 6/11/82 The News (2 pages); 6/8/82 The News (1 page); 5/13/82 The News (1 page)
85.	3/31/83*	To Mayor's Thorium Advisory Committee (100 pages) EX. 6 Attaching 2/20/83 Article The New York Times (1 page)
86.	Undated	Typed List of Names/Addresses (2 pages) EX. 6

20 OCT 1982

Ms. Sally Marcy
The William Marcy Agency
505 Newark Pompton Turnpike
Pompton Plains, NJ 07444

Dear Ms. Marcy:

In response to your letter of September 20, 1982, we have taken a closer look at the aerial photography map and other information about the thorium contamination at Wayne and Pompton Plains, New Jersey.

Because the property at the intersection of the Newark Pompton Turnpike and Sunset Road is at the edge of the aerial survey area, more definitive information may not be available unless another survey of an enlarged area is made.

Nonetheless, based on our on-the-ground surveys of all suspicious locations revealed by the aerial surveys that have already been completed we can say it is most likely that there is no problem at the Chilton Memorial Hospital location mentioned in your letter.

We do know that your property is at least 1,000 to 2,000 feet south of the railroad siding location which showed no unusual readings of radiation levels on the aerial survey although a small amount of contamination was found on the ground.

There has been recently a more detailed and extensive aerial survey conducted by the Department of Energy. I suggest that if you want to inquire about that survey and the location of interest to you that you call the Public Affairs Office of the Department of Energy at 301/353-3335 or write to Mr. James Cannon, Office of Public Affairs, U.S. Department of Energy, Washington, D.C. 20545.

Finally, we will keep your letter in our files and if we receive additional information that has a bearing on the property of interest to you, we will be in touch with you again about this. In the meantime, we do not now know of any reason for concern over the

~~OFFICIAL RECORD COPY~~

ITEM # 38

D11

(2)

health or safety of persons at that location which would be attributable to thorium contamination at other locations in your area.

Sincerely,

Karl Abraham
Public Affairs Officer

PAO
Abraham:mgm
10/15/82

DETP
J. Kinneman
10/19/82

DETP
J. Joyner
10/19/82

~~OFFICIAL RECORD COPY~~

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

10 AUG 1982

Miss Terri Brauch
c/o Albert Payson Terhune School
40 Cyanamid Drive
Wayne, New Jersey 07470

Dear Miss Brauch:

I have been asked to respond to your letter to President Reagan regarding radioactive residues which were buried in Wayne, New Jersey.

The U.S. Nuclear Regulatory Commission and the Department of Energy have been working with the New Jersey Bureau of Radiation Protection to identify all affected areas and determine what actions to take. To my knowledge, no deaths or illnesses have been associated with the burial of these residues, which are thorium tailings, not the pure metal.

I have enclosed some information for you. However, if you wish to have additional information, I suggest you write to the following address:

New Jersey Bureau of Radiation Protection
380 Scotch Road
Trenton, New Jersey 08628

Your interest in our environment is greatly appreciated.

Sincerely yours,

Joyce Feldman

Joyce Feldman
Regional Radiation Representative

encl.

ITEM # 29

2/2

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 18 1981

MEMORANDUM FOR: [redacted]

FROM: Leo B. Higginbotham, Chief, Radiological Safety Branch, IE

SUBJECT: REVIEW OF FORMERLY USED SITES TI-2690 W.R. GRACE CO.

As recommended by your July 30, 1981 memorandum on the subject OELD has been asked to provide a legal interpretation of the responsibility for remedial action at the W.R. Grace, Pompton Plains, N.J. site. In addition, NMSS has been requested to perform the survey you recommended, if possible. Both OELD and NMSS may be in touch with you to make arrangements for the survey or gather specific data on the site.

Leo B. Higginbotham
Chief
Radiological Safety Branch, IE

Enclosures:
1. Memo to Page
2. Memo to Cunningham

CONTACT: D. K. Sly
49-29896

ITEM # 33

OCT 2 7 1982

James J. Dooley, Esquire
25 East Salem Street
Hackensack, New Jersey 07601

Gentlemen:

Subject: Radiological Surveys of Sheffield Brook, Final Report

Enclosed for your information is a copy of the subject report. This report does not contain the results of measurements made on the W. R. Grace and Company property on Black Oak Ridge Road in Wayne. These measurements will be the subject of a separate report.

If you have any questions concerning this report you may call me at (215) 337-5252.

Sincerely,

Original Signed By:

John D. Kinneman, Chief
Nuclear Materials Section A

Enclosure: As stated

bcc:
Region I Docket Room (w/concurrences)

RI:DETP
Kinneman/gwc
10/27/82

OFFICIAL RECORD COPY

D/4

ITEM # 580

W. R. GRACE & CO.

RESEARCH DIVISION

Washington Research Center, Clarksville, Maryland 21029

GRACE

February 13, 1973

Director, Division of Compliance
U. S. Atomic Energy Commission
Washington, D. C. 20545

Ref: SNM 840

Re: Final Report Regarding Overexposure of Personnel to Airborne Radioactivity

Dear Sir:

Our initial findings on the subject incident were described to you in the Interim Report attached to my letter of 7 November 1972. The attached Final Report details our understanding of the circumstances, probable causes, results and corrective actions related to this incident and concludes our efforts in its regard.

We believe the report is comprehensive and accurate. However, in the event unanswered questions remain, please do not hesitate to direct them to me at the above address.

Sincerely,

G. E. Ashby
Vice President
Nuclear

GEA:srh

cc: Region I
RMC, Attn: Syd Porter

Attachment

E11

ITEM # 1

241

1

Final Report

on

Incident of Airborne Contamination

at

W. R. Grace & Co.
NUCLEAR FACILITY
Clarksville, Maryland 21029

Prepared By: R. A. Hurst

Approved By: G. Ashley

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IV.	EVENTS AND OBSERVATIONS	5
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VI.	CORRECTIVE ACTIONS	15

Attachments

A. Interim Report by Radiation Management Corporation

B. Progress Report by Radiation Management Corporation

C. Report of Results of Whole-Body Counts by Oak Ridge National Laboratory of JM and CL

D. Report of Results of Urine Analyses of Specimens from CL and JM

Appendix I

I. INTRODUCTION

During the period 4 October to 7 October 1972, W. R. Grace & Co. detected airborne enriched uranium contamination in the restricted area of the Nuclear Facility at its Clarksville, Maryland, site which was in excess of the applicable MPC_a. As a consequence of this and subsequent events, several individuals were believed to have experienced an overexposure to airborne radioactivity from highly enriched uranium. Tests and analyses done since this incident have shown no overexposures to have occurred. The attached report describes the circumstances and events related to this incident and summarizes actions taken to determine its effects on personnel and to preclude its repetition.

The chronological account related herein was assembled from the available records and the comments of personnel involved in the suspect operation who were interviewed after the incidents in question.

This is the final report on this incident and supplements the preliminary report submitted 7 November 1972.

II. BACKGROUND

W. R. Grace & Co.'s Nuclear Facility at its Clarksville, Maryland, site operates under a license from the U. S. Atomic Energy Commission (SNM 840) and performs contract research and development using highly enriched uranium. Operation with enriched uranium began in April of 1972.

The present staff assigned full time to the Facility numbers approximately 20. Work is normally in progress twenty-four hours each day five days per week.

III. GENERAL

Uranium ceramic particles are "finished" in one operation in the production of nuclear fuel. Finishing consists of fluidizing a heated bed of the ceramic particles with an inert gas/hydrogen mixture which also contains a metal halide vapor. The operation is normally done at temperatures in the range of 500-1000°C and at atmospheric pressure.

The process gases are supplied at 15 psig and the pressure in the process equipment is indicated and periodically noted by the operators. The off-gas from the fluid bed reactor is passed through a knock down trap and filters to remove any suspended particulates. The off-gas is then scrubbed to neutralize the halogen byproducts and finally exhausted to the Facility's regular air exhaust duct system where it passes through high efficiency filters and is monitored before discharge to the environment. Radioactive material is completely contained. This equipment is schematically illustrated in Figure 1.

If during any routine check of the pressure indicators, a pressure accumulation in excess of 8 psig is observed, the operator is instructed to notify his supervisor regarding the condition. The supervisor is expected to exercise his best technical

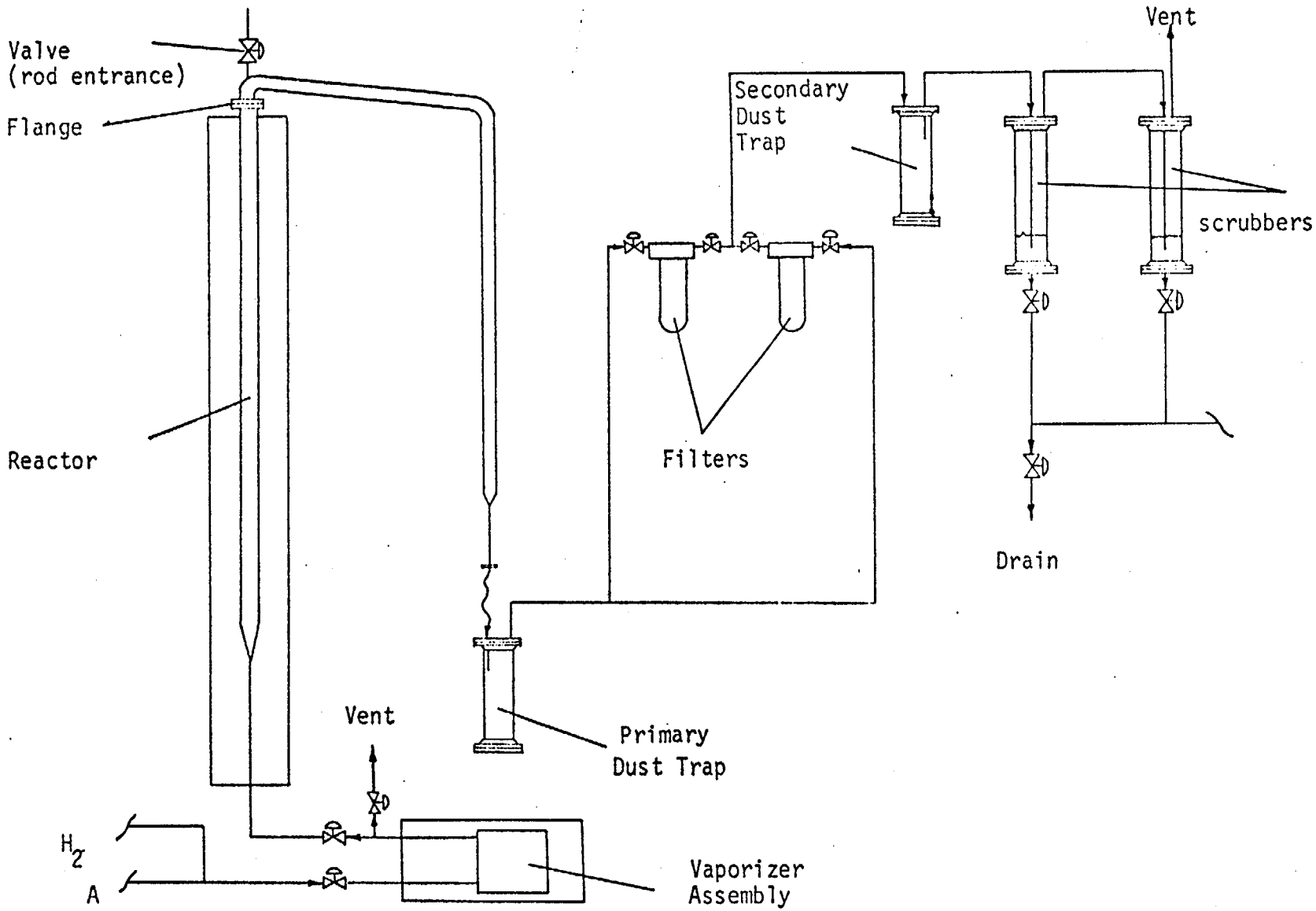


Figure 1. Schematic description of the Finishing Apparatus.

judgement to analyze the cause and to correct the deficiency responsible for the pressure accumulation.

The finishing run in progress during the week of 2 October was the first ever done in the Facility with nearly a full-scale charge to the reactor and metal halide vaporizer. Start-up was complicated by operating difficulties in the vaporizer assembly and operation did not begin in earnest until 3 October 1972. Air sampling in the process area was begun on 3 October 1972 at 1530 hours and was continued intermittently throughout the remainder of the work week.

IV. EVENTS AND OBSERVATIONS

2 October 1972

Finishing operation was begun. Reactor and vaporizer were assembled.

3 October 1972

Finishing commenced with charging of uranium ceramic particles to the reactor. Fluidization gas flow started. The metal halide vaporize pre-heater failed and was repaired. Air sampling begun at breathing level in location shown schematically in Figure 2 at 1530 hours.

4 October 1972

Processing continued. Pressure accumulation was detected. Efforts to diminish the pressure accumulation failed and the indicated pressure exceeded 8 psig at about 1500 hours. The [redacted] and [redacted] were notified. E46 The system containment was breached by the Foreman assisted by the Process Engineer in an effort to clear ("rod") an obstruction suspected to exist near the base of the bed where the fluidizing gas and metal halide enter the reactor. This action successfully diminished the pressure accumulation and processing was continued. An air sample collected from 1530,

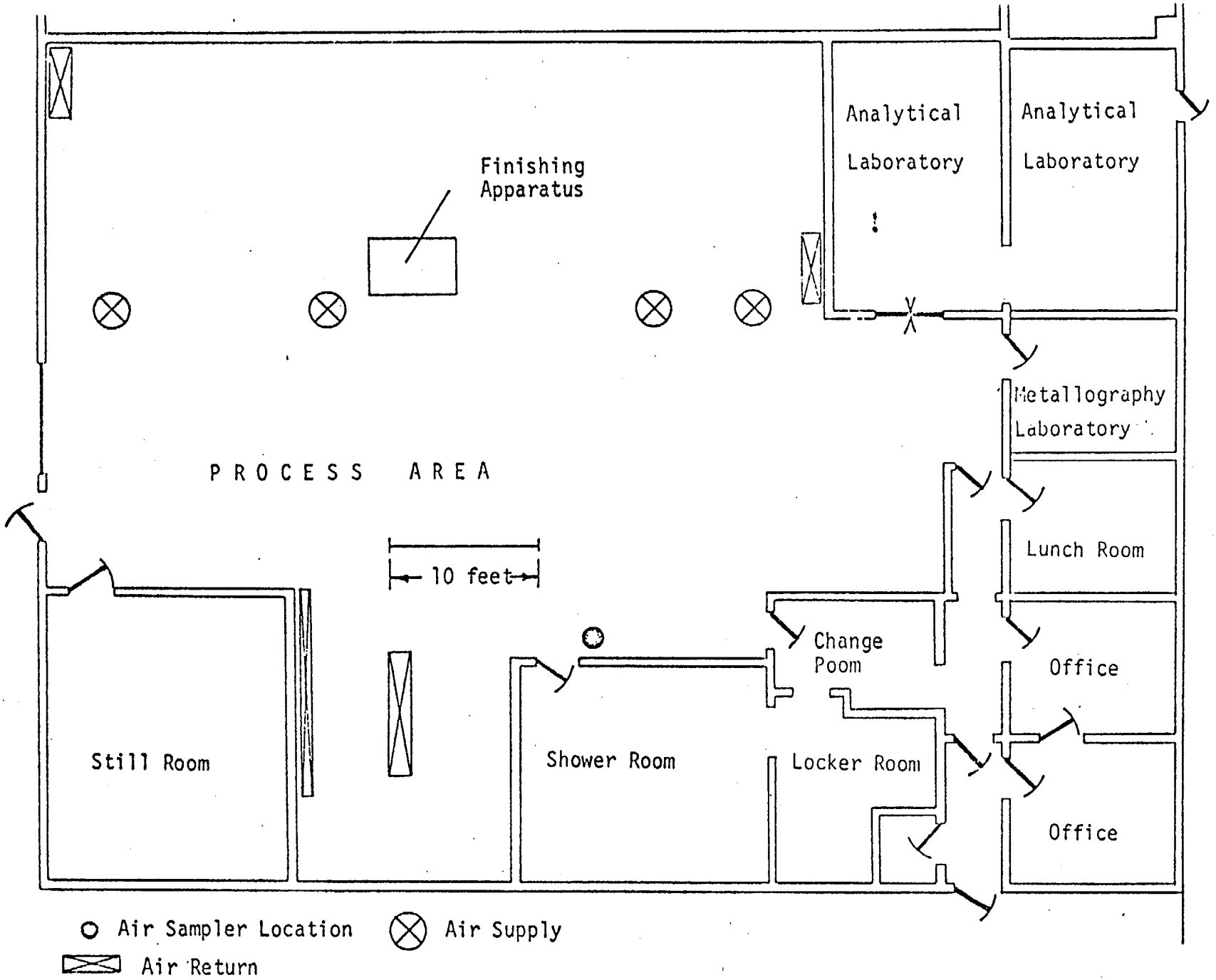


Figure 2. Location of Air Sampler in Process Area of Nuclear Facility on 3 October 1972.

