

U. S. NUCLEAR REGULATORY COMMISSION

REGION V

Report No. 70-754/82-03

Docket No. 70-754 License No. SNM-960 Safeguards Group 1

Licensee: General Electric Company  
Vallecitos Nuclear Center; P. O. Box 460  
Pleasanton, California 94566

Facility Name: Vallecitos Nuclear Center

Inspection at: Pleasanton, California 94566

Inspection conducted: August 12, 1982

Inspectors: J. F. Pang 8-20-82  
 J. F. Pang, Radiation Specialist Date Signed

B. A. Riedlinger 8/20/82  
 B. A. Riedlinger, Radiation Specialist Date Signed

R. D. Thomas 8/20/82  
 R. D. Thomas, Chief, Materials Radiation Protection Date Signed  
 Section

Approved by: R. D. Thomas 8/20/82  
 R. D. Thomas, Chief, Materials Radiation Protection Date Signed  
 Section

Approved by: H. E. Book 8/23/82  
 H. E. Book, Chief, Radiological Safety Branch Date Signed

Summary:

Inspection on August 12, 1982 (Report No. 70-754/82-03)

The licensee, after the decontamination of their Advanced Fuels Laboratory (AFL), requested NRC to conduct a survey of the AFL to confirm that the facility meets the NRC limits for unconditional release with respect to plutonium (alpha) contamination.

As the requested survey was not a final survey prior to license termination, this matter was referred to NRC Headquarters. On August 11, 1982, Region V received a memorandum from Mr. Leland Rouse, Chief, Advanced Fuel and Spent Fuel Licensing Branch, directing the regional office to conduct a survey to confirm that plutonium decontamination was accomplished by the licensee. Mr. Rouse stated that confirmatory survey results would be useful in connection with license renewal actions and in any future request for release of the facility, since plutonium decontamination requirements are significantly more restrictive than those for uranium.

On August 12, 1982, three inspectors, expending a total of 18 inspector hours, conducted this survey.

Results: This survey, conducted with four alpha survey instruments and fifty-eight wipes, found the contamination levels within the AFL (Building 102, basement) to be above NRC guidelines. The NRC survey was terminated until the licensee performs necessary decontamination, conducts the final survey, and submits the survey results for evaluation by the NRC.

## DETAILS

### 1. Persons Contacted

Daloy Bowden, Nuclear Safety Compliance Engineer, Nuclear Safety  
Gene Cunningham, Senior Licensing Engineer  
George Berg, Engineer

### 2. Background

On July 20, 1982, the licensee requested NRC to conduct a survey of the Advanced Fuels Laboratory (AFL) in the basement of Building 102 at the Vallecitos Nuclear Center to confirm that the facility meets the NRC limits for unconditional release with respect to plutonium (alpha) contamination.

After this confirmatory survey effort is complete, the licensee intends to return this facility to operation as the Fuels Fabrication Laboratory, using only natural and low enriched uranium.

As the requested survey was not a final survey prior to license termination, this matter was referred to NRC Headquarters. On August 11, 1982, Region V received a memorandum from Mr. Leland Rouse, Chief, Advanced Fuel and Spent Fuel Licensing Branch, directing the Regional Office to conduct a survey to confirm that plutonium decontamination was accomplished by the licensee. Mr. Rouse stated that confirmatory survey results would be useful in connection with license renewal actions and in any future request for release of the facility, since plutonium decontamination requirements are significantly more restrictive than those for uranium.

On August 12, 1982, three inspectors, expending a total of 18 inspector hours, conducted a special radiological confirmatory survey of the basement of Building 102. The survey criteria were based on NRC requirements established by the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, July 1982."

### 3. Reference Source

An NRC Region V plutonium-239 counting source (Serial No. 7685) was selected for use in determining the efficiencies of the portable survey instruments and the laboratory proportional counter. The plutonium-239 source yielded 1810 disintegrations per minute (dpm) of activity on August 25, 1977.

