

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 999-90003/94027(DRSS)

Licenses No. SNM-0746 and No. SNM-0716 (terminated)

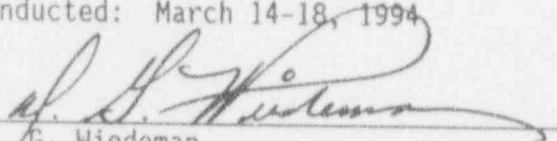
Docket Nos. 070-00807; 070-00351 (terminated)

Licensee: National Aeronautics and Space Administration (NASA)  
Lewis Research Center  
21000 Brookpark Road  
Cleveland, Ohio 44135

Inspection At: Lewis Research Center  
Buildings 14, 23, 49, 51, 54, 77, 86, 100, 105, 106 and 309  
Cleveland, Ohio  
-and-  
Plum Brook Reactor Facility  
Second floor chemistry laboratories  
Sandusky, Ohio

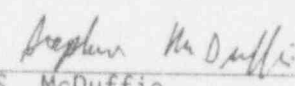
Inspection Conducted: March 14-18, 1994

Inspector:

  
D. G. Wiedeman  
Senior Health Physicist

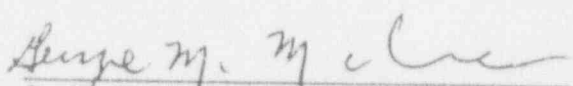
4-14-94  
Date

Assisted By:

  
S. McDuffie  
Intern

4/19/94  
Date

Approved By:

  
G. M. McCann, Chief  
Fuel Facilities and Decommissioning  
Section

4/19/94  
Date

Inspection Summary

Inspection on March 14-18, 1994 (Report No. 999-90003/94027(DRSS))

Areas Inspected: This was a special inspection to review the licensee's activities and to determine if facilities had been adequately decontaminated prior to termination of its licenses. The inspectors conducted an independent review of transfer records and performed radiation surveys in the licensee's buildings previously used for research and testing with AEC licensed special nuclear materials. This inspection was part of an NRC project which evaluated approximately 17,000 retired licenses. An NRC contractor, Oak Ridge National Laboratories (ORNL), performed the evaluation. On the basis of the

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information in the retired license file, such as type and quantity of authorized materials and lack of adequate decontamination documentation, ORNL concluded that this facility has a potential for residual radioactive contamination.

Results: The NRC inspectors identified low level removable contamination on the floor in two chemistry laboratories at the Plum Brook Reactor facility; however, the contamination was not from the licensee's use of special nuclear materials. The inspectors determined that all other buildings and facilities used for research and development with special nuclear material were free of residual contamination, except Rooms C-5, H-10 (now room 9) and 13-A. At the time of the inspection these rooms were being used to store radioactive sources and/or radioactive waste under License No. 34-00507-16 preventing an adequate close out survey due to the radiation levels.

## DETAILS

### 1. Persons Contacted

- \*Gayle Reid, Radiation Safety Officer, NASA
- @\*Michael Blotzer, Chief, Industrial Hygiene Office, NASA
- @John Cooper, Ph.D, Service Contractor for NASA, Bionetics, Hampton, Virginia
- Henry Pfanner, P.E., Engineering Manager, Plum Brook Reactor Facility, NASA
- Len Homyak, Engineer, Plum Brook Reactor Facility, NASA
- Ray Ruffing, Rad Technician, Plum Brook Reactor Facility, NASA
- \*Larissa Gilham, Health Physicist, Ohio Department of Health

\* Attended the exit meeting conducted on March 18, 1994.

@ Telephone conversation conducted on April 7, 1994, regarding the results of laboratory analysis of samples collected at the time of the inspection.

### 2. Background

#### License No. SNM-0746

AEC License No. SNM-0746 was issued to NASA on December 31, 1963 (Attachment A). This license originally authorized 500 grams (.5 kg) of uranium enriched in the uranium-235 isotope. In 1971 the possession limit was raised to 10,000 grams (10 kg) of enriched uranium. The license authorized possession of enriched uranium in the form of fuel plates, pins, cermet plates, powder and fuel pellets/foils in support of research and development. The NRC inspectors' review of historical documents in the license file indicated that special nuclear materials were used in the following buildings: 49 (Materials and Stress Building) and 105 (Materials Processing Laboratory) in the Lewis Research Center, Cleveland, Ohio and the Plum Brook Reactor Facility (PBRF) in Sandusky, Ohio. The license expired on March 31, 1975.