10/3 to 1130, 10/4 measured airborne activity equal to 0.002 times MPC_a. The air sampler was moved from the location shown in Figure 2 to that shown in Figure 3.

5 October 1972

Processing continued. An air sample collected from 1130 10/4 to 1130, 10/5 and counted initially at 1215 indicated activity 1.98 times the applicable MPC_a. The RPO was advised. (The air sampling plan in effect was reviewed.) The maximum exposures of personnel were estimated assuming air samples to be representative of process area air, maximum exposure times of eight hours and no further exposure during the work week. Based on this estimate no persons were believed to be over-exposed. Possible causes of high air activity were investigated by reviewing the operations executed during the time period represented by the air sample. A second count of the suspect air sample at ~1615 hours confirmed the presence of long-lived activity in excess of applicable MPC_a (1.79 X MPC_a). Air sampling was continued at the location of Figure 3. Sample collection began at 1715 hours.

Pressure accumulation occurred again during the second shift and operating personnel, [redacted] and [redacted] executed the rodding operation. The pressure was relieved and processing was continued. Ex 6

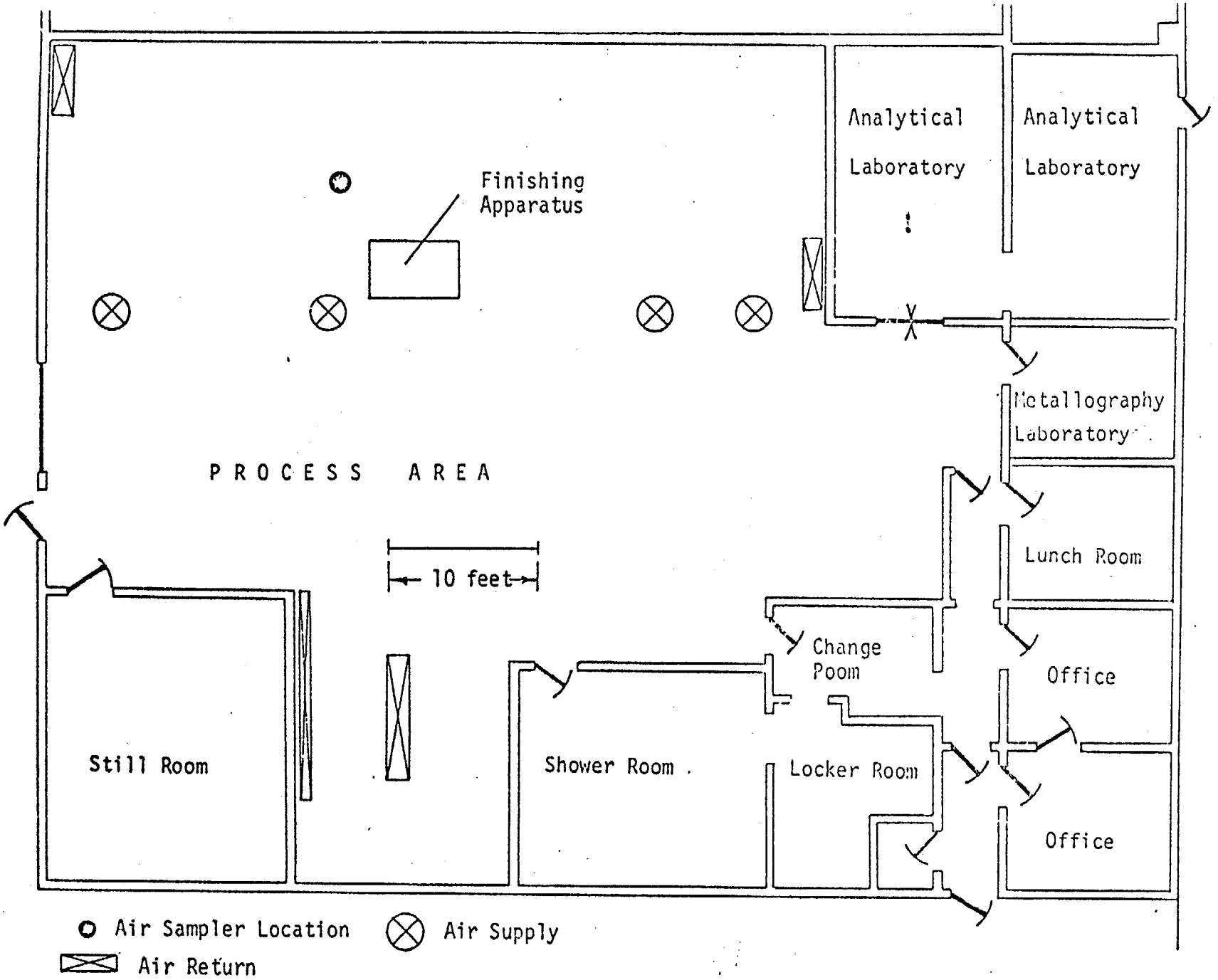


Figure 3. Location of Air Sampler in Process Area of Nuclear Facility on 4 October - 6 October 1972.

Pressure accumulation repeated during third shift and attempts by [redacted] and [redacted] to do the rodding operation were unsuccessful when resistance was encountered near the top of the reactor. Dusting was noted each time the containment was breached (vented) to attempt rodding. Respirators were donned and venting was repeated until no further dusting was noted. Rodding could not be accomplished due to continued resistance near the top of the reactor. Heating was discontinued and the gas supply to the reactor was stopped. Operating personnel proceeded to further breach containment by disassembling the flange at the top of the reactor. An "elephant trunk" (flexible connection to the Facility exhaust system) was moved to the vicinity of the flanged connection. Respirator use was continued until the disassembly was complete and the conduit between the reactor and the knock-down trap was removed.

The air sample collected during the second and subsequent rodding attempts and the system disassembly detected activity concentrations equal to 0.58 times the MPC_a.

6 October 1972

Temporary operating instructions were proposed to cover further disassembly and cleaning of the finishing apparatus. Nuclear Safety Committee concurrence in the proposed instruction

was obtained and these instructions were carried out during the second shift. Air samples collected in the vicinity of the breathing zone of the operators during the clean-up procedure measured 38 times MPC_a from 2115 to 2200 hrs. Nasal smears taken during a work break and at the conclusion of the clean-up were slightly positive.

The results of air sampling and nasal smear tests related to second shift work were reviewed by RPO with RST. Events of previous five days were chronicled by RPO during interviews with third shift personnel. Further work with the finishing apparatus was halted.

7 October 1972

A decision to review with expert consultants all information related to the incident was made when upon reflection it became apparent that certain individuals, particularly those involved in the rodding action, could have experienced acute exposures to airborne activity significantly greater than we had initially estimated on the basis of air sampling data. Our efforts to reach local consultants were unsuccessful. The incident was reviewed with the site Medical Officer and, with his concurrence, Radiation Management Corporation (RMC) was contacted and aprised of specifics regarding the incident at about 1500 hrs. RMC advised immediate whole body counting

and urine and fecal sample collection from affected personnel. These personnel were believed to be most probably [redacted] and less probably [redacted]. Communication efforts were concentrated on reaching [redacted] were contacted and asked to go to RMC on 8 October 1972 for whole body counting and, at the same time, to submit any urine and fecal eliminations which occurred between the time they were reached and the time of arrival at RMC on 8 October. [redacted] could not be reached from 1700 to 2430 hrs on 7 October 1972. [redacted] was reached on 8 October 1972 and arrangements were made for whole body counting of him at RMC on 9 October 1972.

EX 6

8 October 1972

[redacted] were whole body counted at RMC at about 1300. Only [redacted] showed any evidence of possible ^{235}U intake (see Table 1).

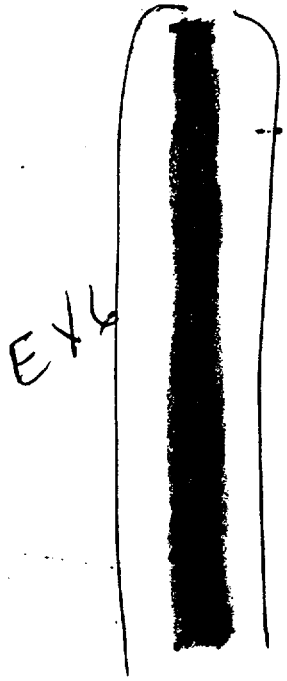
EX 6

9 October 1972

CL was whole body counted at RMC and was determined to have possibly 25 nCi of ^{235}U in his body (see Table 1). All Facility staff with the exception of members of management and the analytical groups were requested to submit 24-hour urine samples and a fecal sample.

TABLE 1

Summary of Results[1] of Whole Body and Thoracic Region Counts of Personnel Suspected of Overexposure to Airborne Highly Enriched Uranium

Subject Identification	Probable Date of Exposure	Date of Count	Result, nCi
	10/4/72	10/9/72[2]	15 ± 10
		11/6/72[3]	< 4
	10/6/72	10/8/72[2]	10 ± 10
	10/6/72	10/8/72[2]	< 10
		11/6/72[3]	< 4
	10/5 & 10/6/72	10/8/72[2]	< 10
		11/6/72[3]	< 4
	10/4/72	11/6/72[3]	< 4
	10/5 & 10/6/72	11/6/72[3]	< 4

(1) Data by RMC, Philadelphia, Pa.

(2) Whole body analyses.

(3) Thoracic region analyses.

12 October 1972

A urine sample and fecal sample were sent to RMC for analysis. NOTE: Failure to adequately inform personnel regarding the importance and the appropriate procedure for collecting these samples caused submittal of less than complete samples and loss of precise data regarding the time samples were collected.

3 November 1972

An interim report was received from RMC, Attachment A, summarizing results of all tests and analysis completed to this date. Based on these findings, RMC identified five individuals for whom reason persisted to suspect overexposure in the form of inhaled ^{235}U. The followup actions recommended where accepted and implemented.

6 November 1972

Thoracic region counts were done on [redacted] EX 6 (erroneously) and [redacted] All measurements were less than the MDA which was estimated to be 4 nCi.

16 November 1972

Results of analyses of 24-hour urine samples from all Facility personnel except management were reported by RMC. All results were below action levels.

1 December 1972

A progress report, Attachment B, was received from RMC summarizing all body counting and bioassay data which had been obtained as of that date (see Table 2). Further whole body counting at ORNL and additional bioassay were recommended for EX6 [redacted]

19 December 1972

EX6 [redacted] were whole body counted at ORNL. The results of these measurements, Attachment C, were concluded to be negative.

9 January 1973

The results of analyses of three consecutive 24-hour urine EX6 samples obtained from [redacted] from 2 December to 5 December and 4 December to 7 December, respectively, were received from RMC, Attachment D and Table 2. These results were interpreted to be negative and no further tests or analyses were proposed.

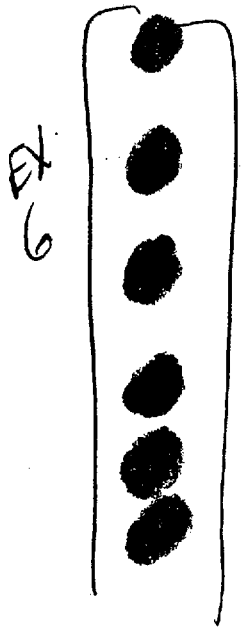
TABLE 2

Summary of Results[1] of Bioassays of Urine and Fecal Samples from Personnel Suspected to Have Been Overexposed to Airborne Highly Enriched Uranium

Subject Identification	Fecal Analyses			Urine Analyses		
	Date	Sample Mass gs	Results, nCiα	Date	Sample Volume mls	Results pCi α/l
	10/12	30	0.001 ± 0.0003	10/9	280	71
				10/12	1600	5
				11/5	1500	0.08
				12/3	1100	0.098
				12/4	1000	0.089
				12/5	1150	0.13
EX6	10/8	20	0.151 ± 0.008	10/8	800	9
	10/12	30	.006 ± 0.0009	10/12	1600	5
				11/6	1100	0.13
				12/5	1350	0.28
				12/6	1500	<0.132
				12/7	1500	0.13
	10/12	30	.004 ± .0005	10/8	230	56
				10/12	1500	0.7
				11/5	900	<.16
	10/12	120	.007 ± .0007	10/8	300	53
				10/12	1150	.6
				11/5	1100	0.63
	10/12	120	.002 ± .0009	10/12	1400	0.6
				11/5	1100	<0.33
				10/12	1200	9.2
				11/6	1150	<0.12
				10/12	1150	3.3
				11/6	1000	<0.18
	10/12	30	.0008 ± .0002	10/12	1150	2.0
				11/6	800	<0.07

(Continued)

TABLE 2 (Cont'd.)

Subject Identification	Fecal Analyses			Urine Analyses		
	Date	Sample Mass gs	Results, nCiα	Date	Sample Volume mls	Results pCi α/l
 EX 6	10/12	30	.001 ± .0003	10/12	1000	21
				11/6	900	< .16
	10/12	30	.001 ± .0002	10/12	400	40
				11/5	1100	0.37
	10/12	30	.001 ± .0002	10/12	900	12
				11/4	1000	0.42
				11/5	1150	<0.08
				11/5	1000	<0.17
				11/7	1100	<0.12

V. CONCLUSIONS

Airborne activity in excess of the MPC_a was detected twice during the week of 2 October 1972 in the process area of the Nuclear Facility. The first instance is believed related to an intentional breach of the containment to correct a malfunction in the equipment used to apply a metal layer or finish to uranium ceramic fuel particles. A breach early in the cycle of this operation could discharge respirable activity to the environment. Subsequent breaches of the containment were not associated with detectable airborne activity. However, it is possible and highly probable that the potential concentration of respirable activity from the particle bed diminishes as the finish layer deposits and builds. This is believed to explain why the first breach resulted in detectable airborne activity whereas the second and subsequent breaches did not. Air sampling during this part of the week was executed poorly and the results of these measurements are interpreted to be only qualitatively significant.

The second instance of detectable activity in excess of the MPC_a occurred during disassembly and clean-up of the finishing equipment when the operation was terminated because of repeated operational problems. In this instance dusting

was anticipated and affected personnel used respiratory protection (half-face masks) and air samples were collected continuously in the vicinity of their breathing zones.

When the possibility of acute exposures to airborne acitivity significantly in excess of the MPC_a was recognized, the Radiation Management Corporation was consulted and whole body counting and bioassay measures were implemented. The absence of adequate planning procedures and communication caused the results of the first bioassays to be of doubtful validity and, therefore, inconclusive.

Repeated thoracic region and whole body counting and more exhaustive bioassay measures were required to determine finally the consequences of the exposures. The results of all of these tests and measurements has been negative or marginally positive. These results are consistent with what we would expect as a consequence of chronic exposure to radioactive material in the amounts and under the circumstances known to exist normally in our Nuclear Facility.

We conclude that airborne activity significantly in excess of the MPC_a occurred during the week of 2 October 1972. However, no exposed personnel experienced an uptake of activity which was not promptly eliminated by normal biological processes. No

immediate injury has occurred. No longer term debilitation is expected to accrue as a consequence of these exposures.

Breaching of the finishing system containment was necessitated by the transport and subsequent deposition of inordinate quantities of dust in the off-gas processing parts of the finishing apparatus. The dust derived from overcharging and inadequate design of the vaporizer assembly.

Based on our analysis of the circumstances and events related to this incident, we also conclude that no overexposure of personnel to airborne radioactivity would have occurred had (1) containment not been breached, (2) adequate ventilation been available at the point of the containment breach, or (3) full-face respirators been worn by personnel involved in the operation.

VI. CORRECTIVE ACTIONS

As a direct result of this accident, the following actions have been taken to correct deficiencies in equipment design or operating procedures which could have contributed to the cause or confounded determination of its consequences:

Equipment Design

1. The vaporizer assembly in the finishing apparatus has been redesigned to reduce the probability of producing dust that can accumulate and plug piping causing pressurization of the apparatus.

2. The off-gas piping from the finishing reactor has been modified to include:

    a. a large diameter disengagement section at the top of the reactor to return particulate material to the fluidized bed,

    b. a large diameter transfer section to the off-gas processing components, i.e., dust trap, filters and scrubbers, and

    c. a larger capacity and more effective primary dust trap.

3. A flexible exhaust duct has been installed to supply localized, high-velocity ventilation to the finishing apparatus to be used in the event containment must

be broken for operating or maintenance reasons.

Operating Procedures

1. The amount of material which may be charged to the vaporizer assembly has been limited by revisions to the Standard Operating Procedure for the finishing operation.

2. Procedures have been prepared to instruct personnel regarding actions to be taken in the event airborne radioactivity is suspected to have been released.

3. Radiation safety personnel have been issued instructions regarding actions to be taken whenever airborne radioactivity is suspected.

We have done the finishing operation on four occasions since these corrective actions have been taken and in no instance has containment had to be broken for any reason. We conclude that the corrective actions which have been taken were effective and that the risk of exposure to airborne contamination as a consequence of this operation has been significantly reduced.

ATTACHMENT A

INTERIM REPORT

by

RADIATION MANAGEMENT CORPORATION

INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT (W. R. GRACE & CO.)

I. General

This is an interim report that is issued so that W. R. Grace & Co. may make the required 30 day notification to the AEC under the requirements of the Code of Federal Regulations, Title 10, Part 20.405 (a) (1).