4. Field Radiation Detection Instruments

Alpha surface contamination levels were measured with four portable survey instruments:

- a. LRL Alpha Survey Meter, NRC#000374, calibrated on 3/10/82 and due for recalibration on 9/10/82.
- b. LRL Alpha Survey Meter, NRC#000375, calibrated on 6/10/82 and due for recalibration on 12/10/82.
- c. Ludlum Model 12 Count Rate Meter, NRC#003564, calibrated on 3/31/82 and due for recalibration on 9/31/82.
- d. Ludlum Model 12 Count Rate Meter, NRC#003565, calibrated on 3/31/82 and due for recalibration on 9/31/82.

The efficiencies of these instruments were determined by use of the Pu-239 counting source described above (#7685) with the following results:

<u>Instrument Number</u>	<u>Reading in Counts per Minute (cpm)</u>	<u>Efficiency</u>
000374	880	49%
000375	750	41%
003565	900	49%
003564	800	44%

It should be noted that the area of the probes used with the LRL Alpha Survey Meters (Numbers 000374 and 000375) is 116 square centimeters. The area of the probes used with the Ludlum Survey Meters (Numbers 003564 and 003565) is 50 square centimeters.

5. Acceptable Contamination Release Levels

The Advanced Fuels Laboratory (AFL) in the basement of Building 102 was used in conjunction with research and development work on plutonium-bearing fuels. Materials were possessed and used under NRC License SNM-960.

The acceptable contamination levels established by the guideline for transuranics are summarized in Table I.

TABLE I  
ACCEPTABLE LEVELS OF CONTAMINATION

<u>Maximum</u>	<u>Average</u>	<u>Removable</u>
300 dpm per 100 square centimeters	100 dpm per 100 square centimeters	20 dpm per 100 square centimeters

It should be noted that the maximum contamination level applies to an area of not more than 100 square centimeters. Also, measurements of average contamination should not be averaged over more than one square meter.

6. Meter Allowable Readings (MAR)

In order to determine the acceptable response range for field instruments, meter allowable readings (MAR) were developed relative to the guideline, the response of the instruments to the NRC plutonium-239 reference source, and the areas of the instrument probes.

As the maximum contamination levels apply to areas of less than or equal to 100 square centimeters, all of the contamination in a 100 square centimeter area might be seen under one probe area or less. Therefore, the MAR values for the maximum contamination levels were derived by considering only the instrument efficiencies.

The average contamination levels assume that contamination may be spread over areas up to one square meter. Since the average surface contamination limit is given in terms of 100 square centimeters, correction factors for the probe areas are made when the MAR values for average contamination levels are derived.

The MAR determinations are shown in Attachment 1.

Table II is a summary of the meter allowable readings established for the use of the LRL or the Ludlum instruments.

TABLE II  
CONTAMINATION LIMITS: METER ALLOWABLE READINGS

<u>Instrument</u>	<u>Maximum MAR Counts Per Minute</u>	<u>Average MAR Counts Per Minute</u>
000374	147	57
000375	123	48
003565	147	24
003564	132	22

7. Wipes Survey

Nucon cloth smears were used exclusively during this survey. The wiping procedure was to apply medium pressure over the area being wiped, and sample at least a 100 square centimeter area.

These wipes were counted with the Region V NMC Model PC-55 gas flow proportional counter, NRC#000383. Using the NRC plutonium-239 standard, a counter efficiency of 41 percent was observed. The background was 0.3 counts per minute alpha on August 13, 1982 when the wipes were counted.

8. Building Interior Survey

The AFL floor plan is given in Figure 1. The areas surveyed on August 12, 1982 are noted on Figure 1 as the Front Laboratory and the Sodium Room. Glove boxes, other equipment, and some floor tiles had been removed by the licensee in the decontamination effort.

For purposes of conducting and documenting survey efforts, the Front Laboratory was divided into sections of approximately one hundred square feet each, as shown on Figure 2. At least one square meter of each surface in each of these sections was surveyed on August 12, 1982.