#### License No. SNM-0716

AEC License No. SNM-0716 was issued to NASA in 1963. This license authorized 1,000 grams (1 kg) of uranium enriched in the uranium-235 isotope in the form of uranium foils and aluminum alloys for research and development of uranium alloys (Attachment B). The NRC inspectors' review of historical documents in the license file indicated that special nuclear materials were used in the following buildings: 49 (Materials and Stress Building), 105 (Materials Processing Laboratory), 77 (Instrument Research Laboratory), 100 (Rocket Operations Building), 14 (Technical Services Building), 51 (High Energy Fuels Building), 23 (Energy Research Building), 309 (Space Power Research Laboratory), 106 (Basic Material Laboratory), 86 (Super Sonic Wind Tunnel - 10 x 10), 54 (Super Sonic Wind Tunnel - 8 x 6), and the Plum Brook Reactor Facility. The license expired on February 19, 1974.

3. Facility Status

This facility is approximately 600 acres in size with approximately 100 buildings. Limited research and development is currently being conducted in certain buildings under NASA's broadscope license, No. 34-00507-16 and the Plum Brook Reactor Facility is licensed (Docket 50-30) which authorizes "possession only."

4. Independent Measurements

Independent radiation surveys were performed with a Victoreen Model 190 portable survey instrument with a Model RP-1 pancake probe, NRC Tag No. 040608, and Ludlum Model 19, NRC Tag No. 015522, calibrated on February 14, 1994 and July 28, 1993, respectively. Prior to the surveys all instruments were checked for accuracy and constancy with dedicated and traceable check sources. All instruments responded as expected.

Comparative background radiation measurements were taken in the downtown area of Cleveland, Ohio with the Victoreen Model 190 and Ludlum Model 19 portable survey instruments. Background measured 45-55 counts per minute (cpm) with the Victoreen and 7-15 microroentgens per hour ( $\mu\text{R/h}$ ) {1.8-3.8 nanocoulomb per kilogram per hour} (nC/kg/h) with the Ludlum.

The inspectors conducted radiation surveys in and around selected rooms at the Lewis Research Center in Cleveland, Ohio which included: Buildings 14, 23, 49, 51, 54, 77, 86, 100, 105, 106 and 309 and the Plum Brook Reactor Facility (PBRF), second floor chemistry laboratories, Sandusky, Ohio. The areas surveyed included hallways, offices, former manufacturing and storage areas, research laboratories, loading docks and all rooms associated with former licensed activities under Licenses No. SNM-0746 and No. SNM-0716. The NRC inspectors' survey of the above referenced rooms, buildings and adjacent property did not identify any radiation levels above natural background except in the following areas: (1) two isolated areas of removable contamination (cesium-137) were found in laboratories 209 and 210 at the PBRF, (2) the floor in room C-5, Building 49 showed generalized low-level fixed sodium-22 contamination from former activities associated with the operation of the cyclotron facilities, and (3) room H-10 (now room 9), 13-A (radiochemistry laboratory), Building 49, contained numerous sealed/unsealed radioactive sources and/or radioactive waste possessed under License No. 34-00507-16. The inspectors were unable to confirm that the above referenced rooms were free of residual contamination from previous licensed activities under Licenses No. SNM-0746 and No. SNM-0716.

5. Laboratory Analysis

Smear tests for removable activity were taken at locations with direct readings in excess of background measurements. A sample of the radioactive material from the floor in laboratories 209 and 210 at the PBRF was collected at the time of the inspection and analyzed in the Region III laboratory. The smear tests were analyzed for gross alpha

and beta activity and the radioactive sample was analyzed for isotopic identification. Results of the laboratory analysis for the smear tests and sample are listed below:

Smear No.	Location	Direct Radiation Measurements		
		disintegrations per minute * dpm/100 cm <sup>2</sup>	Smear Test Results	
			Removable Activity dpm/100cm <sup>2</sup>	
		alpha	beta	
1	PBRF, Lab 209 floor	60,000 (cesium-137)	< 5.	113 ± 6
2	PBRF, Lab 210 floor	12,000 (cesium-137)	< 5.	1745 ± 25
3	Bldg. 49 ZPRF, east floor drain	background (150)	< 5.	< 5.
4	Bldg.49 ZPRF, west floor drain	background (150)	< 5.	< 5.
5	Bldg. 49, Room C-5 (floor hot storage)	1,800 (sodium-22)	< 5.	< 5.
6	Bldg. 49, Room C-5; sky-lite room floor	540 (sodium-22)	< 5.	< 5.

\*NRC uranium limit is 15,000 dpm/100 cm<sup>2</sup> (maximum). Readings were converted from counts/minute (cpm) to disintegrations/minute (dpm) using a conversion factor of 5,000 cpm = ≈15,000 dpm then corrected for counting efficiency (32%) and probe size (15 cm<sup>2</sup>).