The maximum air activities, during the week of October 2 through 7, occurred during the second shift near the sintered $^{235}UO_2$ fluidizing operations. The weekly average air activity was approximately six times the allowable MPC_a (restricted area) for ^{235}U ($MPC_a = 10^{-10}$ uCi/cc).

The specific measurements are listed below:

II. Air Activity in ^{235}U Operations Area - Second Shift.

Date	Maximum Exposure (Hrs)	Air Concentration (XMPC_a - restricted area)	Nominal Activity * In MPD - Hours (Restricted Area)
10/6	5	45	225.0
10/6	3	.87	2.6
10/5	8	.87	7.0
10/4	8	1.89	15.1
10/3	8	.002	.02
10/2	8	.002	.02
			249.74 ÷ 40 hrs = 6.2xMPC_a

Note that no credit has been taken for the half face respirators worn on 10/6 because of the fact that positive nose swabs were found which indicates leakage around the respirator filters. The uncertainties involved with the non-representative air sampling on October 4 and October 5 give further evidence that the 40 hour MPC_a average was most likely exceeded.

* Data given verbally to RMC from Dr. R.J. Herbst of W. R. Grace & Co.

INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT (W. R. GRACE & CO.)

III. Interim Results of ^{235}U Intake Studies

A. Whole body counting plus urine (transuranic separations) and fecal analyses (transuranic separations) demonstrate that there has been ^{235}U intake by all 11 workers. The extent of the exposures from these intakes is presently being estimated.

B. Results of Whole Body Counting & Urinalyses

Subject	Date of Probable Exposure	Date of ** Whole Body Count	nCi of ^{235}U In Body	Estimated * nCi ^{235}U in body (Urinalysis Data)	
EX6	10/4/72	10/9/72	15 ± 10	(11)	(.2)
	10/6/72	10/8/72	10 ± 10	(.04)	(.4)
	10/5/72	10/8/72	< 10	(.2)	(.1)
	10/5/72	10/8/72	< 10	(3)	(.2)
	10/6/72	none		(.1)	
	10/7/72	none		(1.4)	
	10/7/72	none		(.5)	
	10/7/72	none		(.3)	
	10/7/72	none		(3)	
	10/7/72	none		(6)	
	10/7/72	none		(2)	

C. Results of Fecal Analyses

Subject	Date of Sample Collection	Total Activity, pCi ± 2σ
EX6	10/12/72	0.85 ± 29%
	10/8/72, 10/12/72	151 ± 5%, 6.2 ± 14%
	10/12/72	3.67 ± 13%
	10/12/72	7.31 ± 10%
	10/12/72	2.04 ± 43%
	10/12/72	0.97 ± 26%
	10/12/72	0.63 ± 32%
	10/12/72	0.55 ± 35%
	10/12/72	0.80 ± 29%

INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT (W. R. GRACE) Cont....

III. Interim Results of ^{235}U Intake Studies (Cont.)

D. Conclusions

Early results indicate that five subjects [redacted] have a U uptake of substantially more than one investigation level.* It is very unlikely that all of the 15 nCi of ^{235}U in subject [redacted] is non-transportable, since his urine activity decreased by a factor of 50 in 3 days. Thus it is unlikely that the dose to [redacted] lungs will exceed the annual dose limit of 15 rem.

If most of the ^{235}U intake is transportable, then several people may have exceeded the permissible body content (10 investigation levels). The chemical toxicity is the limiting factor for transportable ^{235}U, rather than the radiotoxicity.

IV. Followup Actions

A. Whole body count [redacted] again, as well as a first count for [redacted] Also perform another 24 hour urinalysis on all 11 subjects.

B. Dose estimates will be made for [redacted] These dose estimates will be completed after the analysis of the urine excretion pattern is completed.

* Extrapolated to date of probable exposure using ICRP 10 and 10a equations.

** All subjects suspected of ^{235}U intake have not yet been whole body counted as requested by RMC.

SWP:ss 721103

APPENDIX II

During the period from 2 to 7 October, a number of people were exposed to airborne uranium dust, predominatly U-235 oxides. The duration of these exposures is not known with reasonable accuracy; in some individuals, repeated intakes on consecutive shifts may have occurred.

The main problem encountered in the evaluation of the intake for the eleven individuals involved, apart from the exact period of the intake, is created by the metabolic behavior of the inhaled dust. Essentially, there are two possible cases:

(1) the compound inhaled is "non-transportable", i.e. the dust is deposited in the lungs and only a very minute fraction is absorbed into the blood;

(2) the particles inhaled behave as a"transportable" compound, i.e. a substantial amount is absorbed from the lung into the blood, and subsequently excreted by the kidneys into the urine.

In the first case, the hazard (primarily) arises from lung exposure to an alpha emitting substance; in the second case, from a toxic chemical action on the kidneys. The distinction between these two cases is important, as the "permissible" amounts in the body are strongly dependent on their behavior, as outlined above.

In a situation where intake of radioactive materials is not continuous, but occurring in a relatively short period of time, the "maximum permissible body burden" concept is not applicable. For this reason, the International Commission on Radiological Protection (ICRP), in its reports #10 and 10a, has postulated "investigation levels", i.e. amounts of radioactive materials in the body above which further investigation as to the exposure involved is deemed necessary. For the two cases mentioned before, these investigation levels are:

(1) for non-tranportable Uranium-235 compounds: a deposition of 1.6 nCi in the lungs;

APPENDIX II (Cont.)
W. R. Grace & Co.

(2) for transportable Uranium-235 compounds: inhalation of 0.25 mg in one day, giving rise to an absorption of 0.06 mg into the blood (in terms of curies: an absorption of 0.13 nCi).

In order to determine whether or not a potentially serious situation existed, it was important to evaluate whether or not substantial absorption of radioactivity from the lungs of the individuals exposed has occurred, in other words, whether the uranium dust inhaled behaved as a non-transportable or as a transportable compound.

JWT:sc 721103
RJH:cal Rev. 1

W. R. GRACE & CO.

RESEARCH DIVISION

Washington Research Center, Clarksville, Maryland 21029

GRACE

ADDENDUM TO TR-RMC-30, REV.1

RMC reported to W. R. Grace & Co. the results of additional measurements made on November 6, 1972 in which the Whole Body Count for each of five subjects [redacted], [redacted] was less than 5 nCi ^{235}U.

Ex 6

ATTACHMENT B

PROGRESS REPORT

by

RADIATION MANAGEMENT CORPORATION

December 1, 1972

Richard Herbst, Ph.D.
W.R. Grace & Co.
Washington Research Center
Clarksville, Maryland 21029

Dear Doctor Herbst:

Enclosed you will find a Progress Report which includes a table entitled "Bioassay Results of W.R. Grace Co. Employees". This table summarizes all results through the middle of November. It should be noted that the urine data are expressed in pCi of transuranic alpha per liter of urine. It is assumed that this alpha is due to the mixture, the composition of which was supplied to RMC on 11/8/72 by W.R. Grace Co.

All of the information in the enclosed bioassay table was given (as per your request) to Mr. Eugene Epstein of Region I Compliance of the AEC via telecon, on 11/17/72. Mr. Epstein also requested and was given the volume or weight of each urine and fecal sample.

E46

Please note that the Progress Report recommends that employees [redacted] be whole body counted at Oak Ridge National Laboratories and that these two employees submit three sequential 24 hour urines to RMC.

Please call if you have any questions.

Sincerely,

Sydney W. Porter, Jr.
VICE PRESIDENT
Health Physics

SWP:ss
Enclosure

ERSITY CITY
ICE CENTER

MARKET STREET
DELPHIA PA. 19104
386-1805

lation
ssment
poration

rmc UNIVERSITY CITY SCIENCE C. .R
3508 MARKET STREET
PHILADELPHIA, PA. 19104

PROGRESS REPORT OF

W.R. GRACE CO. ^{235}U INHALATION INCIDENT

I. General

The inhalation incident is described and initial whole body count and urine data are given in the TR-RMC-72-30 entitled "Interim Report of Suspected ^{235}U Inhalation Incident", dated 11/3/72. This interim report was forwarded on 11/7/72 to the AEC Division of Compliance.

II. Calculation of the Activity of the W.R. Grace Co. Uranium Mixture

Isotope of Uranium	% wt.*	Specific Activity at 97.66% enrich.	% activity	Maximum Permissible Lung Burden** nCi	Maximum Permissible Lung Burden** ug
233	.0002	.019	.00	.005	.00
234	.968	59.334	96.30	16.543	2.7
235	97.66	2.089	3.40	.583	272.4
236	.269	.171	0.29	.048	.7
238	1.108	.004	.00	.001	3.1
		61.617	99.99	17.18	278.9

III. Discussion of Bioassay Results

A. General

The enclosed table entitled "Bioassay Results of W.R. Grace Co. Employees" reviews all of the bioassay data available through 11/30/72. The urine and fecal data are expressed in nanocuries of transuranic alpha per liter of urine. The calculation of the urine activity back to date of probable exposure is conservative, since it assumes that all of the activity is transportable and that the activity is eliminated according to the power function $t^{-1.5}$ (reference ICRP 10). A less than (<) symbol in front of some of the urine data of 11/5 indicates that the activity was less than the minimum detectable activity (MDA) of the sample analysis. The MDA is computed separately for each sample, since each

---

* Data supplied to RMC by W.R. Grace Co. on 11/8/72.
** This concept is only applicable for chronic intake.

III. Discussion of Bioassay Results (Continued)

A. General (Continued)

sample varies according to sample self absorption and instrument background. Data which is marked less than (<) is statistically equal to zero and should not be used to extropolate activity at an earlier date.

B. Conclusions

1. The initial whole body count data of [redacted] have not been confirmed in either the second whole body count or in any of the three urine samples. Therefore, it can only be concluded that the 15 nCi of ^{235}U counted was skin or clothing contamination, or even possibly large particles which the body rapidly eliminated. The same conclusion must be drawn for [redacted] since his urine data do not verify his initial whole body count.

2. The fact that the mixture is a highly insoluble sintered UO_2, plus the strong possibility of a series of intakes over a number of days, make the interpretation of dose from urine data a highly questionable procedure. It can be stated that as of 11/5/72, none of the urines contained an amount of transuranic alpha equal to one derived investigation level.

3. Since only six out of twenty-nine urine samples submitted were 1400 ml or more, the question of the validity of the 24 hour urine sample adds another uncertainty to the interpretation of the urine data.

4. Since none of the fecal samples were taken within 48 hours of the probable date of exposure, and since only two of the samples were greater than 30 grams, all of the fecal data are very difficult, if not impossible, to interpret.

5. The new information given to RMC concerning the composition of the uranium mixture shows that the activity of the ^{234}U is clearly the major hazard, and that the chemical toxicity is not a significant hazard with this specific mixture.

IV. Recommendations

A. Whole Body Counting

Since there is still some uncertainty about the uranium body content of [redacted] it is recommended that

Page 3 missing

bable exposure (1972)		in nCi	of ^{235}U	wt. grams	nCi of ∝	10/8 nCi∝/l	10/8 nCi at T=0	urine sample of 10/12 nCi∝/l	10/12 nCi at T=0	11/5 nCi∝/l	11/5 nCi at T=
EN6											
[redacted]	10/4	15 ± 10 (10/9)	<4 (11/6)	30 (10/12)	.001±.0003	.071* (10/9)	11 (10/9)	.005	1.7	<.00008	NA
[redacted]	10/6	10 ±10 (10/8)		20 (10/8) 30 (10/12)	.151±.008 .006±.0009	.009	.019	.0027	.42	.00013 (11/6)	.3
[redacted]	(10/7)	<10 (10/8)	<4 (11/6)	30 (10/12)	.004±.0005	.057*	.114	.0007	.1	<.00016	NA
[redacted]	(10/5)	<10 (10/8)	<4 (11/6)	120 (10/12)	.007±.0007	.053*	3.55	.00056	.15	.00063	1
[redacted]	(10/6)			120 (10/12)	.002±.0009			.00061	.13	<.0003	NA
[redacted]	(10/7)							.00092	1.4	<.00012	NA
[redacted]	(10/7)							.00033	.5	<.00018	NA
[redacted]	(10/7)			30 (10/12)	.0008±.0002			.0002	.3	<.00007 (11/6)	NA
[redacted]	(10/7)		<4 (11/6)	30 (10/12)	.001±.0003			.021	3.3	<.00016	NA
[redacted]	(10/7)		<4 (11/6)	30 (10/12)	.001±.0002			.04*	6.2	.00037	.8
[redacted]	(10/7)			30 (10/12)	.001±.0002			.012	1.9	.00042 (11/4)	.9
[redacted]	(10/7)									<.00008 (11/4)	NA
[redacted]	(10/7)									<.00017	NA
[redacted]	(10/7)									<.00012 (11/6)	NA

*Not a 24-hour sample

ATTACHMENT C

REPORT OF RESULTS

of

WHOLE-BODY COUNTS BY OAK RIDGE NATIONAL LABORATORY

of

[redacted]

EK6

UNITED STATES
ATOMIC ENERGY COMMISSION
OAK RIDGE OPERATIONS
P.O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

January 16, 1973

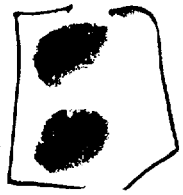
W. R. Grace & Company
Research Division
Washington Research Center
Clarksville, Maryland 21029

ATTN: Mr. Richard J. Herbst

Gentlemen:

Whole body counting of two of your employees, as requested in your letter of December 14, 1972, was done at the Oak Ridge Y-12 Plant on December 19, 1972. The results are presented below:

EW6



Count No.	μg ^{235}U
1	0
2	0
1	24
2	29

The limit of error on a single count is ± 80 μg ^{235}U.

We hope that all aspects of this service were satisfactory to you.

Sincerely,

H. D. Hickman
Director
Manufacturing Division

OMW:MRT

RECEIVED JAN 19 1973

ATTACHMENT D

REPORT OF RESULTS

of

URINE ANALYSES OF SPECIMENS

from

[redacted]

E46

UNIVERSITY CITY SCIENCE CENTER
3508 MARKET ST., PHILADELPHIA, PA. 19104
(215) 386-1805

INVOICE NO. 746

To: Mr. Richard J. Herbst
W. R. Grace & Co.
Research Division
Washington Research Center
Clarksville, Md. 21029

Date January 9, 1973

Purchase Order No.	R. M. C. Control No.	Date Received
597 GM		12/12/72, 12/18/72

Method of Analysis

Analysis for transuranium alpha emitters

	Customer Identification	R.M.C. Lab Identification	pCi of α/liter	Volume (1)	Unit Price
3	[redacted] 12/2-12/3/72	10012	< 0.098	1.1	$ 20.00
	[redacted] 12/3-12/4/72	10013	< 0.089	1.0	20.00
	[redacted] 12/4-12/5/72	10014	< 0.13	1.15	20.00
	[redacted] 12/4-12/5/72	10015	0.28 ± 55%	1.35	20.00
	[redacted] 12/5-12/6/72	10016	< 0.132	1.5	20.00
	[redacted] 12/6-12/7/72	10017	0.13 ± 94%	1.5	20.00
	[redacted] 12/7-12/8/72	10018	< 0.137	0.8	20.00
	[redacted] 12/13-12/14/72	10019	< 0.124	1.15	20.00
	[redacted] 12/13-12/14/72	10022	< 0.124	1.1	20.00

NTS

continued on page 2

RECEIVED JAN 1 1973 Accountability

SUB-TOTAL $ 180.00

TOTAL CHARGE
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UNIVERSITY CITY SCIENCE CENTER
3508 MARKET ST., PHILADELPHIA, PA. 19104
(215) 386-1805

INVOICE NO. 747

Mr. Richard J. Herbst
W. R. Grace & Co.
Research Division
Washington Research Center
Clarksville, Md. 21029

Date January 9, 1973

Purchase Order No.	R. M. C. Control No.	Date Received
		12/12/72, 12/18/72

Method of Analysis

Fecal analysis for transuranium α emitters

Customer Identification	R.M.C. Lab Identification	pCi of α per sample	Unit Price
[redacted] 12/13/72	10020	0.685 ± 30% (25 g sample)	$ 35.00
[redacted] 12/13/72	10021	2.76 ± 17% (130 g sample)	35.00

$ 70.00

TOTAL CHARGE
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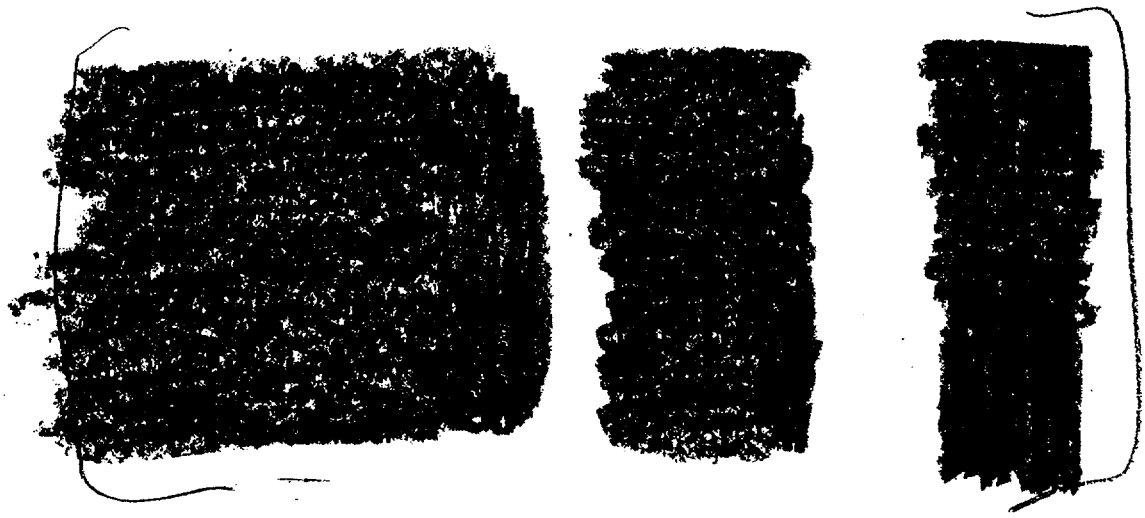
INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT
(W. R. GRACE) Cont....

