

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 999-90003/94028(DRSS)

License No. SNM-0334, Docket No. 070-00355 (terminated)

License No. CX-13, Docket No. 050-00075 (terminated)

License No. CX-21, Docket No. 050-00197 (terminated)

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

Inspection At: Lewis Research Center
Materials and Stress Building (No. 49)
Material Processing Laboratory (No. 105)
Special Projects Laboratory (No. 309)
Engine Research Building (No. 23)

Inspection Conducted: March 14-18, 1994

Inspector: *Daryl S. Wiedeman* 3/30/94
D. G. Wiedeman Date
Senior Health Physicist

Assisted By: *Stephen M. Duffie* 03/30/94
S. McDuffie Date
Intern

Approved By: *G. M. McCann* 3/30/94
G. M. McCann, Chief Date
Fuel Facilities and Decommissioning
Section

Inspection Summary

Inspection on March 14-18, 1994 (Report No. 999-90003/94028(DRSS))

Areas Inspected: This was a special inspection to review the licensee's activities and to determine if licensed material was properly transferred to an authorized recipient and buildings used under the former AEC licenses were properly decontaminated prior to the termination of the licenses. The inspectors conducted an independent review of transfer records and performed radiation surveys in the licensee's buildings that were used for research and testing. 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 information in the retired license files, such as type and quantity of authorized materials and lack of adequate decontamination documentation, ORNL concluded

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that these facilities have the potential for residual radioactive contamination.

Results: All licensed material possessed under AEC License No. SNM-0323 was properly transferred to Monsanto Research Corporation, Mound Laboratories in 1973. All buildings and facilities formerly covered under AEC License No. SNM-0323, CX-13 and CX-21 were free of residual contamination.

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 on March 24, 1994, regarding the results of laboratory analyses of samples collected at the time of the inspection.

2. Background

License No. SNM-0334

AEC License No. SNM-0334 was issued to NASA on October 28, 1957, and was terminated in 1973. This license originally authorized 336 grams (10 curies) of plutonium as a plutonium/beryllium neutron source; however, in 1959 the total possession limit was reduced to 96 grams, Attachment A. The NRC inspectors' review of historical documents in the license files indicated that this source was used as a start-up neutron source for the Zero Power Reactors, Licenses No. CX-13 and CX-21 in the Materials and Stress Building, (No.49). The source was also used for research and development in the following buildings: Material Processing Laboratory, (No. 105), Special Projects Laboratory, (No. 309), and the Engine Research Building, (No. 23). The NRC inspectors' review of transfer records indicate that prior to the termination of this license, all special nuclear materials were transferred in 1973 to Monsanto Research, Mound Laboratories.

License No. CX-13 and CX-21

The Zero Power Reactor Facility (ZPRF) consisted of two homogeneous liquid fuel reactors which were located in the basement of Building No. 49. The license authorized 10 kilograms of fully enriched uranium. This fuel was compounded as uranyl fluoride (UO₂F₂) and was mixed with water to form the moderated fuel solution. Both reactors used solution fuel from a single inventory of which each reactor was limited by its license to a maximum quantity. Both reactors shared the same test and control console. In a letter dated February 1, 1973, NASA requested authorization to dismantle and dispose of the ZPRF. This request was approved on March 30, 1973, and on November 13, 1973 the AEC terminated both licenses, Attachment B.

3. Facility Status

The former ZPRF facilities located in the basement of Building No. 49 consisted of a control room, fuel solution room, reactor room and connecting hallway. The NRC inspectors noted that the Reactor Room walls, ceilings and floors had been sand-blasted in the past and some of the hallway floor tiles had been replaced. The remaining buildings that licensed materials were used in, were currently occupied and being used for non-radioactive research.

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 in Buildings 105, 309, and 23 and the ZPRF facilities in the basement of Building No. 49. The surveys included direct radiation measurements inside and outside of the ZPRF and smear tests of selected areas, Attachment C. The areas surveyed included hallways, offices, former manufacturing and storage areas, loading docks and all rooms associated with the ZPRF. The NRC inspectors' survey of the above referenced rooms, buildings and adjacent property did not identify any radiation levels above natural background. Several smear tests for removable activity were taken in the floor drains of the ZPRF. These smear tests were analyzed for gross alpha and beta activity. Analysis results for gross alpha and beta activity were both less than 5 disintegrations per minute (dpm) (0.1 becquerels (Bq))/100 cm^2 which is below the NRC limit of 1000 dpm (16.6 Bq)/100 cm^2 .