@NRC limit is 1,000 dpm {alpha}/100 cm<sup>2</sup> and 1,000 dpm {beta}/100 cm<sup>2</sup>

Laboratory analysis of smears No. 1 & 2 taken in the PBRF were analyzed on a gamma spectroscopy counter and indicated that the contamination was cesium-137.

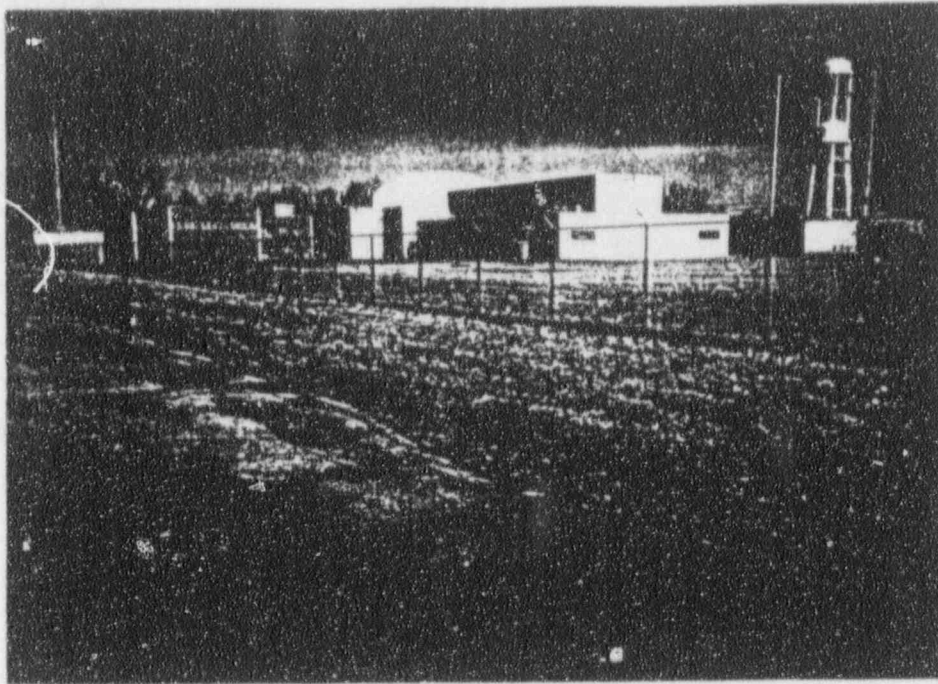
## 6. Exit Meeting

The NRC inspectors conducted an exit meeting at the conclusion of the inspection with the individuals identified in Section 1 of this report and summarized the findings of the inspection. The inspectors informed

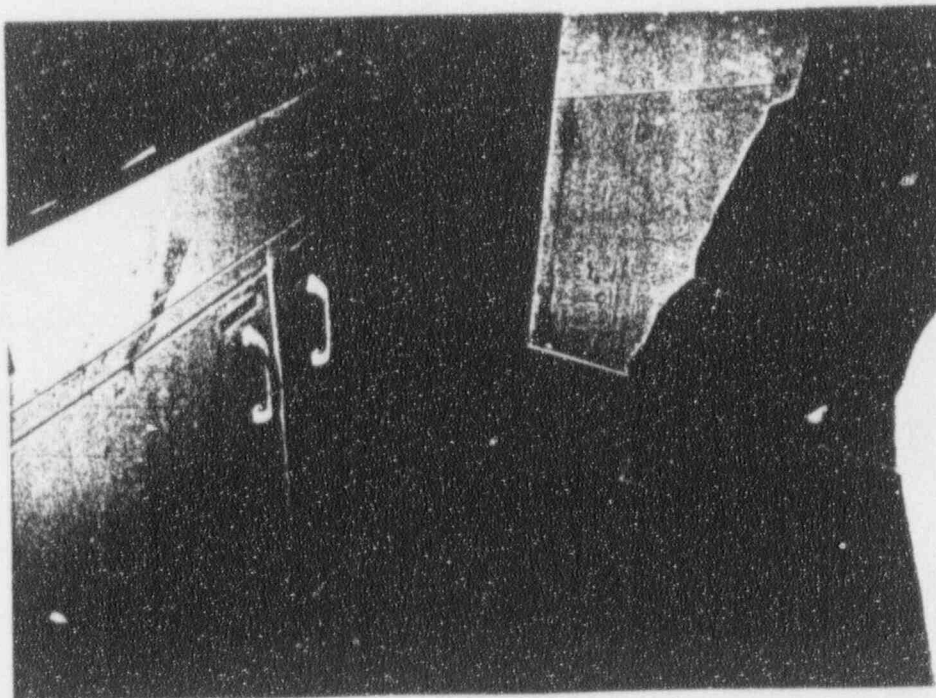
the licensee that it appeared that the buildings and rooms used under the special nuclear material licenses had been properly decommissioned; however, some byproduct and cyclotron materials were stored in certain rooms, which precluded checking these areas for residual contamination. During the exit meeting, none of the participants indicated to the inspectors that any of the inspection findings or documents provided to the inspectors were considered proprietary.