APPENDIX I

Section III of the main report gives the initials of the subjects. Below is a list of the names, social security numbers and birth dates associated with each initial:



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W. R. GRACE & CO.

GRACE

RESEARCH DIVISION

Washington Research Center, Clarksville, Maryland 21029

7 November 1972

Director, Division of Compliance
U. S. Atomic Energy Commission
Washington, D. C. 20545

REF: SNM 840

RE: Notification Pursuant to 10 CFR, Part 20.405 (a) (1).

Dear Sir:

The attached interim report summarizes measurements and analyses by W. R. Grace & Co. and Radiation Management Corporation related to an incident of potential over-exposure to airborne contamination in excess of MPC for restricted areas. The incident occurred between 4 October and 7 October 1972.

This report is submitted to comply with requirements of the Code of Federal Regulations, Title 10, Part 20.405 (a) (1). A final report will be submitted when tests and analyses currently in progress at RMC are completed. We expect these tests will be completed by 20 November 1972.

W. R. Grace & Co. has reviewed the circumstances associated with this incident and has implemented the following corrective actions:

1. The equipment being used in the operations involved has been modified to preclude venting of radioactive contamination to the restricted area. Outlets from the equipment are now vented directly to the Facility exhaust system which, in turn, is absolutely filtered before discharged to the environment.

2. Full face masks have been procured for use in the event of suspected airborne contamination. The use of partial

E/2

ITEM # 2

(9)

face respirators is prohibited.

3. Air sampling techniques have been improved to include personal air sampling (breathing zone) during operations which are suspected to involve potential air contamination.

Copies of the attached report have been transmitted to the individuals mentioned in paragraph III D. [redacted].

EX6

Please direct any further questions to my attention at the above address.

Sincerely,

G. E. Ashby
Vice President Research Div.

GEA/cal
cc: Region I, Director
Division of Compliance
U.S. Atomic Energy Commission
970 Broad Street
Newark, New Jersey 07102

INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT (W. R. GRACE & CO.)

I. General

This is an interim report that is issued so that W. R. Grace & Co. may make the required 30 day notification to the AEC under the requirements of the Code of Federal Regulations, Title 10, Part 20.405 (a) (1).

The maximum air activities, during the week of October 2 through 7, occurred during the second shift near the sintered $^{235}UO_2$ fluidizing operations. The weekly average air activity was approximately six times the allowable MPC_a (restricted area) for ^{235}U ($MPC_a = 10^{-10}$ uCi/cc).

The specific measurements are listed below:

II. Air Activity in ^{235}U Operations Area - Second Shift.

Date	Maximum Exposure (Hrs)	Air Concentration ($XMPC_a$ - restricted area)	Nominal Activity * In MPD - Hours (Restricted Area)
? 10/6	5	45	225.0
10/6	3	.87	2.6
10/5	8	.87	7.0
10/4	8	1.89	15.1
10/3	8	.002	.02
10/2	8	.002	.02
			249.74 ÷ 40 hrs = $6.2xMPC_a$

Note that no credit has been taken for the half face respirators worn on 10/6 because of the fact that positive nose swabs were found which indicates leakage around the respirator filters. The uncertainties involved with the non-representative air sampling on October 4 and October 5 give further evidence that the 40 hour MPC_a average was most likely exceeded.

* Data given verbally to RMC from Dr. R.J. Herbst of W. R. Grace & Co.

INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT (W. R. GRACE & CO.)

III. Interim Results of ^{235}U Intake Studies

A. Whole body counting plus urine (transuranic separations) and fecal analyses (transuranic separations) demonstrate that there has been ^{235}U intake by all 11 workers. The extent of the exposures from these intakes is presently being estimated.

B. Results of Whole Body Counting & Urinalyses

Subject	Date of Probable Exposure	Date of ** Whole Body Count	nCi of ^{235}U In Body	Estimated * nCi ^{235}U in body (Urinalysis Data)	
EX6	10/4/72	10/9/72	15 ± 10	(11)	(.2)
	10/6/72	10/8/72	10 ± 10	(.04)	(.4)
	10/5/72	10/8/72	< 10	(.2)	(.1)
	10/5/72	10/8/72	< 10	(3)	(.2)
	10/6/72	none		(.1)	
	10/7/72	none		(1.4)	
	10/7/72	none		(.5)	
	10/7/72	none		(.3)	
	10/7/72	none		(3)	
	10/7/72	none		(6)	
	10/7/72	none		(2)	

C. Results of Fecal Analyses

Subject	Date of Sample Collection	Total Activity, pCi ± 2σ
EX6	10/12/72	0.85 ± 29%
	10/8/72, 10/12/72	151 ± 5%, 6.2 ± 14%
	10/12/72	3.67 ± 13%
	10/12/72	7.31 ± 10%
	10/12/72	2.04 ± 43%
	10/12/72	0.97 ± 26%
	10/12/72	0.63 ± 32%
	10/12/72	0.55 ± 35%
	10/12/72	0.80 ± 29%

INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT (W. R. GRACE) Cont....

III. Interim Results of ^{235}U Intake Studies (Cont.)

D. Conclusions

Early results indicate that five subjects [redacted] have a U uptake of substantially more than one investigation level.* It is very unlikely that all of the 15 nCi of ^{235}U in subject [redacted] is non-transportable, since his urine activity decreased by a factor of 50 in 3 days. Thus it is unlikely that the dose to [redacted]s lungs will exceed the annual dose limit of 15 rem.

If most of the ^{235}U intake is transportable, then several people may have exceeded the permissible body content (10 investigation levels). The chemical toxicity is the limiting factor for transportable ^{235}U, rather than the radiotoxicity.

IV. Followup Actions

A. Whole body count [redacted] and [redacted] again, as well as a first count for [redacted] Also perform another 24 hour urinalysis on all 11 subjects.

B. Dose estimates will be made for [redacted] These dose estimates will be completed after the analysis of the urine excretion pattern is completed.

* Extrapolated to date of probable exposure using ICRP 10 and 10a equations.

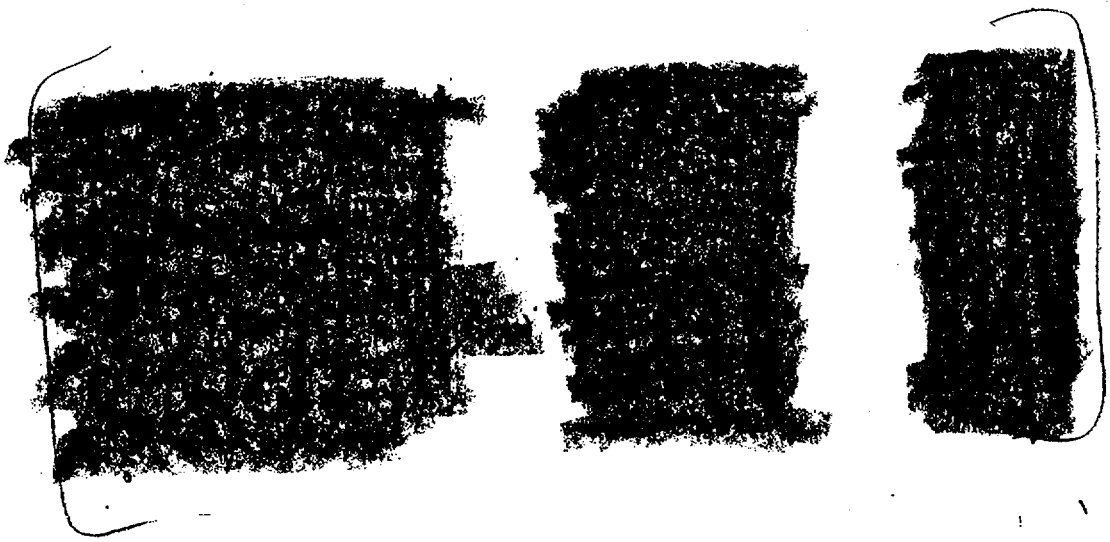
** All subjects suspected of ^{235}U intake have not yet been whole body counted as requested by RMC.

SWP:ss 721103

INTERIM REPORT OF SUSPECTED ^{235}U INHALATION INCIDENT
(W. R. GRACE) Cont....

APPENDIX I

Section III of the main report gives the initials of the subjects. Below is a list of the names, social security numbers and birth dates associated with each initial:



EX 6

APPENDIX II

During the period from 2 to 7 October, a number of people were exposed to airborne uranium dust, predominatly U-235 oxides. The duration of these exposures is not known with reasonable accuracy; in some individuals, repeated intakes on consecutive shifts may have occurred.

The main problem encountered in the evaluation of the intake for the eleven individuals involved, apart from the exact period of the intake, is created by the metabolic behavior of the inhaled dust. Essentially, there are two possible cases:

(1) the compound inhaled is "non-transportable", i.e. the dust is deposited in the lungs and only a very minute fraction is absorbed into the blood;

(2) the particles inhaled behave as a"transportable" compound, i.e. a substantial amount is absorbed from the lung into the blood, and subsequently excreted by the kidneys into the urine.

In the first case, the hazard (primarily) arises from lung exposure to an alpha emitting substance; in the second case, from a toxic chemical action on the kidneys. The distinction between these two cases is important, as the "permissible" amounts in the body are strongly dependent on their behavior, as outlined above.

In a situation where intake of radioactive materials is not continuous, but occurring in a relatively short period of time, the "maximum permissible body burden" concept is not applicable. For this reason, the International Commission on Radiological Protection (ICRP), in its reports #10 and 10a, has postulated "investigation levels", i.e. amounts of radioactive materials in the body above which further investigation as to the exposure involved is deemed necessary. For the two cases mentioned before, these investigation levels are:

(1) for non-tranportable Uranium-235 compounds: a deposition of 1.6 nCi in the lungs;

APPENDIX II (Cont.)
W. R. Grace & Co.

(2) for transportable Uranium-235 compounds: inhalation of 0.25 mg in one day, giving rise to an absorption of 0.06 mg into the blood (in terms of curies: an absorption of 0.13 nCi).

In order to determine whether or not a potentially serious situation existed, it was important to evaluate whether or not substantial absorption of radioactivity from the lungs of the individuals exposed has occurred, in other words, whether the uranium dust inhaled behaved as a non-transportable or as a transportable compound.

JWT:sc 721103
RJH:cal Rev. 1

W. R. GRACE & CO.

RESEARCH DIVISION

Washington Research Center, Clarksville, Maryland 21029

GRACE

ADDENDUM TO TR-RMC-30, REV.1

RMC reported to W. R. Grace & Co. the results of additional measurements made on November 6, 1972 in which the Whole Body Count for each of five subjects [redacted] was less than 5 nCi ^{235}U.

W. R. GRACE AND COMPANY

Research Division

Washington Research Center

Clarksville, Maryland

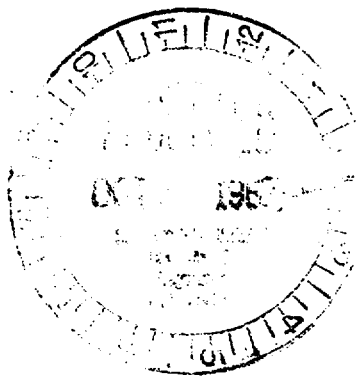
APPLICATION FOR RENEWAL AND AMENDMENT

OF

SPECIAL NUCLEAR MATERIALS LICENSE

SNM - 840

October 4, 1967



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APPLICATION FOR RENEWAL AND AMENDMENT OF SPECIAL NUCLEAR

MATERIALS LICENSE SNM - 840

Research Division - W. R. Grace and Company

I. Introduction

The Research Division of W. R. Grace & Co. hereby makes application to the United States Atomic Energy Commission for renewal of its Special Nuclear Materials License SNM - 840, covering 1 kg. of uranium-235, which is due to expire on November 30, 1967. Concurrently, W. R. Grace & Co. requests the amendment of this renewed license to include up to 25 grams of plutonium-239. The information presented below in this application is that required by Sections 70.21, 70.22, Part 70, Title 10, Code of Federal Regulations. The order of presentation of the material is essentially that as given in the above mentioned sections.

II. Corporate Information

W. R. Grace & Co. is a United States corporation organized under the laws of the State of Connecticut with principal offices at 7 Hanover Square, New York, New York. The Research Division (Washington Research Center) has its principal offices and facilities on Route 32, Howard County, Clarksville, Maryland. The voting stock of the Company is publicly owned and is traded on the New York Stock Exchange. As of May 22, 1967, shares of outstanding stock of W. R. Grace & Co. representing more than 95% of the voting power of all outstanding shares of stock of W. R. Grace & Co. were held of record by stockholders having registered addresses within the United States.

The President, Vice President, Treasurer, Secretary, and members of the Board of Directors are all citizens of the United States. On the above

basis, W. R. Grace & Co. is not controlled or owned by an alien, foreign corporation, or foreign government.

The names and addresses of the principal officers of W. R. Grace & Co. are listed in Appendix I.

III. Location of Operation and General Plans

W. R. Grace & Co. has extensive interests in the nuclear field through the activities of its operating subsidiary, Nuclear Fuel Services, Inc. In support of these activities, the Washington Research Center has an active Nuclear Research Department, which has during the past several years developed a new type of nuclear fuel in the form of dense microspheres of uranium oxide, carbide or nitride. In order to further test and evaluate these materials, it is sometimes necessary to produce small quantities containing enriched uranium. We also wish to extend this technology to plutonium-bearing fuels, using processes which we have demonstrated with the use of analogues.

IV. Duration of License

W. R. Grace & Co. requests that a license for special nuclear material be granted for a period of five years.

V. Amounts and Forms of SNM Materials

The special nuclear materials we wish to possess and use are:

1. Uranium-235

Uranium-235 in amounts up to 1000 grams with a maximum amount in process of 250 grams. This material will be received in the form of oxides or salts, which will be put into solution form, and ultimately converted to refractory oxides, carbides or nitrides.

2. Plutonium-239

Plutonium, mainly Pu-239 as available from fuel processing plants, in amounts up to 25 grams. This material will be received in solution form, and

converted to refractory oxides, carbides or nitrides, alone or in combination with natural or depleted uranium. No plutonium or uranium in metallic form will be used.

No nuclear materials (reactor products) will be produced at the Washington Research Center.

VI. Schedule

Receipts and transfers of enriched uranium will be scheduled as required by the progress of the research and development program, except that in no case will there be more than 1000 grams of contained U-235 on the premises at any time.

The initial receipt of plutonium is desired by about November 15, 1967. Receipts and transfers thereafter will be scheduled as required, except that in no case will there be more than 25 grams of plutonium on the premises at any time.

VII. Technical Qualification

Brief resumes are given below for the scientific personnel in our Nuclear Research Department who will be responsible for the handling of special nuclear materials.

L. V. Triggiani — Manager, Nuclear Research

Dr. Triggiani has had more than 7 years of experience in inorganic and nuclear research. He has worked on the development of Group III-V semiconductor compounds, oxidation catalysts, and since 1963 has done research on ceramic nuclear fuels. He has worked with uranium oxides, carbides and nitrides, and has developed a process for preparation of urania-plutonia microspheres.

J. G. Smith — Supervisor, Nuclear Research

Dr. Smith is a physical chemist with over 14 years of experience in inorganic and nuclear research. Her specialty since 1956 has been the

colloid chemistry of thorium, uranium, and the rare earth elements. She has also been involved in the preparation of new types of reactor fuels and in the chemistry of reprocessing spent fuels.

A. M. Gammill — Supervisor, Nuclear Development and AEC Security Officer

Dr. Gammill is a physical chemist with extensive experience in the nuclear industry. He was Technical Director of the Erwin, Tennessee, plant of Nuclear Fuel Services, Inc., for five years prior to joining the Washington Research Center. His areas of experience include ceramic nuclear fuels, fuel reprocessing and reactor technology.

N. R. Laine — Senior Research Chemist

Dr. Laine has worked in the field of gas-solid interactions, particularly the sorption of gases and vapors on surfaces, and the formation of coatings by vapor deposition. For the past year, he has been working in the area of ceramic nuclear fuels, particularly in the synthesis, sintering and coating of these fuels.

J. D. Moyer — Radiation Protection Officer

Dr. Moyer, Radiation Protection Officer of the Washington Research Center for the past 7 years, has had 16 years of experience in synthesis of radioactive labeled materials. Dr. Moyer has also had postgraduate courses in radiation measurements and radiochemistry.