Two pits are located in the Front Laboratory area, as shown on Figure 2. Pit 1 is approximately 2' x 4' x 8'. Pit 2 is approximately 3' x 7' x 10'.

The locations of wipes and direct readings taken on August 12, 1982 are indicated on Figure 2 and Attachment 2. It should be noted that the fixed contamination in Pit 1 covered an area of greater than 100 square centimeters, so the average MAR values shown in Table II applied. All other areas where direct survey results were noted covered less than 100 square centimeters, so the maximum MAR values applied. The appropriate MAR values are given in Attachment 2 along with the direct survey readings.

9. Conclusion and Exit Meeting

An exit meeting was held with the licensee on August 12, 1982. The licensee was informed that the Front Laboratory area in the AFL did not meet the release limitations of the established NRC guidelines. The licensee should perform necessary decontamination, conduct a final survey, and submit a written report of the decontamination and final survey results to the NRC for evaluation. The licensee representatives were informed that the NRC Region V confirmatory survey would not be continued until their written report had been received.

The licensee representatives stated that the decontamination effort will continue and that the required survey report will be submitted.

ATTACHMENT 1

Meter Allowable Readings (MAR) Contamination Calculations

a.) Maximum Contamination Levels

- 1.) Instrument 000374  
 $(300 \text{ dpm})(.49 \frac{\text{cpm}}{\text{dpm}}) = 147 \text{ cpm}$
- 2.) Instrument 000375  
 $(300 \text{ dpm})(.41 \frac{\text{cpm}}{\text{dpm}}) = 123 \text{ cpm}$
- 3.) Instrument 003565  
 $(300 \text{ dpm})(.49 \frac{\text{cpm}}{\text{dpm}}) = 147 \text{ cpm}$
- 4.) Instrument 003564  
 $(300 \text{ dpm})(.44 \frac{\text{cpm}}{\text{dpm}}) = 132 \text{ cpm}$

b.) Average Contamination Levels

- 1.) Instrument 000374  
 $(\frac{100 \text{ dpm}}{100 \text{ cm}^2})(\frac{116 \text{ cm}^2}{\text{probe area}})(.49 \frac{\text{cpm}}{\text{dpm}}) = 57 \text{ cpm per probe area}$
- 2.) Instrument 000375  
 $(\frac{100 \text{ dpm}}{100 \text{ cm}^2})(\frac{116 \text{ cm}^2}{\text{probe area}})(.41 \frac{\text{cpm}}{\text{dpm}}) = 48 \text{ cpm per probe area}$
- 3.) Instrument 003565  
 $(\frac{100 \text{ dpm}}{100 \text{ cm}^2})(\frac{50 \text{ cm}^2}{\text{probe area}})(.49 \frac{\text{cpm}}{\text{dpm}}) = 24 \text{ cpm per probe area}$
- 4.) Instrument 003564  
 $(\frac{100 \text{ dpm}}{100 \text{ cm}^2})(\frac{50 \text{ cm}^2}{\text{probe area}})(.44 \frac{\text{cpm}}{\text{dpm}}) = 22 \text{ cpm per probe area}$

ATTACHMENT 2

I. Tabulation of results of direct readings with survey instruments and of wipes taken on August 12, 1982.

Wipes were counted in the Region V gas flow proportional counter on August 12, 1982. Locations of readings and wipes are shown on Figure 2.