Attachments:

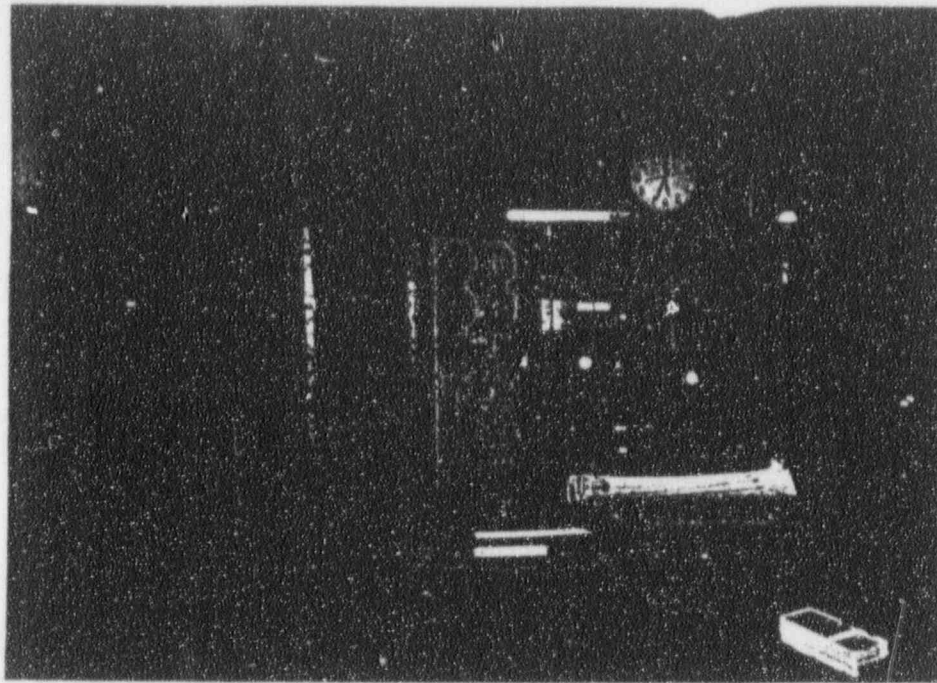
- A. AEC License No. SNM-0746 dtd 12/31/63
- B. AEC License No. SNM-0716 dtd 8/6/63



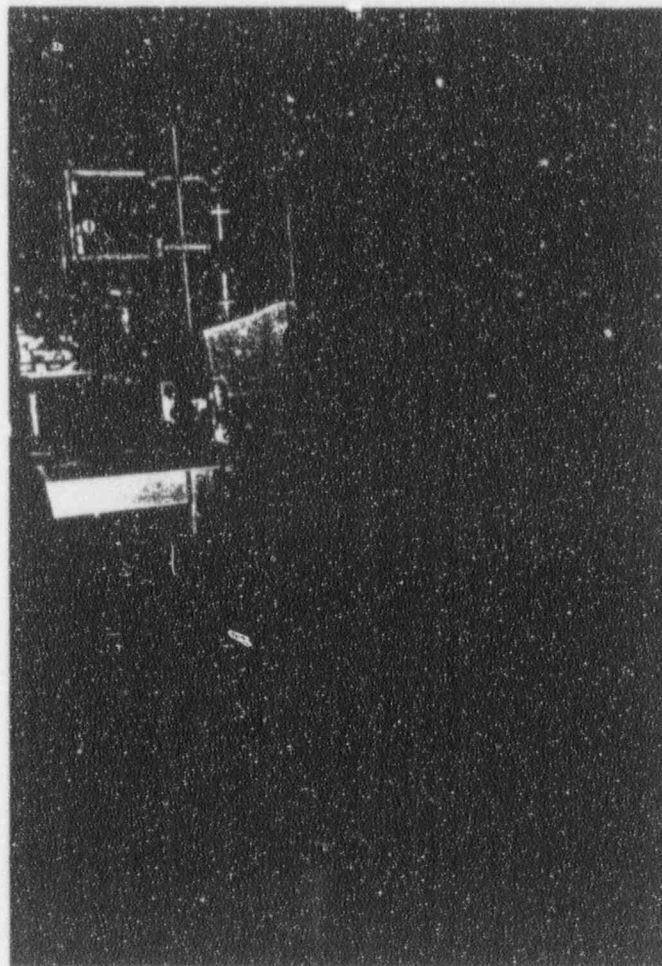
NASA Plum Brook Reactor Facility, Sandusky, Ohio