5. 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 all licensed material formerly licensed under AEC Special Nuclear Material License No. SNM-0334 was properly transferred prior to the termination of the license and all remaining buildings used for licensed activities were properly decommissioned. During the exit meeting, none of the participants indicated to the inspector that any of the inspection findings or documents provided to the inspectors were considered proprietary.

Attachments:

- A. AEC license dtd 10/28/59
- B. AEC Termination Order dtd 11/13/73
- C. Survey results of ZPRF



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

DOCKET NOS. 50-75 AND 50-197

ORDER TERMINATING FACILITY LICENSES NOS. CX-13 AND -21

The Atomic Energy Commission ("the Commission") has found that the National Aeronautics and Space Administration's (NASA) two solution-type critical facilities designated Zero Power Reactor-I and -II (jointly referred to as the Zero Power Reactor Facility) located in the Lewis Research Center at Cleveland, Ohio, have been dismantled and decontaminated, and that satisfactory disposition has been made of the component parts and fuel (pursuant to the Commission's Order dated March 30, 1973) in accordance with the Commission's regulations in 10 CFR Chapter I, and in a manner not inimical to the common defense and security or to the health and safety of the public, and that termination of the licenses does not involve significant hazards considerations.

Therefore, pursuant to the application by NASA dated February 1, 1973, and Commission regulations, Facility Licenses Nos. CX-13 and CX-21 are hereby terminated as of the date of this order.

FOR THE ATOMIC ENERGY COMMISSION

Donald J. Skovholt
Assistant Director
for Operating Reactors
Directorate of Licensing