Note: The release limit for removable plutonium alpha contamination is 20 dpm per 100 square centimeters, as shown on Table I. MAR for fixed plutonium alpha contamination are shown in Table II and are also indicated in this attachment.

a. Wipes taken on August 12, 1982

<u>Wipe</u>	<u>Location</u>	<u>Results per 100 square centimeters</u>	
		<u>Alpha Net DPM</u>	<u>Beta-gamma Net CPM</u>
1.	Front Lab Section A (FLSA) pipes overhead	3	98
2.	FLSA ledge on wall	0	44
3.	FLSA floor near pit	0	0
4.	FLSA floor near pit	0	1
5.	FLSA pipe (overhead)	0	7
6.	FLSA flange	49	1598
7.	FLSA pipe	1	77
8.	FL Section B (FLSB) floor near pit	0	0
9.	FLSB floor near pit	0	0
10.	FLSB pipe	0	22
11.	FLSB light fixture	1	1
12.	FLSC near threshold	0	11
13.	FLSC pipes	0	0
14.	FLSC light fixture	1	8
15.	FLSC ledge	0	4
16.	FLSD pipe	2	27
17.	FLSD pipe on wall area	0	208
18.	FLSD pipe overhead	0	6
19.	FLSE vent	0	4



<u>Wipe</u>	<u>Location</u>	<u>Results per 100 square centimeters</u>	
		<u>Alpha Net DPM</u>	<u>Beta-gamma Net CPM</u>
20.	FLSE pipes	1	0
21.	FLSE floor	0	0
22.	FLSF pipe	0	3
23.	FLSF floor near pit	0	0
24.	FLSF floor near pit	0	0
25.	FLSF electrical conduit	4	12
26.	FLSF electrical conduit	3	12
27.	FLSG pipe	3	50
28.	FLSG light fixture	1	25
29.	FLSG floor	5	24
30.	FLSG floor	0	4
31.	FLSH floor	0	13
32.	FLSH floor	0	216
33.	FLSH floor	0	85
34.	FLSH floor	0	6
35.	FLSH electrical conduit	0	0
36.	FLSH light fixture	0	3
37.	FLSI electrical conduit	0	0
38.	FLSI junction box	0	0
39.	FLSJ pipes	1	0
40.	FLSJ pipes	0	0
41.	FLSJ floor	1	0
42.	FLSK pipe	0	25

Wipe	Location	Results per 100 square centimeters	
		Alpha Net DPM	Beta-gamma Net CPM
43.	FLSK junction box	1	23
44.	FLSL pipe	0	1
45.	FLSL pipe	0	0
46.	FLSM junction box	0	0
47.	FLSM electrical conduit	1	0
48.	FLSN pipes	0	0
49.	FLSN vent	0	3
50.	FLSO pipes	1	1
51.	FLSP pipes	1	0
52.	Floor of Pit 1	0	0
53.	Wall of Pit 1	1	16
54.	Wall of Pit 2	0	0
55.	Wall of Pit 2	0	2
56.	Sodium Room-Wall	0	0
57.	Sodium Room-Floor	0	0
58.	Sodium Room-Ledge Near Piping	0	0

b. Direct surveys made with alpha survey instruments on August 12, 1982

Location Noted on Figure 2	Further Description of Location	Meter Used	Direct Meter Reading (cpm)	Appropriate MAR Value (cpm)
1.	Front Lab, Section A, piping	LRL 000374	280	147
2.	Front Lab, Section A, flange	LRL 000374	600	147

<u>Location Noted on Figure 2</u>	<u>Further Description of Location</u>	<u>Meter Used</u>	<u>Direct Meter Reading (cpm)</u>	<u>Appropriate MAR Value (cpm)</u>
3.	Front Lab, Section D, piping	Ludlum 003565	1000	147
4.	Front Lab, Section M, floor	LRL 000374	400	147
5.	Front Lab, Section J, floor	LRL 000374	140	147
6.	Front Lab, Pit 1 floor	LRL 000374	140	57
7.	Front Lab, Pit 1 wall	LRL 000374	250 - 300	57
8.	Front Lab, Pit 1 wall	LRL 000374	300	57
9.	Sodium Room	Ludlum 003564	3000*	132

\*Note: This spot of contamination was removed by the licensee at the time of the inspection.