Contaminated Area on floor of second floor chemistry lab

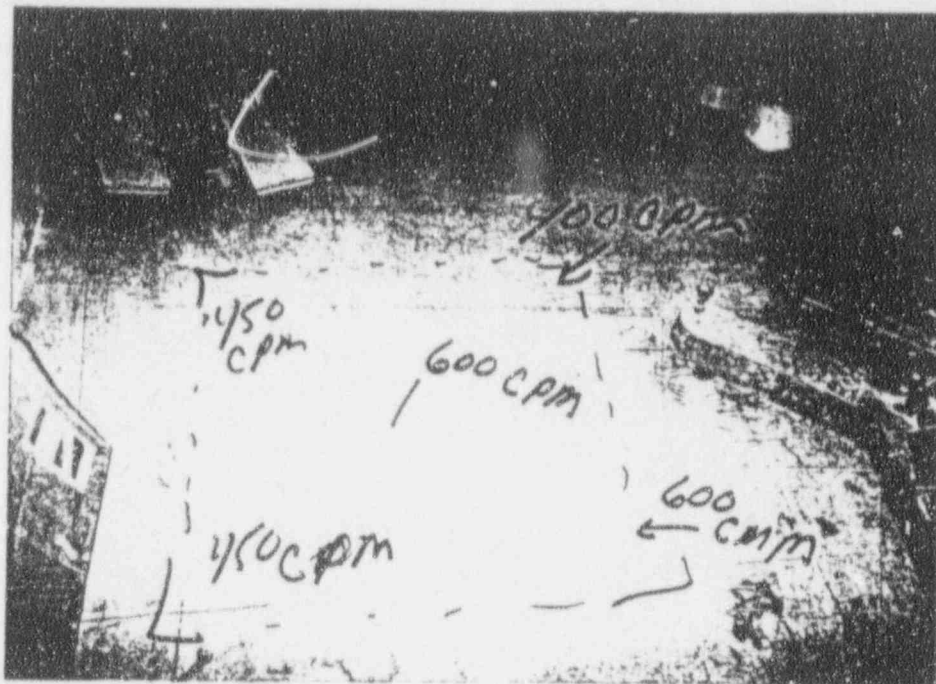


NASA Zero Power Reactor Facility (ZPRF) Control Room

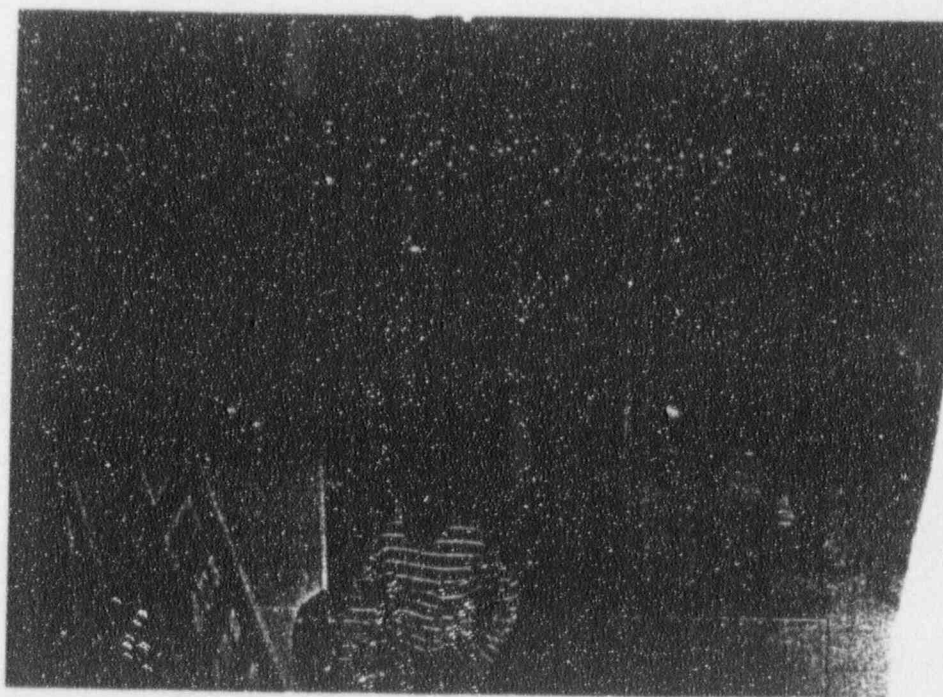