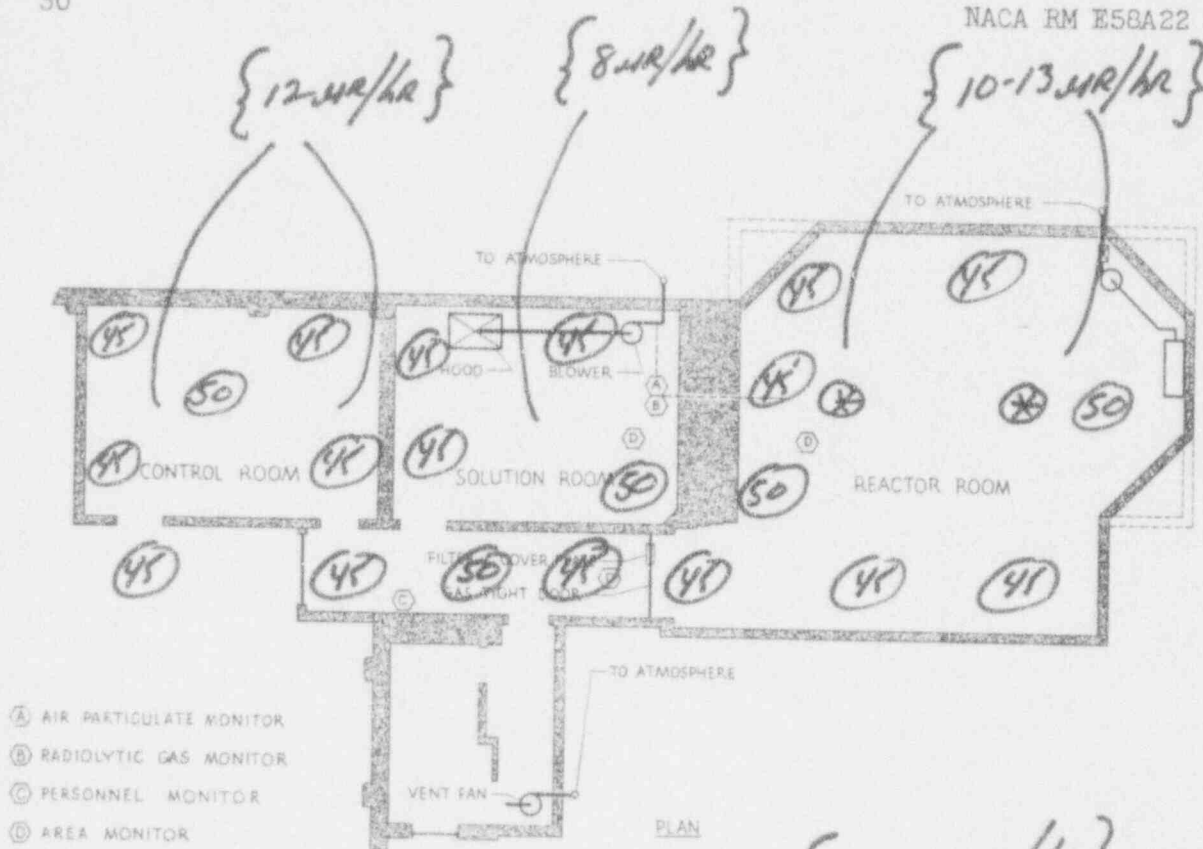
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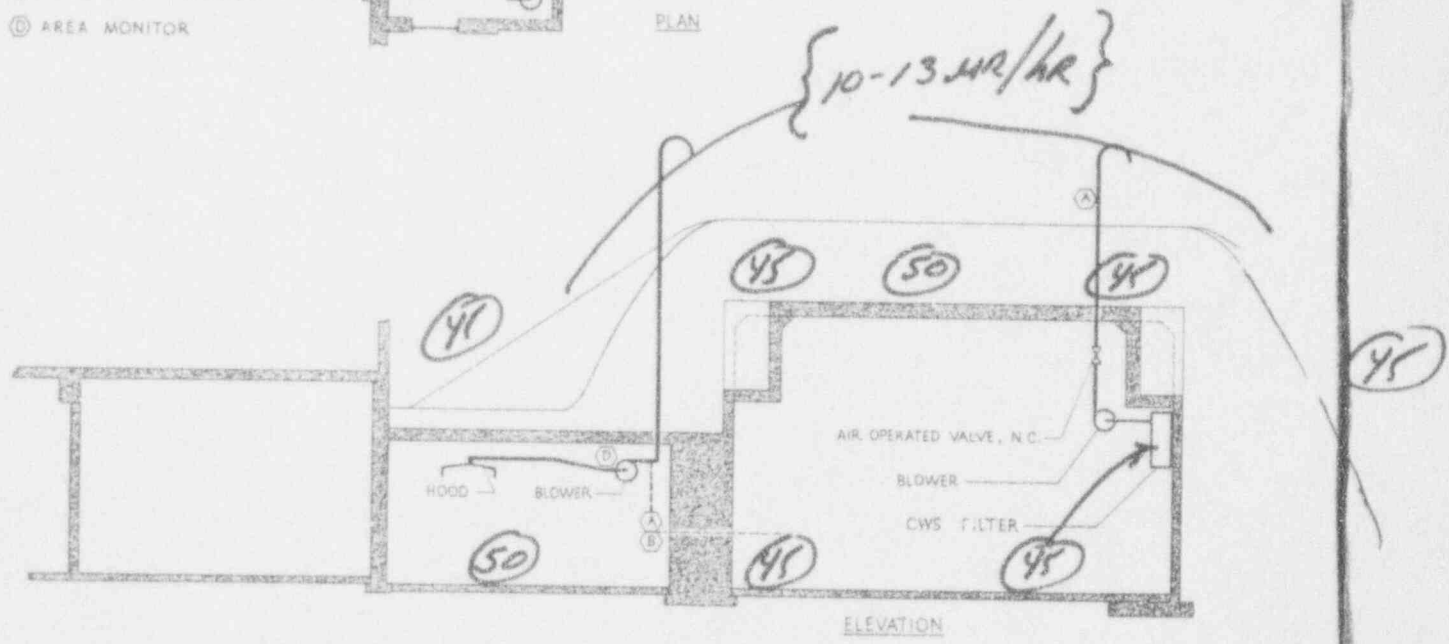
ATTACHMENT B

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- Ⓐ AIR PARTICULATE MONITOR
- Ⓑ RADIOLYTIC GAS MONITOR
- Ⓒ PERSONNEL MONITOR
- Ⓓ AREA MONITOR



CD-5704

Figure 3.5. - Zero power reactor facility ventilation system.

Date of Survey- 3/14-15/1994

Survey Instruments- Victoreen 190 w/pancake probe and Ludlum Model 10 microR meter

Survey units- ○ counts/minute (cpm) { } microR/hour

Background radiation- 45-55 cpm (7-15 microR/hour)

Survey by: D. G. Wiedeman and S. McDuffie

⊗ Locations where smear tests were taken