J. H. Baird — Manager, Analytical Research

Mr. Baird has had more than 20 years of experience in the development of analytical methods, including microscopy, functional group analysis, radiochemistry, electroanalysis, particle size analysis, and gas-liquid chromatography. His formal training includes a 6-month course in analytical radiochemistry and 2 years on-the-job training in the use of radioactive isotopes.

A. MacCragh — Research Chemist

Dr. MacCragh is a physical-inorganic chemist with three years of experience in the nuclear field. His research interests have included calcium phosphates, radioactive waste treatment, fuel reprocessing, and ceramic fuels.

R. D. Shoup — Research Chemist

Dr. Shoup is a physical-inorganic chemist with three years of experience in preparation and characterization of nuclear fuels such as UO_2 and UN. Previous experience includes the chemistry of boron hydrides.

N. Haberman — Research Chemist

Dr. Haberman is a physical chemist with over five years of experience in the nuclear field. He has specialized in the preparation and evaluation of ceramic nuclear fuels, including investigations of high temperature sintering and coating by vapor deposition.

J. B. Ziegler — Medical Director

Dr. Ziegler has been Medical Director of the Washington Research Center for the last seven years. He holds a B.S. degree from Gettysburg College and an M.D. degree from the University of Maryland. He is well known in the fields of industrial medicine and physical therapy.

VIII. Description of Equipment and Facilities

1. Uranium-235

Work with U-235 will be done in three air-conditioned laboratories, supplied with all standard facilities, including stainless steel fume hoods. The laboratories are located in a security area in the basement of Building 1A, which is part of a large, modern research laboratory with extensive maintenance, engineering and machine shop services.

All experiments requiring the use of volatile organic liquids will be

in a well-ventilated development laboratory equipped with an automatic sprinkler system for fire protection. Most of the equipment in which U-235 will be handled is critically safe and has been designed to minimize the possibility of loss or spreading of radioactive materials. Also, the amount of material in process at any time will be limited to 250 grams. This equipment has been extensively tested and characterized using natural or depleted uranium.

Special receptacles for storage of liquid and solid waste are provided in all these laboratories. This waste will be shipped to Nuclear Fuel Services at West Valley for disposal. Monitoring equipment is described under Appendix II below.

Uranium-235 will be stored in a locked storage room in the security area. The material will be received from the Nuclear Fuel Services plant at Erwin, Tennessee, in a 55-gallon, drum-type birdcage equipped with a 3" diameter polyethylene bottle, containing 250 grams of U-235 per birdcage. (Bureau of Explosive Permit No. 1078 has been issued to the Erwin plant for shipment of special nuclear materials in this type of container.)*

2. Plutonium-239, General Layout

All work with plutonium will be done in a specially designed laboratory, Room 069, in the basement of Building 1A, located as shown in Drawing 67036-8C. The adjacent room, 067, is the change room.

The doors leading from the plutonium laboratory into the corridor and into Room 071 are sealed so access to the plutonium laboratory is only through the change room. Access is limited to specifically authorized personnel. Everyone entering the plutonium laboratory will be required to wear disposable coveralls or coats and shoe covers, which will be available in the change room. Immediately on leaving the plutonium laboratory, these

* Outbound shipments of uranium and plutonium will be made in accordance with Title 10, Part 71, Code of Federal Regulations. It is anticipated that Section 71.6 ("General License") will be applicable to most shipments.

will be removed and deposited in the receptacles provided. A knee-operated sink is available in the plutonium laboratory, and a sink and shower are available in the change room. A closed container for storage of bagged solid wastes will be provided in the plutonium laboratory. The floor of the plutonium laboratory is coated with an epoxy paint and covered with a heavy vinyl sheet taped in place to facilitate removal and replacement in the event of contamination.

The plutonium laboratory, the change room, and Room 071 have their own common ventilation system, which is completely independent of the rest of the building. The blower for this system is connected to an emergency generator which will switch on automatically in the event of a power failure. The exhaust from the plutonium laboratory is split, with each portion going through a 30" x 24" x 12" absolute filter as shown on Drawing 67036-5B and 67036-8C. These are fire resistant Model 1-D Cambridge filters. The return diffusers in each of these lines are louvered. There is a shut-off damper in each line just past the filter, so the filters can be isolated for changing. There is also a rough filter on each return diffuser. The exhaust from the lavatory in the change room will also go through an absolute filter before joining the main exhaust line. Air flows will be balanced so that flow is always from the change room into the plutonium laboratory.

Each glove box is provided with an 8" x 8" x 5-7/8" absolute filter on both inlet and exhaust. There are butterfly valves on both sides of the exhaust filters, and between the intake filters and the box. Thus, the negative pressure in each box can be controlled to $\frac{1}{4}$ to $\frac{1}{2}$" of water, and the filters can be isolated for changing. The exhaust manifold from the boxes is split into two legs with a valve on each leg to permit changing of individual filters without disturbing the rest of the system.

The exhaust fan EF-#4 (see Drawing 67036-8C) is in the second floor Fan

Room and discharges through the roof by way of a short stack. The glove box exhaust blower is interlocked with a sail switch with EF-#4 and cannot operated unless EF-#4 is drawing air. The rated capacity of EF-#4 is 9000 CFM at 3.6" water column.

The ventilation of the plutonium laboratory will be adjusted to approximately $\frac{1}{4}$" negative pressure with respect to the surrounding rooms.

In the event of loss of a glove, the air flow through the open port will be approximately 75 feet per minute. This should be sufficient to eliminate room contamination.

3. Plutonium-239, Glove Box Layout

The plutonium laboratory has eight glove boxes arranged in two parallel lines with cross-over ports at both ends and each cross-over port is provided with a sphincter valve and a bag-out port with a heat-sealable plastic bag, as shown on Drawing 67036-4C. The can in the sphincter valve is locked in position when not in use. The boxes are connected via nine inch square tunnels, and can be isolated from each other by means of a totally enclosed sliding glass door, with an inflatable rubber gasket for sealing. Thus, material can be introduced or removed at either end and can be transferred to any box without removal from the closed system. The cross-over ports do not have their own air inlet and exhaust lines but are kept under negative pressure by keeping the door to an adjacent box open.

The boxes are of 14-gauge, 304 stainless steel construction and have a $\frac{1}{4}$"-thick safety glass window, except for Box 6, which has a $\frac{1}{2}$"-thick plexiglass window equipped with a Neoprene diaphragm through which microscope eyepieces are brought out. The 3-foot glove boxes have two circular 8-inch glove ports, and the 4-foot boxes have three glove ports. There is a single glove port in each of the cross-over assemblies. Standard 15-mil or 30-mil gloves will be secured to the ports with rubber "O" rings. Details of glove box construction are shown in Drawings 67036-C, -1C, -2C, -3C.

Each box has a water tap and cup sink which drains to either of two 300-gallon Neoprene-lined steel tanks in the sub-basement of the building. These tanks are provided with a high level alarm system. Only uncontaminated liquids such as cooling water, etc. will be sent to these tanks. Draining of these tanks and handling of contaminated liquids is discussed in Appendix II below.

An inert gas supply is available for atmosphere control in any box when

necessary. The inert gas use will be intermittently as required for quality control of the material being processed in the glove boxes. The gas supply will be adjusted manually at supply bottles which are located outside the boxes. In order to insure proper operation of the inert gas supply, strict administrative controls will be exercised at all times as discussed below. The inert gas will not be used unless someone is present at all times; therefore, overnight operation of the inert gas supply will be permitted only if an operator is present. In the event of failure of the exhaust system or other causes which could result in overpressure in the boxes, the inert gas system will be shut down immediately. This instruction will be posted as part of the emergency shut-down procedures in the laboratory. All gas cyclinders will be equipped with reducing valves and pressure gauges to eliminate overpressures that might be caused by sudden surges with a direct connection. The needle valve on the reducer will eliminate the possibility of sudden pressure increases.

Each box also has coupling for a fire extinguisher for emergency uses. Three boxes will be equipped with fire extinguishers at present and one of these is the large furnace box.

to the box will have valves to permit removal or repair of the pumps without opening the box.

Plutonium will be introduced into the facility immediately upon receipt, and stored in Box 1 until needed. Product will be stored in Box 5, and bagged out immediately prior to shipment.

Box 1 will be used for unpacking and storage of plutonium shipments. Boxes 2 and 3 will be used for wet chemistry operations and contacting fine ceramic particles with plutonium solutions. Box 4 contains a vacuum oven and high temperature sintering furnace. The furnace has a water-cooled jacket to keep the surface temperature at an acceptable level. Box 5 has an analytical balance and will be used for product storage and packaging. Box 6 will contain apparatus for metallographic examination of ceramic fuel materials. Boxes 7 and 8 will be used for analytical sample preparation, miscellaneous wet chemistry and wet analytical chemistry.

The glove boxes will be checked for leak tightness prior to use by a dye penetration test of all welds, and a soap bubble test of all window housings and joints with the system under a positive pressure of about three inches of water.

All equipment and procedures will be tested in the glove boxes using analogues, prior to the introduction of plutonium.

IX. Health and Safety Programs

1. Uranium-235

The detailed discussion of the health and safety programs for Uranium-235 is contained in Appendix IV.

2. Plutonium-239

Standard operating procedures for routine operation of the facility, including changing of gloves and filter, are given in Standard Operating Procedure PF-1.

Procedures for liquid waste handling are given in Standard Operating Procedures PF-2.

Procedures for solid waste handling are given in Standard Operating Procedure PF-3.

Procedures for receiving and unpacking plutonium shipments are given in Standard Operating Procedure PF-4.

Health and safety procedures are given in Standard Operating Procedure PF-5.

Since the amount of plutonium in the facility at any time is limited to 25 grams, no special precautions regarding criticality are necessary.

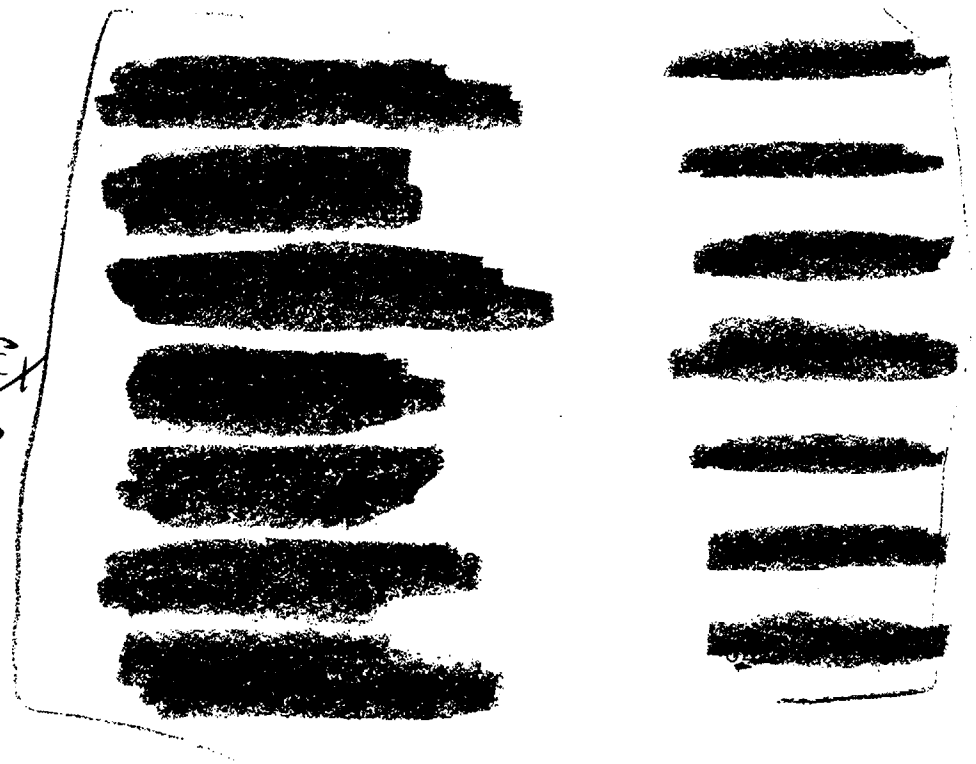
APPENDIX I

OFFICERS OF W. R. GRACE & CO.

OFFICERS		ADDRESS	CITIZENSHIP
President	J. Peter Grace	[redacted]	[redacted]
Executive Vice President	Felix E. Larkin	[redacted]	[redacted]
Executive Vice President	Alexander T. Daignault	[redacted]	[redacted]
Executive Vice President	John C. Duncan	[redacted]	[redacted]
Executive Vice President	Andrew B. Shea	[redacted]	[redacted]
Executive Vice President	Osgood V. Tracy	[redacted]	[redacted]
General Counsel, Vice President & Secretary	Leo A. Larkin	[redacted]	[redacted]
Vice President	George W. Blackwood	[redacted]	[redacted]
Vice President	Charles H. Erhart, Jr.	[redacted]	[redacted]
Vice President	Thomas G. Gibian	[redacted]	[redacted]
Vice President	Thomas E. Hanigan, Jr.	[redacted]	[redacted]

Vice President	William J. Haude
Vice President	Edward L. Hutton
Vice President	George F. Mason, Jr.
Vice President	John D. J. Moore
Vice President	D. Walter Robbins, Jr.
Treasurer	Kenneth A. Lawder
Controller	Fred R. Feuss

Ex 6



APPENDIX II

STANDARD OPERATING PROCEDURE

PF-1, Routine Operation of Facility

I. Entering and Leaving the Facility

A. Only personnel authorized by the facility supervisor shall be permitted to enter the facility, and everyone entering or leaving will be required to sign a log book kept outside the entrance.

B. No one will be permitted to enter the facility alone. A second person shall either be present in the facility, or observing the operation from outside.

C. Access to the facility will be only through the clean room. Disposable coveralls will be put on in the clean room, and disposable shoe covers will be put on at the entrance to the glove box room.

D. On leaving the glove box room, shoe covers will be removed and disposed of in the receptacle provided, just before entering the clean room. Coveralls will be monitored after each use and disposed of in the receptacle provided if they are no longer usable or saved for re-use.

E. After removal of coveralls and shoe covers, hands will be thoroughly washed, and hands and feet monitored. If there is any evidence of contamination, remain in the clean room and notify the Radiation Protection Officer.

II. Operation of the Glove Boxes

A. Before starting work in a box, read the manometer. If the pressure is between $\frac{1}{4}$ and $\frac{1}{2}$ inch, put on surgical gloves, untie box gloves and insert hands slowly so as to cause minimum disturbance to the pressure in the box. If the pressure is outside these limits, leave the glove box room and notify the facility supervisor.

B. Sharp objects or tools will be used only when essential, and with extreme care to prevent puncturing of gloves. When necessary to handle objects with jagged surfaces such as broken glass, tongs should be used whenever possible. Any wound or cut received while working in the box shall be reported to the Radiation Protection Officer immediately. The use of flames in the boxes is strictly prohibited.

C. When finished working in a box, check to see that all electrical equipment not in use is turned off, and sink covers and transfer port doors are closed. Carefully remove hands and secure gloves outside of the box, being careful to minimize pressure fluctuations during this operation. If vacuum has been used and is no longer required, be sure vacuum pump is turned off and valves are closed.

D. Immediately on completion of work in a box, hands will be monitored before removing surgical gloves. If there is any evidence of contamination, notify the Radiation Protection Officer as soon as possible.

E. On completion of work in the facility, surgical gloves will be removed and disposed of in the receptacle provided. After removal of protective clothing, hands will be thoroughly washed and monitored.

F. Pressure in the boxes will be read at the end of each working day. Plant security personnel will be instructed to observe box pressures in the event of a power failure during non-working hours. Indicators will be placed outside the facility for this purpose. The Radiation Protection Officer shall be notified immediately if pressure exceeds the specified limits.

G. When it is necessary to change gloves, this will be done under the supervision of the Radiation Protection Officer. The old glove will

be positioned inside the box, and a new glove will be placed on the port and secured with an "O" ring in the position nearest the box. The old "O" ring will be worked loose through the new glove, and the old ring and glove will be pushed inside the box to be bagged out. The new "O" ring will then be moved to the position farthest from the box.

III. Changing of Filters

When it is necessary to change filters, this will be done under the supervision of the Radiation Protection Officer. Filters will be changed when the pressure drop across the filter, as measured by the attached pressure gauge, changes by 25%.

A. Box Exhaust Filters

1. Close valves on both sides of exhaust filter and valve before inlet filter.
2. Insert a new filter in a plastic bag and tape the bag in place on the filter housing over the old bag.
3. With the new bag in place, remove the old bag, open the door, and remove the old filter into the bag.
4. Insert the new filter in place and close the door.
5. Heat seal the bag containing the used filter, and dispose of it in the solid waste container.

B. Box Inlet Filters

1. Same as Step (1) above.
2. Insert a plastic bag over the air intake line and tape in place.
3. Follow Step (2) - (5) above.
4. Carefully remove the plastic bag over the air intake line and immediately open all valves.
5. Monitor the area around the air intake line.

C. Final Exhaust Filters

1. Close either valve (A) or (B) on Drawing 67036-8, and close the

corresponding shut-off damper and intake diffuser.