Former ZPRF Reactor Room, Lewis Research Center, Cleveland, Ohio

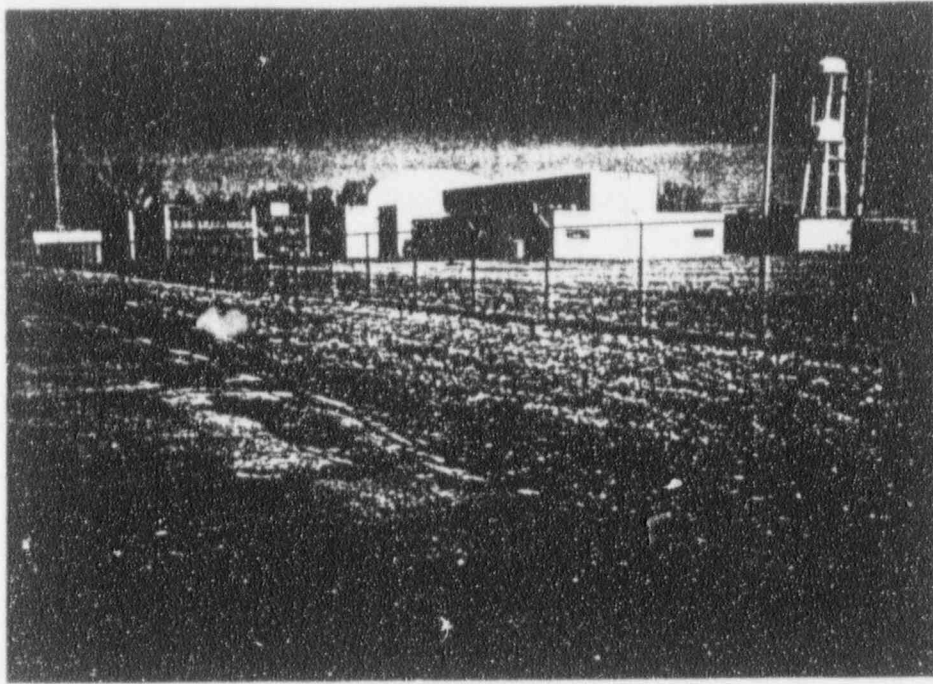




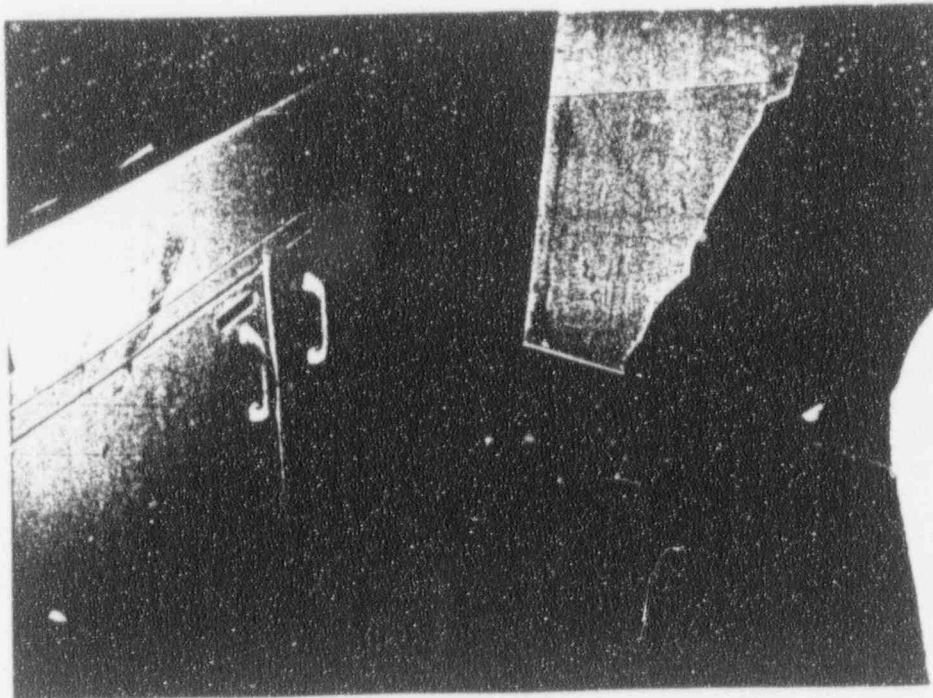
Building No. 49, former Hot Storage room, note-floor contaminated with Na-22