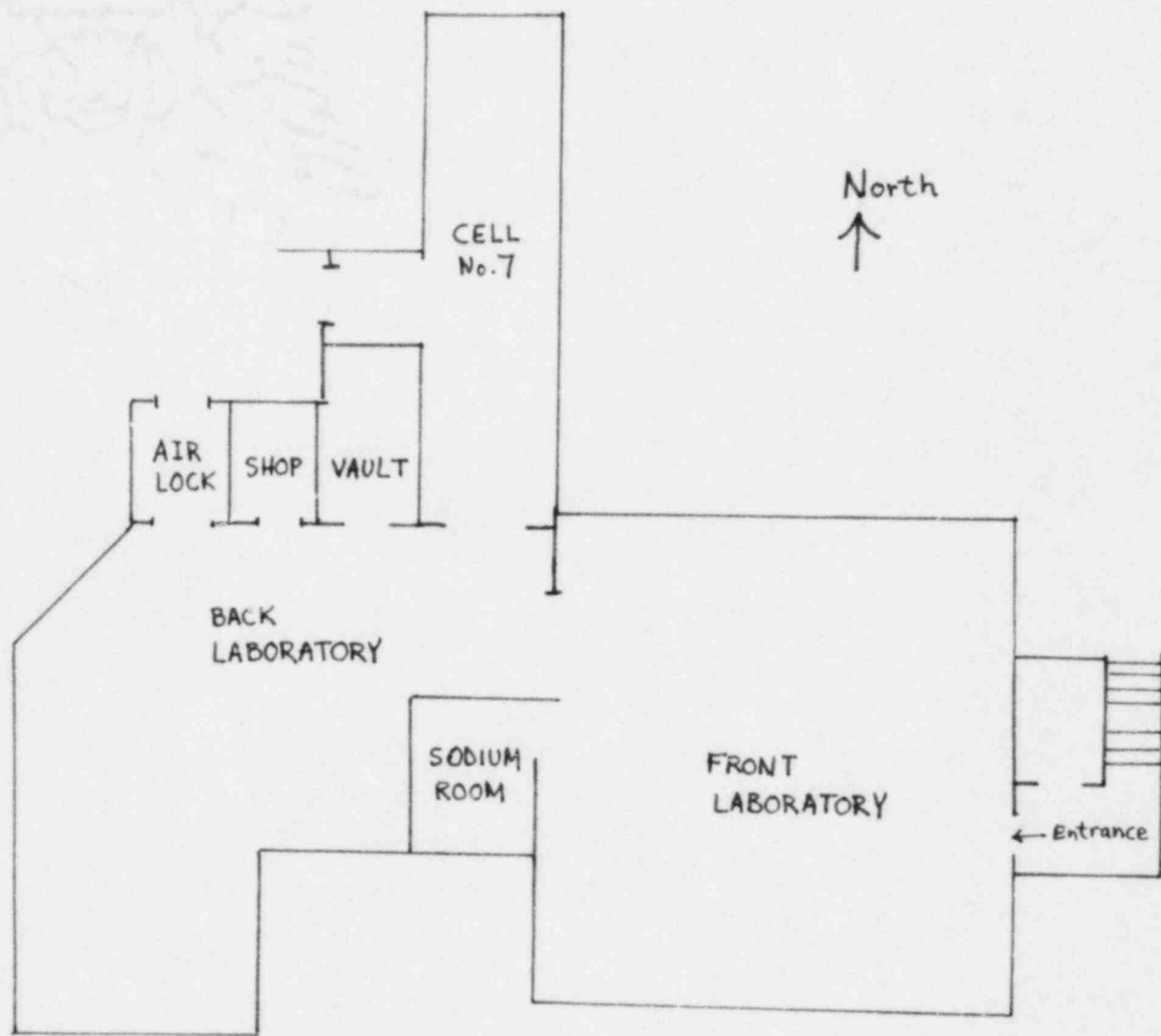


FIGURE 1  
Building 102 Basement  
Advanced Fuels Laboratory

North  
↑

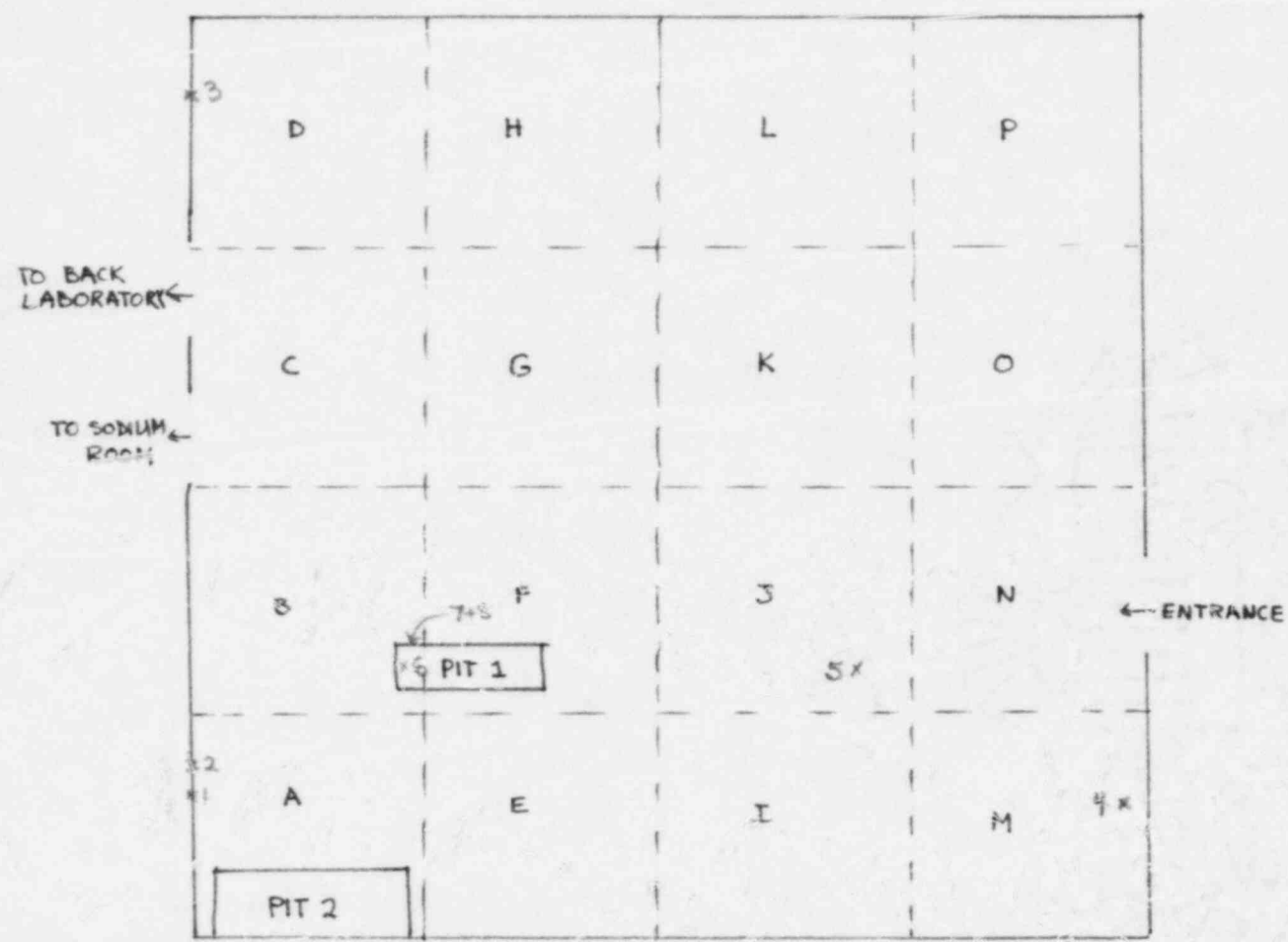


FIGURE 2  
FRONT LABORATORY,  
ADVANCED FUELS  
LABORATORY  
SHOWING LOCATIONS  
OF WIPES AND  
DIRECT SURVEY  
READINGS