2. Inspect the plastic bag over the filter housing and make sure that the bag is taped in place.
3. Open the housing door and remove the old filter.
4. Heat seal the bag and dispose of as solid waste.
5. Insert a new filter in a plastic bag and tape in place.
6. Insert the new filter.
7. Leave the sealed bag in place until the next change. Open all valves and dampers.

STANDARD OPERATING PROCEDURE

PF-2, Liquid Waste Handling

I. General

A. There will be four categories of liquid waste which will be handled by different procedures, according to composition and likelihood of contamination.

1. Aqueous process liquids which normally are not exposed to the glove box atmosphere, such as cooling water.
2. Aqueous process liquids which contact plutonium in insoluble form, such as microsphere ammoniation and wash liquors.
3. Aqueous process liquids which are known to be contaminated, such as analytical samples, solutions used for decontamination, etc.
4. Organic process liquids.

B. The hold tanks normally will be used only for the storage of uncontaminated aqueous liquids. Except for category (1) liquids, no liquid is to be discharged to these tanks until the permission of the facility supervisor has been obtained.

II. Category (1) Liquids

These liquids will normally be discharged directly to the hold tanks. If there is any evidence of a leak which could result in contamination of these liquids, they will be collected in a container in the box until the operation can be shut down, and this liquid will be treated as a category (2) liquid.

III. Category (2) Liquids

A. These liquids will be collected and stored in a 500 cc. container in

the box. Ammonia solutions and wash water will be stored in separate containers.

B. When these containers are full, the contents will be filtered through a 10 mμ Millipore filter.

C. After filtration, ammonia solutions will be heated to just below the boiling point and held there until the pH of the condensate is no higher than 8.

D. The solution will be sampled and counted. If the activity is less than 3×10^{-5} μc/ml, permission will be requested to discharge to the hold tanks.

E. If the activity is up to three times the specified limit, the solution will be diluted appropriately, and then follow instruction (D)

F. A record will be kept of the quantity and concentration of all liquids discharged to the hold tanks.

G. If the activity is in excess of three times the specified limit, the solution will be slowly boiled down to approximately 50 cc, and the residue will be mixed with Plaster of Paris and allowed to set, and will be bagged out as solid waste.

IV. Category (3) Liquids

1. These liquids will be accumulated to a volume of 100 cc, and precipitated with an excess of concentrated ammonium. The precipitate will be filtered out, and stored as solid waste. A record will be kept of the amount of plutonium in this waste, and it will be bagged out for disposal when its volume becomes inconvenient to store or when one gram of plutonium has been accumulated.

2. The filtrate will be treated as a Category 2 liquid, and disposed of according to Procedure III.

V. Category (4) Liquids

1. Organic process liquids will be stored and re-used wherever possible. When feasible they will be purified for re-use by distillation.
2. Organic liquids which cannot be re-used will be evaporated to dryness adsorbed on an excess of a suitable granular solid, and bagged out as a solid waste.

VI. Monitoring and Emptying of Hold Tanks

1. Only one tank will be used for receiving liquid at any time. The other tank will be held in reserve for diluting the effluent when necessary.
2. The tanks are not to be emptied except by permission of the Radiation Protection Officer and the facility supervisor.
3. A running record will be kept of all activity discharged to the tanks. When the plutonium content reaches 500μ g, or when the tank is full, the Radiation Protection Officer will be notified. If the 500μ g. level is reached before the tank is full, water will be added to fill the tank.
4. The tank will be sampled and counted under the supervision of the Radiation Protection Officer. If the level is below 3×10^{-5} μc/ml, it will be discharged to the sewer system.
5. If the level is above this limit, the contents will be transferred in increments to the second tank and diluted to bring the level down to the specified limit. The contents of the second will be sampled and counted again prior to discharge.

STANDARD OPERATION PROCEDURE

PF-3, Product and Solid Waste Removal

I. General

A. The approval of the Radiation Protection Officer will be required for all product removal operations, and he will be responsible for monitoring the operation.

B. All such operations will be recorded in a notebook, listing date and time, description and assay of material removed, and description of any abnormal occurrences.

II. Packaging of Product

A. Inside of a glove box the product will be carefully poured into a plastic bottle. This will be capped tightly and taped around the cap. The bottle will be carefully inspected and wiped clean of any evidence of contamination. It will then be inserted into a pipe container held in place in a vise or other appropriate clamping device, and the threaded caps for the pipe container carefully tightened. The pipe container will then be inspected and wiped clean of any evidence of contamination.

B. Removal of Product

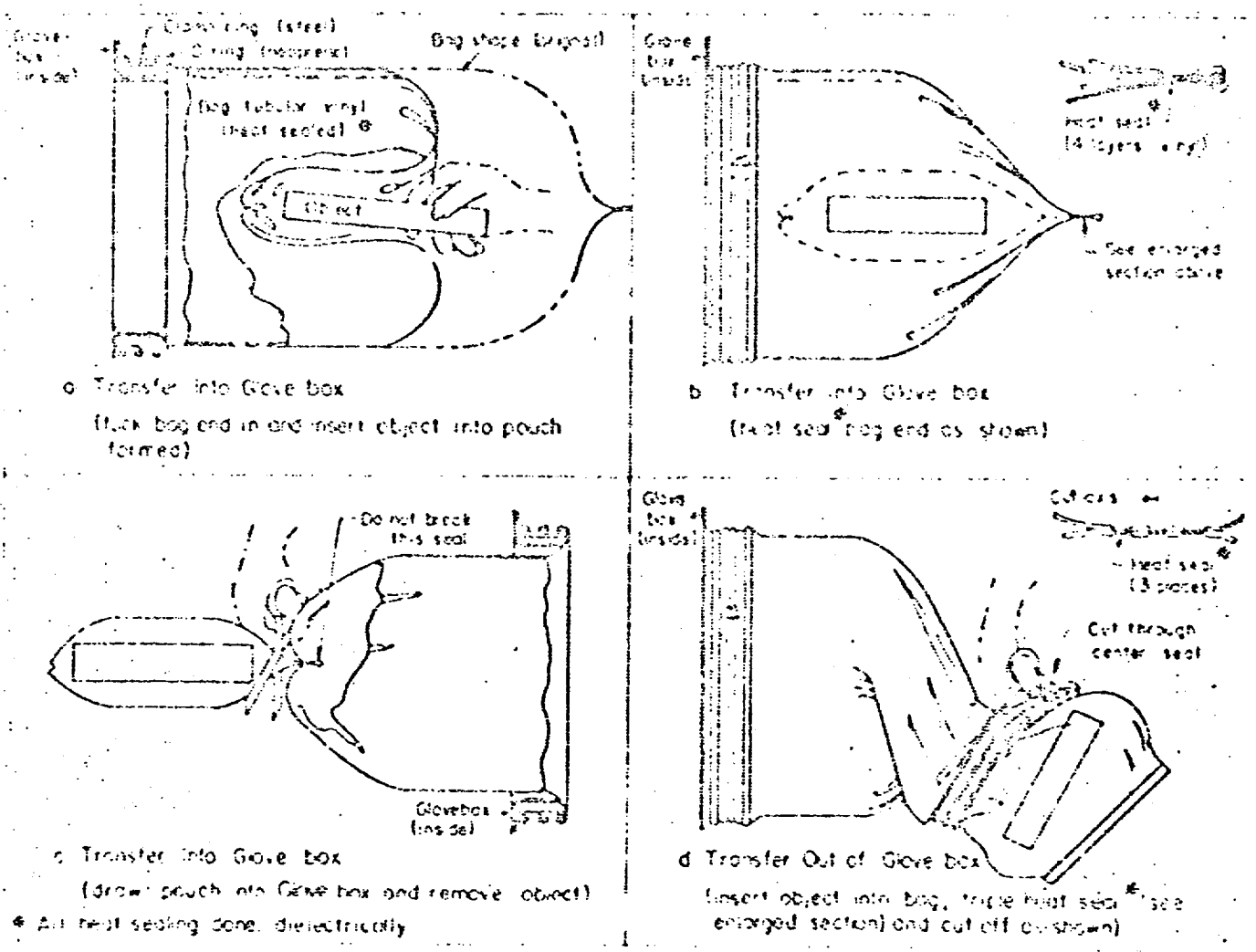
1. Product will be bagged out as shown in the diagram below.

C. Final Packaging

1. The bagged product will be monitored, and packed for shipment as directed by the Radiation Protection Officer.

D. Bag Replacement

1. The old bag is secured by the "O" ring farthest from the box. Place a new bag over the old one and secure with an "O" ring in the groove nearest the box.



a Transfer into Glove box
(Tuck bag end in and insert object into pouch formed)

b Transfer into Glove box
(Heat seal * bag end as shown)

c Transfer into Glove box
(Draw pouch into Glove box and remove object)

d Transfer Out of Glove box
(Insert object into bag, triple heat seal * (see enlarged section) and cut off as shown)

* All heat sealing done dielectrically

BAG TRANSFER PROCEDURE

2. Work the "O" ring on the old bag free through the new bag and remove.
3. Remove the old bag and "O" ring into the box and store to be bagged out as solid waste.
4. Carefully work the "O" ring on the new bag into position farthest from the box.

III. Packaging of Waste

Wastes will be bagged out and packaged and shipped according to procedures specified by the appropriate regulatory agencies.

STANDARD OPERATION PROCEDURE

PF-4, Receiving and Unpacking

I. General

A. The approval of the Radiation Protection Officer will be required whenever any material is to be introduced into the facility. He will be responsible for monitoring this operation.

B. All such operations will be recorded in a notebook, listing date and time, description and shipper's assay of material introduced, and description of any abnormal occurrences.

II. Opening of Shipping Container

A. Operators will wear surgical gloves during this operation, which will be monitored and disposed of at the conclusion of the operation.

B. The shipping container will be placed on a plastic sheet on the laboratory floor, and the cover unfastened and removed. Enough packing material will be removed to lift out the secondary container. The surface of the outside container will be monitored. The disposal of the shipping container and packing material will be specified by the Radiation Protection Officer.

III. Introduction into Glove Box

A. Containers less than three inches in diameter will be introduced through a sphincter valve, and larger containers will be bagged in.

B. For introduction through the sphincter valve, the container will be inserted into an appropriate can, and one operator will carefully insert the can in the sphincter valve and gently press it into position, while another operator will be in position to catch the old can and remove the container into the glove box as soon as the new can is in place.

C. For bagging in, operation will be as shown in the diagram below.

IV. Unpacking Primary Container

The secondary container will be clamped in a vise or other appropriate clamp or holder, and the cover carefully loosened and removed. The primary container will be carefully removed and placed in a stainless steel beaker. The secondary container will be recapped and all packaging materials will be transferred to the "out" box for bagging out.

STANDARD OPERATING PROCEDURE

PF-5, Health and Safety Program for Handling Plutonium

I. Air Monitoring

A. Equipment

1. Air Sampler, Staplex Model TFIA Hi-volume
2. Air Sampler, MCI Inc., Model HD28 Constant Flow Sampler, with Gast Pump and Gelman Filters.
3. Gast pump with limiting orifices, Gelman filter
4. Counter, Windowless, Gas-flow, Proportional, Nuclear Measurements Corp., Model PC-3A

B. Procedure

1. Air will be sampled continuously through two filters at breathing level in the laboratory during work hours. Samples will be collected daily and counted twice in the PC-3A windowless proportional counter, once shortly after sampling and again after allowing for decay of radon and thoron daughters.
2. For non-routine situations, and for air sampling in other areas, the Staplex Hi-volume Sampler will be used.
3. Stack effluent (downstream of the final filters) will be sampled continuously and isokinetically with a Gast pump and Gelman filter. Samples will be counted in the PC-3 counter.

II. Surface Monitoring

A. Equipment

1. Alpha Survey Meter, Proportional Gas-flow, Eberline Instrument Corp. Model PAC-3G
2. Alpha Floor Monitor, Eberline Instrument Corp., Model FM-3G

B. Procedure

1. Floors of the facility, change room, and entrance hall will be monitored daily during work periods.

2. Surfaces other than floors will be checked daily with the PAC-3G Survey Meter for alpha contamination.

3. Filter paper smear samples from work areas will be counted daily in the Nuclear Measurements PC-3A Proportional Counter.

4. Glove-box gloves will be examined daily and monitored for leakage by filter paper smears during periods of usage.

5. Equipment and materials will be surveyed for removable and fixed contamination before release from the laboratory.

Guide for Surface Contamination Limits

Surface	Limits
Floors	Controlled areas - 1000 dpm/100 cm^2 total Uncontrolled areas - 200 dpm/100 cm^2 total
Released equipment	500 dpm/100 cm^2, fixed 100 dpm/100 cm^2, removable

III. Area Monitoring

A. Equipment

1. Survey Meter, Victoreen Instrument, Model Thyac III, with alpha-beta-gamma probe

B. Procedure

The Thyac III will be used for gamma surveying where required, and for alpha detection in areas inaccessible to the larger probe of the PAC-3G survey instrument.

IV. Liquid Waste Monitoring

In general, liquid wastes known to contain special nuclear materials will not be permitted in sewage. Nevertheless, all effluent from the laboratory and clean room will be run into the collection tank and monitored before release into the general sewage system. A plancet alpha-counting procedure with Nuclear Measurements Corp. PC-3A proportional counter will be used.

V. Personnel Monitoring

A. Equipment

Three Hand Monitors, Eberline Instrument Corp., Model RM-3A with AC-3 alpha probes

B. Procedure

1. Two of the hand monitors will be mounted in convenient locations at work areas in the facility for routine survey of hands, surgical gloves, and other surfaces. Hand surveys are required after each operation in the glove box.

2. A hand and clothing monitor will be placed near the exit from the facility for final contamination checks before leaving the room.

VI. Equipment Calibration

The Nuclear Measurements Corp. PC-3A proportional counter will be calibrated semi-annually with a Pu^{239} alpha standard.

The three hand monitors, floor monitor, and portable survey meter will be calibrated semi-annually with a Pu^{239} standard, and their operation tested daily with an alpha check source.

The Thyac III survey meter will be calibrated semi-annually with a Cobalt-60 source and a Pu^{239} alpha standard.

VII. Bioassays

A pre-employment urinalysis for special nuclear materials will be required of each employee to establish a base line. Thereafter, routine sixty-day sampling will be required, with additional special sampling when indicated, and at termination of employment.

Urinalysis for plutonium in urine (and other biological specimens when necessary) will be performed by Isotopes, Inc., Westwood, New Jersey, using a procedure involving coprecipitation, separation on ion exchange, electrodeposition, and counting by alpha spectrometry.

Action points for excretion levels of plutonium will be 0.2 dpm/24 hrs. At this level the person will be removed from plutonium work, and re-samples will be taken.

VIII. Medical

See Section VIII of UF-1, Health and Safety Program for Handling U-235.

IX. Protective Equipment

A. Clothing

Shoe covers

Laboratory coats, disposable

Coveralls, disposable

B. Breathing

Dust Respirators

C. Procedures for Use

Laboratory coats and foot covers will be worn in the plutonium facility. After one using, the foot covers will be discarded into a receptacle at the exit from the facility. Coats and coveralls will be monitored after each use for contamination and collected in the receptacle when no longer usable. Respirators will be maintained outside the laboratory and will be used as required in special situations.

X. Emergency

A. Equipment

1. Scott self-contained breathing apparatus
2. First-aid kit, equipped for treating hemorrhage, lacerations, burns, and shock
3. Emergency kit containing disposable plastic suits, boots, head covers, and full-face respirators
4. Decontamination kit containing cleaning equipment, detergents, and waste containers

B. Procedure

Emergency equipment will be stored just outside the work area for use by Radiation Protection or Medical personnel. Emergency procedures are included with this application.

XI. Waste Disposal

All waste, including disposable clothing, will be packaged and shipped under applicable regulations to Nuclear Fuel Services, West Valley, New York, for disposal.

STANDARD OPERATING PROCEDURE

PF-6, Emergency Procedures

TABLE OF CONTENTS

I. Accidential Spills

A. Within glove box

1. Minor spills

2. Major spills

B. Outside glove box

II. Fire or Explosion

A. Fire within glove box

B. Fire outside glove box

C. Explosion

III. Glove Leakage

IV. Medical

V. Criticality

INTRODUCTION

All personnel working with plutonium will be required to become familiar with the safety emergency procedures described here before starting the work. They are intended to be guides for your actions during emergency, but not as a substitute for good sound judgment.

I. Accidental Spills

A. Within glove box

1. Summon your supervisor. If, in his judgment, the situation requires it, summon the Radiation Protection Officer (RPO), or his designated substitute.
2. In the meantime, if you are absolutely certain the gloves have not been punctured, do what you can to limit the spread of material.
3. Proceed with the clean-up under the direction of the supervisor, and the monitor if necessary.
4. Resume operations only after approval of your supervisor. Review your procedures critically to help avoid future accidents.

B. Outside glove box

The chance of radioactive materials being spilled outside the glove box is remote since the only operations performed outside the system are the introduction and removal of materials. In the event of rupture of a container during introduction or removal of materials, quickly evacuate and close the laboratory. Decision to evacuate the building will be made by the supervisor and Radiation Protection Officer. Remain nearby to be checked for contamination. Do not leave until the monitor gives approval. Decontamination will be directed by the Radiation Protection Officer using proper protective equipment. Re-enter the room only after decontamination and radiation survey are completed.