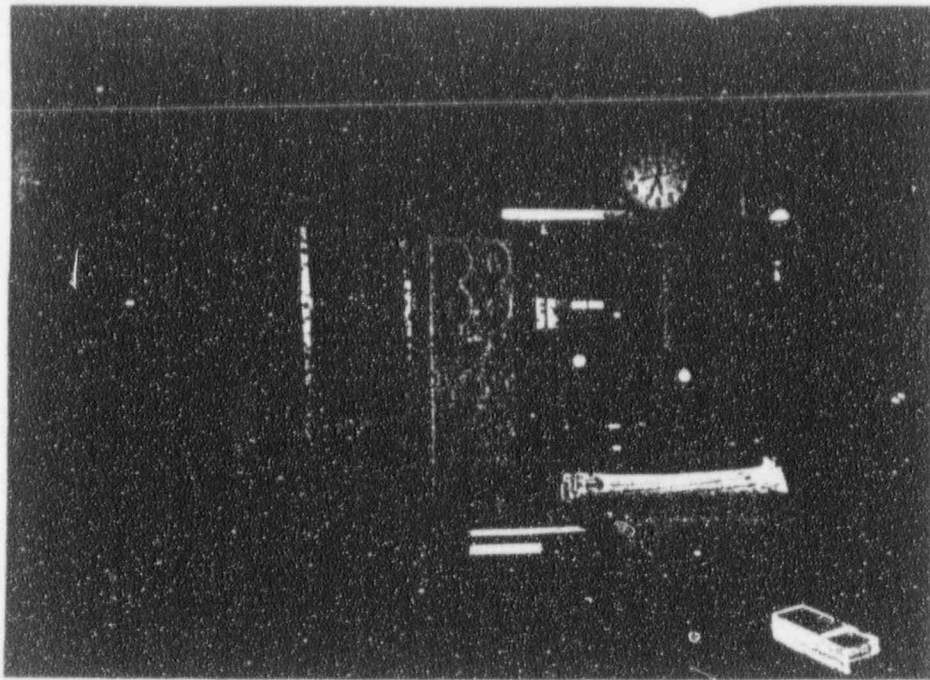
Building 49, sky-light room next to hot storage, Lewis Research Center, Cleveland, Ohio



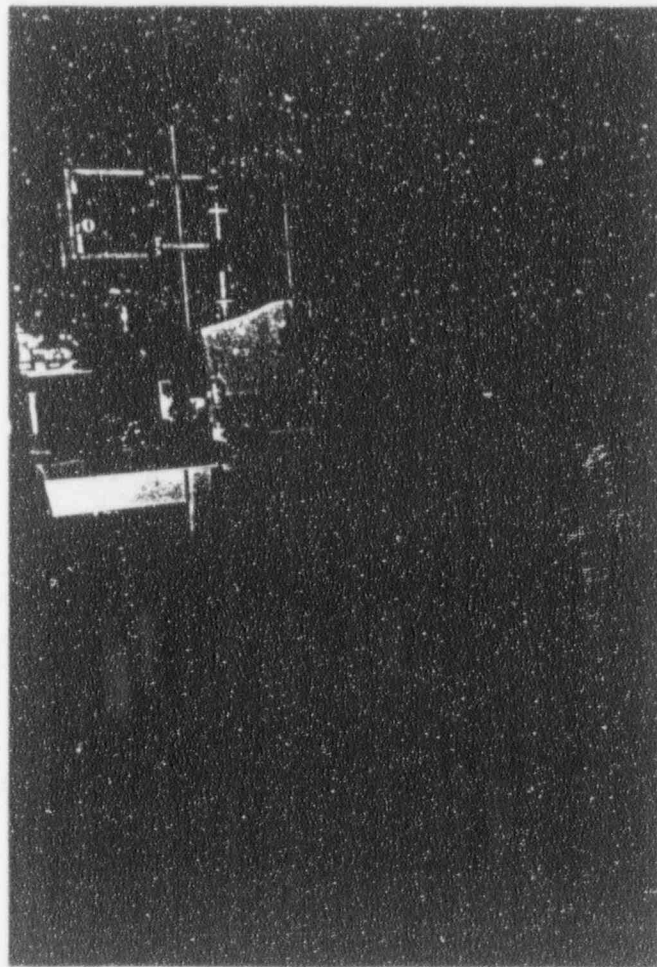
NASA Plum Brook Reactor Facility, Sandusky, Ohio