II. Fire or Explosion

A. Fire within the glove box

1. Warn all personnel in the area and make a quick evaluation of the fire. Have someone summon the supervisor and the Radiation Protection Officer.

2. Small fires (paper, small quantities of solvents, etc.) can usually be extinguished by smothering. If this is impractical, use the fire extinguisher mounted in the box.
3. If the fire is not easily controllable, retreat to a safe distance, telephone the Fire Department and pull the fire evacuation alarm located at the entrance to the facility. Remain nearby to assist fire-fighters and the Radiation Protection Officer.

B. Fire outside glove boxes

Any fire in the laboratory outside the glove boxes would almost certainly involve non-radioactive materials. However, respirators should always be worn when fire breaks out anywhere within the facility. Emergency procedures will be similar to those outlined for glove box fires.

C. Explosion

Explosion in a glove box is potentially the most dangerous occurrence. Quick action is imperative. For any explosion, assume that toxic material has been released into the laboratory.

1. Hold your breath and immediately evacuate and close the laboratory.
2. Have someone sound the building evacuation alarm, call the supervisor and the Radiation Protection Officer. Remain in the change room until you are surveyed for contamination if it is safe to do so.
3. If there is any chance that contaminating materials reached your body, remove clothing and take a shower with copious quantities of soap and water. Repeat if monitoring shows contamination above permissable level. The Radiation Protection Officer will survey and dispose of clothing if necessary.

III. Glove Leakage

Positive reading on the hand monitor is strong evidence of leakage through

the gloves. When this happens, proceed as follows:

1. Do not move around any more than necessary to assure your safety. Widespread contamination may be avoided by proper control of movements.
2. Have someone call the Radiation Protection Officer.
3. Place your hands inside a plastic bag and carefully strip off the surgical gloves. Be careful not to touch your exposed skin with the contaminated glove.
4. Check hand contamination again with the hand monitor. If still high, begin washing with soap and water in the sink.
5. Have someone check clothing with the hand and clothing monitor. If high readings are noted, get the assistance of the Radiation Protection Officer and the Medical Director for decontamination.
6. Resume operations only after complete decontamination, area monitoring, and replacement of the defective glove.

IV. Medical

Any injury while working with plutonium, no matter how minor, is considered serious. Small punctures can carry hazardous quantities of material into the body.

In any injury, proceed as follows without delay:

1. Summon aid from the medical office and call the Radiation Protection Officer. Do not leave the facility unless it is unsafe to remain there.
2. If first aid or other assistance is needed, the persons administering the aid must wear protective clothing and surgical gloves. Respirators will be worn if there is any chance that the contamination can be airborne.

Puncture wounds suspected to contain plutonium may be excised (if deemed advisable by the Medical Director), ashed and counted for plutonium. Otherwise wound monitoring will be performed at the Naval Medical Center.

3. Flush open wounds with copious amounts of soap and water. Stimulate bleeding, if necessary, to help wash out contamination.
4. Tourniquets should be used to control excessive bleeding and to help restrict uptake of radioactive material by the blood stream.
5. The Radiation Protection Officer will monitor wounds for residual contamination and the Medical group will proceed accordingly.
6. In case of puncture or laceration, save the responsible material for examination and radiation survey.
7. Injured persons will resume work only after release by the Medical Director.

STANDARD OPERATING PROCEDURE

UF-1, Health and Safety Program of Uranium-235

Following is a description of equipment and an outline of the program for the protection of personnel working with enriched uranium.

I. Air Monitoring

A. Equipment

1. Air Sampler, Staplex Model TFIA Hi-volume
2. Counter, Windowless, Gas-flow, Proportional, Nuclear Measurements Corp., Model PC-3A

B. Procedure

1. Air will be sampled during procedures where air contamination hazard may be created. Collected samples will be counted in the PC-3A windowless proportional counter.

II. Surface Monitoring

A. Equipment

1. Alpha Survey Meter, Proportional Gas-flow, Eberline Instrument Corp. Model PAC-3G
2. Alpha Floor Monitor, Eberline Instrument Corp., Model FM-3G

B. Procedure

1. Floors of the laboratories and storage area will be monitored routinely.
2. Surfaces other than floors will be checked with the PAC-3G Survey Meter for alpha contamination.
3. Filter paper smear samples from work areas will be counted in the Nuclear Measurements PC-3A Proportional Counter.

III. Area Monitoring

A. Equipment

1. Survey Meter, Victoreen Instrument, Model Thyac III, with alpha-beta-gamma probe

B. Procedure

The Thyac III will be used for gamma surveying where required, and for alpha detection in areas inaccessible to the larger probe of the PAC-3G survey instrument.

IV. Liquid Waste Monitoring

In general, liquid wastes known to contain special nuclear materials will not be permitted in sewage.

VI. Equipment Calibration

The Nuclear Measurements Corp. PC-3A proportional counter will be calibrated semi-annually with an alpha standard.

The PAC-3G portable survey meter will be calibrated semi-annually with an alpha standard, and their operation tested before each use with an alpha check source.

The Thyac III survey meter will be calibrated semi-annually with a Cobalt-60 source and an alpha standard.

VII. Bioassays

A pre-employment urinalysis for special nuclear materials will be required of each employee to establish a base line. Thereafter, routine six-month sampling will be required, with additional special sampling when indicated, and at termination of employment.

VIII. Medical

A complete pre-employment medical examination and medical history survey will be required for each prospective employee. Semi-annual blood test will be routinely given each worker. Results will be examined for unusual indications. The Washington Research Center has a Medical Director who will supervise medical surveillance for both routine and emergency situations.

IX. Protective Equipment

A. Clothing

Laboratory coats

B. Breathing

Dust Respirators

C. Procedures for Use

Laboratory coats will be worn in the SNM laboratory. Respirators will be maintained outside the laboratory and will be used as required in special situations.

X. Emergency

A. Equipment

1. Scott self-contained breathing apparatus
2. First-aid kit, equipped for treating hemorrhage, lacerations, burns and shock
3. Emergency kit containing disposable plastic suits, boots, head covers, and respirators.
4. Decontamination kit containing cleaning equipment, detergents, and waste containers

B. Procedure

Emergency equipment will be stored outside the work area for use by Radiation Protection or medical personnel. Arrangements have been made with the Clarksville, Maryland, Fire Department to provide fire-fighting

assistance, and with the Naval Medical Center, Bethesda, Maryland, to provide emergency hospital facilities. ~~Puncture wounds suspected to contain plutonium may be excised (if deemed advisable by the Medical Director), ashed and counted for plutonium. Otherwise wound monitoring will be performed at the Naval Medical Center.~~

XI. Waste Disposal

Waste will be packaged and shipped under applicable regulations to Nuclear Fuel Services, West Valley, New York, for disposal.

DOCKET NO. 70-456

For Div of Compliance

W. R. GRACE & CO.

Research and Development Division

WASHINGTON RESEARCH CENTER · CLARKSVILLE, MARYLAND

ITEM # 1

October 4, 1960

United States Atomic Energy Commission
Washington 25, D. C.

Attention: Division of Licensing and Regulation

Gentlemen:

W. R. Grace & Co. hereby makes application to the United States Atomic Energy Commission for a license to receive, possess, use and transfer special nuclear material. The information required by Section 70.22, Part 70, Title 10, Chapter I, Code of Federal Regulations, is contained herein and is presented in the same numerical order.

[redacted] in 1899 and has its principal office at 7 Hanover Square, New York 5, New York. Below are shown the names, titles, addresses and citizenship of Grace's principal officers:

EX 6

Name	Title	Address	Citizenship
J. Peter Grace	President	[redacted]	[redacted]
John C. Griswold	Exec. Vice President	[redacted]	[redacted]
A. S. Rupley	Exec. Vice President	[redacted]	[redacted]
Alexander T. Daignault	Exec. Vice President	[redacted]	[redacted]
Felix E. Larkin	Exec. Vice President	[redacted]	[redacted]
Andrew B. Shea	Exec. Vice President	[redacted]	[redacted]
J. T. Whitely	Exec. Vice President	[redacted]	[redacted]
Osgood V. Tracy	Exec. Vice President	[redacted]	[redacted]

E 14 (7)

A majority of each class of stock of the applicant and a majority of the voting power represented by stock of the applicant is owned by citizens of the United States. The applicant knows of no information concerning any control or ownership exercised over the applicant by any alien, foreign corporation, or foreign government. To the best of the applicant's knowledge and belief no control is exercised over the applicant by any alien, foreign corporation, or foreign government.

2. W. R. Grace & Co., through its Research Division, is a subcontractor to the General Electric Company. General Electric in turn, through its Aircraft Nuclear Propulsion Department, is a prime contractor to the United States Atomic Energy Commission. Under the terms of the subcontract, Grace is to attempt to carry out certain developments of a classified nature in the field of uranium chemistry. This development work involves handling special nuclear material which is to be furnished to Grace by the General Electric Company. Therefore, in order to carry out the subcontract, Grace must be able to receive, possess, use, and transfer such special nuclear material. All work under the subcontract will be carried out at Grace's Washington Research Center, Clarksville, Maryland.

In general, the subcontract requires that Grace exert its best efforts to prepare compositions of urania and other materials having specific properties and characteristics. Preparation of these compositions will be attempted using source material available to Grace under its Source Material License No. C-4132. If success is achieved, the preparation of certain of the compositions will be repeated using enriched urania so that the contractor can determine the nuclear properties of the resultant material. Grace has also agreed to supply the contractor with large laboratory samples of specific compositions containing enriched materials as required.

3. W. R. Grace & Co. requests that a license for special nuclear material be granted for a period of one year.

4. The amount and specifications of the special nuclear material to be used by Grace will be determined by the prime contractor, General Electric. We have been informed that we will normally be asked to work with approximately 250 grams of X material, a highly enriched uranium dioxide. The contractor has also stated that we may be asked to work with enriched uranium sulfate and enriched uranium chloride. If our work is successful, we may receive and use, during the course of the contract, as much as 1.5 kilograms of special nuclear material. However, we will not have in our possession at the Washington Research Center more than 250 grams of special nuclear material at any one time.

5. It is estimated that Grace may desire to receive the first shipment of special nuclear material from the contractor by October 17, 1960. Subsequent receipts and transfers will be scheduled when and if the research and development work proceeds successfully. In any event, it is anticipated that all receipts and transfers will have been accomplished by the termination of the subcontract on June 8, 1961.

6. The Research Division of W. R. Grace & Co. has both the physical facilities and qualified personnel to handle special nuclear material. Grace's Washington Research Center is completely modern (built within the last 3 years) and comprises two laboratory buildings with more than 90,000 square feet of floor space (a third building is under construction), a Van De Graaff generator, auxiliary buildings and services, and is well equipped with the latest analytical instruments. The present staff numbers more than 100 professionals and is supported by 200 technical, clerical and service personnel. Grace already has a Byproduct Material License and a Source Material License for the Washington Research Center.

Brief resumes are given below for some of our personnel who have had training or experience in the handling of radioactive materials. While there are additional personnel who have had such training or experience, we have listed only those who would be directly concerned with the subcontract, with safety precautions or who would act in a consulting capacity.

F. T. Fitch — Supervisor, Inorganic Chemical Research

Dr. Fitch, Principal Investigator on the subcontract, has had more than 17 years inorganic research experience, including specialization in the chemistry of thorium, uranium, rare earths, silica, fluorine and catalysts. For approximately 7 years Dr. Fitch was associated with the National Research Council of Canada, where his work on thorium, uranium, plutonium, and fission product separations was in support of the Chalk River Atomic Energy development.

James H. Baird — Analytical Research Group Leader

Mr. Baird, Analytical Consultant on the subcontract, has had more than 13 years experience in the development of analytical methods, including microscopy, functional group analysis, radiochemistry, electroanalysis, particle size analysis, and gas/liquid chromatography. Mr. Baird has taken a 6-months course, "Principles of Analytical Radiochemistry", at the Brooklyn Polytechnic Institute and has had 2 years on-the-job training with Merck & Co. in the use of radioactive isotopes.

10-456
For Div of Compliance

R. K. Taylor — Supervisor, Inorganic Chemical Research

Dr. Taylor, a consultant on the subcontract, has had more than 38 years experience in the physical and analytical chemistry of inorganic compounds with especial interest in the design and construction of experimental apparatus. Dr. Taylor has had 32 years part time experience in handling radium salt solutions for the Kelly Clinic and U. S. Public Health Service Hospital in Baltimore.

J. D. Moyer — Radiochemistry Supervisor

Dr. Moyer, Radiation Protection Officer of the Washington Research Center, has had 9 years experience in the organic synthesis of radioactive-labeled materials. Dr. Moyer's formal training, in addition to on-the-job experience with the National Bureau of Standards, includes a course, "Radiation Hygiene Measurements", at New York University, Post-Graduate Medical School, and a course in Radiochemistry at the University of Maryland.

7. The work will be done in a 25' x 25' modern, air-conditioned laboratory, supplied with all standard facilities. It is part of a large, modern, research laboratory constructed 3 years ago. Extensive maintenance, engineering and machine shop services are available.

Certain procedures, as outlined in Section 8, are to be followed in the receipt and handling of the samples of special nuclear material. These procedures reduce storage requirements to laboratory handling through the experiment and eliminate waste disposal facilities. Limited experimental wastes and residues will be collected quantitatively and shipped to the contractor for recovery. These procedures limit the quantity of special nuclear material on the premises and in experimental use at any time to no more than 250 grams (one shipment), thus removing hazards of criticality.

In most of the preparations, the special nuclear material will be associated with ceramic compositions which are very toxic and which will require very strict precautions during processing. The A.E.C. has established strict requirements for laboratories and facilities handling these toxic compounds. These precautions involve the following:

a) Limited access to area.
b) Closed laboratory at reduced pressure with filtration and monitoring of vented air.
c) Enclosed, protected and vented equipment.
d) Personnel protective clothing and devices.
e) Close monitoring of area and equipment.

The special nuclear material will be received as a non-volatile material, usually as the oxide, and will be put into solution as the initial step. Throughout the preparations and as product, it will be handled as a solution or slurry. No volatile or inflammable solvents are involved. Neither the toxic agent nor the special nuclear material will exist in a volatile form during the operations. The precautions are required because of the extremely low permissable levels of the agents. They prevent any ingestion hazard due to mechanical air entrainment or to contamination which results in toxic dusts.

In use, the special nuclear material will be associated with highly toxic compounds which require strict procedures, as recommended by the A.E.C., to protect personnel, to ensure quantitative handling of the materials, and to avoid contamination. This includes close monitoring supervision of the toxic compounds and medical supervision of the personnel. Monitoring for the work with the toxic compounds requires a detailed, daily sampling program (both smear and air samples) of the area, of the equipment and of individual operations with a final spectrographic determination. Very low permissable levels must and will be maintained. This monitoring will establish and maintain quantitative experimental procedures and uncontaminated working areas. The special nuclear material is to be used in the preparation of selected samples by methods well established by prior work, using the toxic compounds and normal or depleted urania. The monitoring program of both smear and air samples for the toxic compounds will apply in these cases but will also include alpha counting for the special nuclear material to bring this constituent under strict supervision.

The equipment available or on order to conduct the monitoring program for the toxic agents and special nuclear material is summarized briefly below:

Sampling:
Staplex Hi-Volume Air Sampler, Model TFIA.

Spectrographic:
Jarrell-Ash, 3.4 m. Ebert Model 7102 Spectrograph

Jarrell-Ash Microphotometer, Model 2100 and supporting accessories

Radiation Detection:
Nuclear Measurements Corp. PC-3A, Windowless Gas-Flow Proportional Counter. This instrument will be used for measuring alpha activity on filters, smears and other deposits.

Radiation Detection: (Continued)

Victoreen Cutie Pie Survey Meter, Model 740B. Sensitivity range 0-100 mr./hr., window thickness 0.0005 inch of mylar. Useful for laboratory surveying; detects alpha contamination as well as beta and gamma.

Tracerlab Survey Meter, Model SU14. Sensitivity range 0-25 mr./hr., window thickness less than 2 mg/cm^2. Also useful for laboratory surveying. It is more sensitive but less convenient to use than the Cutie Pie.

There will be close supervision of personnel by the applicant's medical department throughout the work, including physical examinations before, during and after working with the toxic compounds and with the special nuclear material. An unsatisfactory medical history or physical condition can exclude an individual from the work at any time.

As a part of its application for a special nuclear material license, Grace proposes the following shipping procedures to protect against accidental conditions of criticality in the transportation of special nuclear material. The information required by Section 71.23, Part 71, of the Code of Federal Regulations is given below.

The maximum quantity of special nuclear material to be shipped in each container is 250 grams. A shipment will include only one container. The special nuclear material will be fully enriched U-235 in the form of a hydrated uranium dioxide suspension or colloid. The suspension or colloid may contain up to 30% uranium dioxide.

Each shipment of special nuclear material will be loaded into a leak-proof container packed in absorbent material (eq. Kimpac) in a one-gallon can. The one-gallon can will be centered in a 20" x 20" x 20" bird cage bearing Bureau of Explosives Permit No. 988 for transportation of radioactive materials. A radioactive material red label identifying the contents will be attached. The shipment will be made by Railway Express Armed Surveillance Service.

In addition to the above, all packages will be surveyed to determine that their surfaces are free from alpha contamination (<20 disintegrations per minute per square foot as determined by alpha smear) before shipment is made. The receiver will be notified by telegram when and how shipment is made.

W. R. GRACE & CO.
Research & Development Division
WASHINGTON RESEARCH CENTER
CONTINUATION

To the best of our knowledge and belief the procedures we have proposed are entirely adequate to protect against accidental conditions of criticality, taking into account the possibility of accidents, including flooding, fire and wreckage.

If additional information is required we will be happy to supply it.

Very truly yours,

W. R. GRACE & CO.

Gage

W. P. Gage
Vice President

WPG:jm

DOCKET NO. 70-456

For Div of Compliance

GRACE

W. R. GRACE & CO.

RESEARCH DIVISION

Washington Research Center, Clarkeville, Maryland 21029

May 28, 1964

Mr. Donald A. Nussbaumer, Chief
Source and Special Nuclear Materials Branch
Division of Licensing and Regulation
United States Atomic Energy Commission
Washington 25, D.C.

License No. SNM-417

0101

Dear Mr. Nussbaumer:

W. R. Grace & Co. hereby makes application for amendment of the above designated special materials license to permit us to store a larger quantity of special nuclear material in a locked room on the premise of our Washington Research Center without in any way changing the quantities of materials designated for processing use at any one time. We are furnishing below information in support of this request for amendment which was discussed with Mr. R. L. Layfield of your office.

In simple terms, we desire to amend our present license to allow storage of up to 1,000 grams of enriched U-235 in a locked storage room on the premise of our Washington Research Center (the storage room is located in Lab. 001 of Building No. 1) with the maximum limit of material in process remaining at 250 grams as stipulated in our present license. The U-235 would be received from the Erwin plant of Nuclear Fuel Services, Inc. at Erwin, Tenn. in 55 gallon drum-type birdcages equipped with 3" diameter sleeves with the active material sealed in a 3" diameter polyethylene bottle, containing 250 grams of contained U-235 per birdcage. (Bureau of Explosives Permit No. 1078 has been issued to the Erwin plant for shipment of special nuclear materials in this type of container.) To further amplify the supporting information to this petition, we are referring below to supporting information contained in our letter of 4 October 1960, which gave the information required by the code of Federal Regulations and indicating under each item number changes which have occurred up to the present time.

1. There have been changes in the officers of the parent company, and we are therefore listing below the current slate of corporate officers:

ITEM # 5

E/5

(4)

Name and Title	Address	Citizenship
J. Peter Grace President	[redacted]	[redacted]
Alexander T. Daignault Executive Vice President	[redacted]	[redacted]
Felix E. Larkin Executive Vice President	[redacted]	[redacted]
Andrew B. Shea Executive Vice President	[redacted]	[redacted]
O. V. Tracy Executive Vice President	[redacted]	[redacted]
Franklin Moon Vice President and Secretary	[redacted]	[redacted]
Charles H. Erhart, Jr. Vice President	[redacted]	[redacted]
Thomas E. Hanigan, Jr. Vice President	[redacted]	[redacted]
John D. J. Moore Vice President	[redacted]	[redacted]
D. W. Robbins, Jr. Vice President	[redacted]	[redacted]
K. A. Lawder Treasurer	[redacted]	[redacted]
F. R. Feuss Controller	[redacted]	[redacted]

EVL

2. The stipulated reason for issuance of the original license was because of our operations as a subcontractor to the General Electric Co. This has now changed to the following: "W. R. Grace & Co. has nuclear interest through the commercial activities of its Nuclear Fuel Services subsidiary. The Research Division of the company will have need from time to time to perform experimental work seeking to develop improved technology in fuel processing which will require work with small amounts of enriched uranium".

3. We would like to maintain this license for an indefinite period. It currently expires in October, 1964, and we would like to have it extended at that time.

4. The information supplied in our letter of October 4, 1960, in reply to this item is now completely obsolete and should be changed in accordance with the information given in paragraph 2 of this letter above.

5. We request permission to receive the first shipment of material under this amended license at the Washington Research Center by 8 June 1964. Subsequent receipts and transfers will be scheduled as required by the progress of the research and development programs.

6. Some additional personnel will work with this material, but we understand that details on them are not required.

7. The information originally given under this item as to facilities is still correct, however, the current series of experiments is to be carried out in our laboratories 213-215 as well as in laboratories 225-227 which were originally designated in our application as the only site for operations with special nuclear materials. The new laboratories conform essentially to the same standards of safety as the previously stipulated laboratories, except that they are not separately filtered through absolute filters with negative pressure provisions. The reason for lack of this precaution in the additional laboratories stipulated (Laboratory 213-215) is that we no longer contemplate use of beryllia in conjunction with the experimental work.

   The point of origin for shipment of enriched urania to this laboratory will also be changed. The material will now come from the Erwin plant Nuclear Fuel Services in Erwin, Tenn. Accountability will be maintained by them, and we will ship back to them the full 250 grams which they ship to us.

   Under the amended license, we propose to receive four 250 gram birdcages at one time and to store them in a locked room. One of these cages would then be issued and the material handled by our chemists in laboratory operations. At the conclusion of their experiments, they would have to account for the entire 250 grams through weighing of the final material and would then repackage this material in the

original birdcage for shipment back to Erwin. Only after completion of this cycle would the second birdcage be opened and additional enriched U-235 taken into the laboratory for processing. In this manner we would have an absolute check against possible inadvertent accumulation of material into a dangerous level.

In paragraph 5 under Item 7 of our original application we stipulated that operations would be carried out under the directions of personnel in the General Electric Corporation. This is now obsolete and the current operations would be carried out under the direction of the Safety and Criticality Engineers from the Erwin plant of Nuclear Fuel Services.

We should also point out that the material given in paragraph 6 under the original item 7 is no longer completely applicable. The current series of experiments will be at the direction of various projected customers of Nuclear Fuel Services, Inc.

8. The information given under this item in our original application is now obsolete and is modified by the basic information given above. We no longer contemplate processing urania with beryllia. Shipping procedures are also changed as above. Shipping procedure and monitoring will remain as formerly listed.

We appreciate your cooperation in this matter and hope that the information given will be sufficient to permit prompt amendment of this license.

Very truly yours,

W. K. O'Loughlin, Director
Contract Operations

WKO/c

File Copy

W. R. GRACE & COMPANY
HMS LABORATORY
BOX 188
POMPTON PLAINS, N.J.

RECEIVED
1965 SEP 14 11 55
U.S. AT... COMM.

ITEM # 6

September 10, 1965

United States Atomic Energy Commission
Washington, D.C. 20545

Attention: Dr. John A. McBride, Director
Division of Materials Licensing

SEE 40-7399

Gentlemen:

W. R. Grace & Company hereby makes application to the United States Atomic Energy Commission for a Source and Special Nuclear Materials License for use at its HMS Laboratory at Wayne, New Jersey.

The information required by Section 70.21 and Section 70.22, Part 70, Chapter 1, Title 10, Code of Federal Regulations, is contained herein and is presented in the same numerical order.

1. W. R. Grace & Company was incorporated in the State of Connecticut in 1899 and has its principal office at 7 Hanover Square, New York, New York (10004). Below are shown the names, titles, addresses, and citizenship of Grace's principal officers:

Name and Title	Address	Citizenship
J. Peter Grace President	[redacted]	[redacted]
Alexander T. Daignault Executive Vice President	[redacted]	[redacted]
John C. Duncan Executive Vice President	[redacted]	[redacted]

EXL

E/6 (9)

ACKNOWLEDGED 3045

United States Atomic Energy Commission
Washington, D.C.

From: R. M. Mandle

Name and Title	Address	Citizenship
Felix E. Larkin Executive Vice President	[redacted]	[redacted]
Andrew B. Shea Executive Vice President	[redacted]	[redacted]
O. V. Tracy Executive Vice President	[redacted]	[redacted]
Franklin Moon Vice President and Secretary	[redacted]	[redacted]
Charles E. Erhart, Jr. Vice President	[redacted]	[redacted]
Thomas E. Hanigan, Jr. Vice President	[redacted]	[redacted]
John D. J. Moore Vice President	[redacted]	[redacted]
D. W. Robbins, Jr. Vice President	[redacted]	[redacted]
K. A. Lawder Treasurer	[redacted]	[redacted]
F. R. Feuss Controller	[redacted]	[redacted]

EX 6

A majority of each class of stock of the applicant and a majority of the voting power represented by stock of the applicant is owned by citizens of the United States. The applicant knows of no information concerning any control or ownership exercised over the applicant by an alien, foreign corporation or foreign government.

United States Atomic Energy Commission
Washington, D.C.

From: R. M. Mandle

2. Certain research concerned with the nuclear fuel cycle is being conducted at the company's HMS Laboratory located in Wayne, New Jersey, where a laboratory scale gas centrifuge test bed has been installed.

Research activities and operations pertaining to gas centrifuges are performed in association with Electro-Nucleonics, Inc., of Caldwell, New Jersey, under Contract No. AT(49-2)-2459 with the United States Atomic Energy Commission. The company will have need from time to time to perform experimental work seeking to develop improved gas centrifuge technology which will result in the slight enrichment of small amounts of uranium.

Natural or depleted uranium hexafluoride will be obtained from ordinary sources. An experimental feed will be made by quantitatively vaporizing these gases into a manifold to form a controlled composition as determined by chemical and isotopic analysis. Gram quantities of this gas will be quantitatively fed into the gas centrifuge system where samples of the product and waste gases from the centrifuge will be collected and analyzed. Because of the separative work performed by the centrifuge some enriched uranium samples may be collected. No enriched uranium will be manufactured.

3. W. R. Grace & Company requests that a license for source and special nuclear material be granted for a period of three years.

United States Atomic Energy Commission
Washington, D.C.

From: R. M. Mandle

4. Uranium hexafluoride will be stored in cylinders in the laboratory, a vault-like controlled area, in quantities so that the maximum of UF_6 possessed at any time shall not be in excess of 250 grams of contained U-235. This material may be in any physical, chemical or isotopic form.

5. Receipts and transfers will be scheduled as required by the progress of the research and development program, except that in no case will there be more than 250 grams of contained U-235 on the premises at any time.

6. The HMS Laboratory has both the physical facilities and qualified personnel to handle source and special nuclear materials. Additional technical support is available from the Research Division of W. R. Grace & Company at Clarksville, Maryland, which has technical responsibility for the HMS Laboratory; and Electro-Nucleonics, Inc., Caldwell, New Jersey, which develops the basic machinery.

Brief resumes are given below for the present personnel who have had training and experience in the handling of radioactive material:

HMS Laboratory Personnel

R. M. Mandle, Laboratory Manager

Mr. Mandle was formerly manager of the W. R. Grace rare earth and thorium plants and has 17 years experience in handling radioactive materials. He now has direct full-time responsibility for the HMS Laboratory. He also has responsibility for the radiation safety aspects of the HMS Laboratory.

United States Atomic Energy Commission
Washington, D.C.

From: R. M. Mandle

R. A. Brooks

Mr. Brooks has had more than 25 years of electronic and mechanical experience. He was formerly associated with Wm. B. Johnson Associates in the design and testing of various radiation detection equipment.

E. G. Smilek

Mr. Smilek was formerly in charge of the thorium refining plant of Rare Earths, Inc. (a W. R. Grace subsidiary) and has had 10 years experience in handling of radioactive material produced under AEC Contract No. AT(30-1)-1037.

Research Division, W. R. Grace Personnel

M. G. Sanchez

Dr. Sanchez in his capacity as Vice President, Inorganic and Nuclear Research Department, has worked in the field of research involving such projects as (1) preparation of special nuclear fuels for reactors, (2) preparation of special nuclear fuels for space crafts, and (3) preparation of special ceramic systems for the ANP program.

G. E. Ashby

Mr. Ashby has had 15 years experience in analytical and physical research including specialization in X-ray diffraction and spectrocopy. For three years before joining W. R. Grace he was supervisor of the X-ray diffraction and electron microcopy for the Trace Elements Program of the Atomic Energy Commission at the U. S. Geological Survey.

United States Atomic Energy Commission
Washington, D.C.

From: R. M. Mandle

Electro-Nucleonics Personnel

J. J. Newgard

Mr. Newgard, President, did graduate work at Columbia University in electromagnetic separation and enrichment of isotopes. He was employed by Westinghouse Electric Corporation where he engaged in design and construction of a solid source mass spectrometer for UF_6 isotope analysis. He was formerly project engineer and Supervisor of Atomic Technology with Pratt & Whitney Aircraft and Thiokol Chemical Corporation respectively, with particular emphasis on nuclear reactors and nuclear reactor propulsion.

V. V. Abajian

Mr. Abajian, Vice President, is a licensed Professional Engineer in the State of New Jersey. He has broad experience in the design and manufacture of mechanical components, rotary mechanical and hydraulic equipment. Mr. Abajian is largely responsible for the design, fabrication and testing of the gas centrifuges installed in the HMS Laboratory.

7. The HMS Laboratory is a modern two-story building providing 6,000 square feet of area devoted exclusively to gas centrifuge technology. The gas centrifuge machines are located on the first floor in an air-conditioned vault-like work area. Access to the machines is limited to authorized personnel by usual AEC security systems.

The laboratory contains the necessary mechanical and analytical support facilities as well as offices, locker rooms, power plant, etc.

United States Atomic Energy Commission
Washington, D.C.

From R. M. Mandle

The entire gas centrifuge system operates under a vacuum which minimizes any airborne activity or waste disposal. Safety showers and eye washes are strategically located in all areas where uranium hexafluoride is handled. Personnel have been trained in the handling of UF_6 both from the standpoint of contamination control and of chemical reactions with organic compounds and reducing agents. Fluorinating and HF forming characteristics are recognized and first aid treatment by prompt flushing is understood. Any wastes resulting from safety showers, floor washings or hydrolysis of uranium hexafluoride are collected and treated in an approved and constantly supervised radiological waste treatment plant located on the property.

A radiological health and safety program will be followed similar to that in force at the adjacent thorium processing plant of W. R. Grace. In addition to the available services of that plant's health physics and safety personnel, the following radiation monitoring equipment is available:

Sampling and Survey

Staplex Hi-Volume Air Sampler with Model TFA 41 Filter

Radiation Detector, Anton Electronic Laboratory, Inc, Model #5

Radiation Detection

Nuclear Corporation DR-15 Gas Flow Windowless Proportional Counter

Nuclear Corporation EDU-12 Sample Evaporator

Radiation Instrument Development Laboratory Model 49-54 Scaler

United States Atomic Energy Commission
Washington, D.C.

From: R. M. Mandle

Analysis

Applied Physics Corporation MAT Mass Spectrometer

Personal Monitoring

Film Badge Service, St. John's X-ray Laboratory.

8. The amount of uranium 235 used in the HMS Laboratory at one time will be limited to 250 grams, therefore, there is no possibility of criticality.

Natural or depleted UF_6, involving gram quantities, is fed to experimental gas centrifuge machines to determine the effect of machine design on the separation of U-235 isotopes in order to develop a feasible gas centrifuge for isotope separation. Following the product and waste sample points, the enriched and depleted UF_6 gas streams exit the centrifuges and are immediately condensed together in a common cold trap or in a receiving cylinder. Following a run, the contents of the common cold trap are vaporized to a cylinder and condensed. Then the contents of the vacuum system cold traps are vaporized and condensed in the same cylinder. If a receiving cylinder is used instead of a cold trap, the contents of the vacuum system cold traps are vaporized and condensed in the receiving cylinder. In any case all of the material charged except small amounts withdrawn for sampling is discharged into the same container. The contents of the receiver cylinder are warmed in a constant temperature bath, liquified, mixed by rolling the clyinder and then cooled and solidified. The mixed UF_6, at natural U-235

United States Atomic Energy Commission
Washington, D. C.

From: R. M. Mandle

concentration, is ued as a feed for additional experiments. Thus no enriched uranium is manufactured. Even the sample, after analysis, will be remixed to the natural state.

Additional details in support of this application are contained in the enclosed Form AEC-2 and supplements thereto.

If additional information is required we will be happy to supply it.

Very truly yours,

W. R. GRACE & COMPANY

Richard M Mandle

R. M. Mandle
Project Manager
HMS Laboratory

RMM:MCB

10 CFR 2.790

PERMISSION

I give permission to employees, contractor personnel, and agents of the U. S. Department of Energy and the U. S. Nuclear Regulatory Commission to perform a radiological survey on the property described below. I understand that this may involve disturbing some underbrush and vegetation, and will include drilling a few holes in the ground as described in the NRC letter dated , which transmitted this form. My restrictions on this permission are listed below.

Property Description:

Property Identified as Block [redacted] EX 6
Lot

Restrictions:

April 17, 1982

[redacted] EX 6
Name

Signature by owner(s) of property or authorized representative

[redacted] EX 6
Address

[redacted]

[redacted] EX 6
Telephone

10 CFR 2.790 INFORMATION

E 7

ITEM # 7

Information in this record was deleted in accordance with the Freedom of Information Act, exemptions 6
FOIA- 2000-0101

10 CFR 2.790 INFORMATION