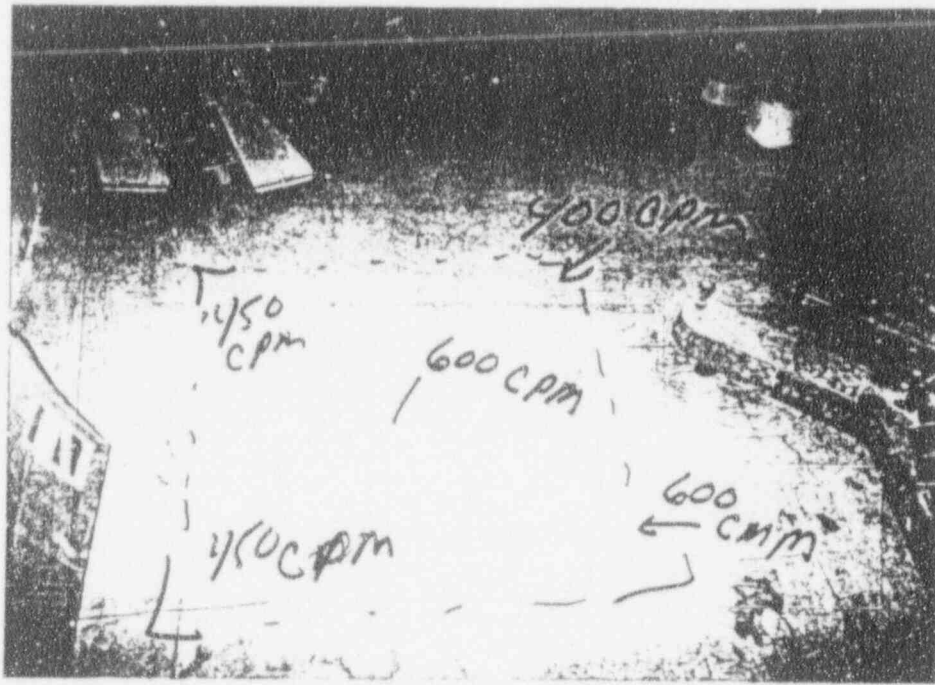
Contaminated Area on floor of second floor chemistry lab



NASA Zero Power Reactor Facility (ZPRF) Control Room



Former ZPRF Reactor Room, Lewis Research Center, Cleveland, Ohio



Building No. 49, former Hot Storage room, note-floor contaminated with Na-22



Building 49, sky-light room next to hot storage, Lewis Research Center, Cleveland, Ohio

UNITED STATES  
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 70, "Special Nuclear Material Regulations," a license is hereby issued authorizing the licensee to receive and possess the special nuclear material designated below; to use such special nuclear material for the purpose(s) and at the place(s) designated below; and to transfer such material to persons authorized to receive it in accordance with the regulations in said Part. This license shall be deemed to contain the conditions specified in Section 70.32(a) of said regulations, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License No.
1. Name	National Aeronautics and Space Administration	SNM-746
2. Address	Lewis Research Center 21000 Brookpark Road Cleveland 35, Ohio	4. Expiration Date December 31, 1966
		5. Docket No. 70-807
6. Special Nuclear Material	Uranium enriched in the U-235 isotope.	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license Five hundred (500) <sup>13,500</sup> grams of U-235 as tungsten - UO <sub>2</sub> cermet.
8. Authorized use For use in accordance with the procedures described in the licensee's application dated November 5, 1963.		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part - - - - -		

CONDITIONS

- 10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above. Authorized places of use: The licensee's Materials Processing Laboratory (Room 209) and Materials & Stresses Building (Room H-2) Cleveland, Ohio, and the Plum Brook Reactor Facility, Sandusky, Ohio.
- 11. Pursuant to 10 CFR 70, the licensee is hereby authorized to possess the special nuclear material produced by irradiation of materials held under this license in accordance with the procedures referenced in Item 8.



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SPECIAL NUCLEAR  
MATERIAL LICENSE  
Supplementary Sheet

License Number SNM-746

12. This license does not authorize the insertion of this material into any nuclear reactor. Such insertions must be authorized by the reactor operating license.

Date DEC 31 1953

For the U. S. Atomic Energy Commission

by \_\_\_\_\_



Division of Licensing and Regulation  
Washington 25, D. C.

UNITED STATES  
ATOMIC ENERGY COMMISSION

SPECIAL NUCLEAR MATERIAL LICENSE

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Licensee		3. License No. SNM-716
1. Name	National Aeronautics and Space Administration	4. Expiration Date March 31, 1965
2. Address	Lewis Research Center 21000 Brookpark Road Cleveland 35, Ohio	5. Docket No. 70-351
6. Special Nuclear Material  Uranium enriched in the U-235 isotope	7. Maximum quantity of special nuclear material which licensee may possess at any one time under this license  One kilogram	
8. Authorized use  For use in accordance with the procedures described in the licensee's application dated May 10, 1963, and supplement dated June 13, 1963.		
9. Quantity of special nuclear material allocated to licensee pursuant to Section 70.31(b) of said part  - - - - -		

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.  
  
Authorized place of use: The licensee's Source Laboratory of the Materials and Stresses Building

For the U. S. ATOMIC ENERGY COMMISSION

AUG 6 1963  
Date of issuance \_\_\_\_\_

