7.5.4 HOISTING BAY

Hoisting Bay Functions

The Hoisting Bay was the shaft through which materials and equipment were crane-lifted from the 337-foot to the 357-foot level (R-001932, p. 4) (Figure 7-36).

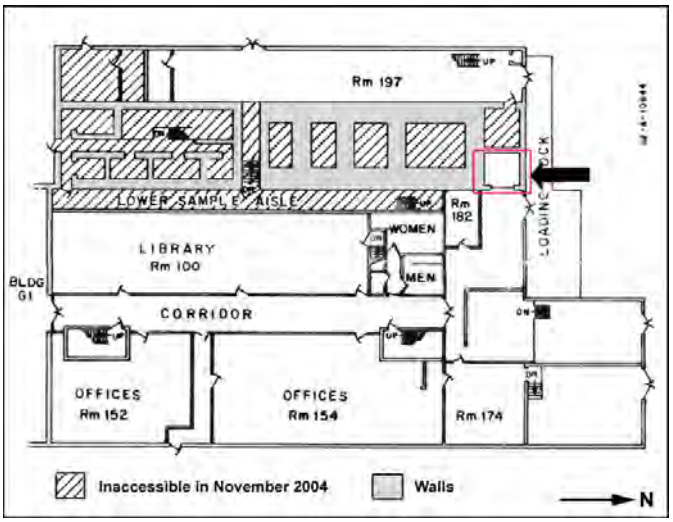

Figure 7-36. G2 337-Foot Level, Hoisting Bay

Hoisting Bay Configuration

The Hoisting Bay is a reinforced concrete shaft 7 feet wide by 10 feet deep and 18 feet high. It has not been modified.

Hoisting Bay Construction Drawings

The following Hoisting Bay drawings are provided in Appendix B, Drawings:

Drawing No. 2828-1-1 Layout Building G2, March 26, 1948
Drawing No. 2828-801-4, Plan – Crane Gallery and Weigh Tank, July 20, 1948
Drawing No. 2828-801-23, Crane Gallery Floor Plan, November 22, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figures G-337, -349, -357, SPRU Building G2-Floor Plans, Elevations 337' through 357', ERG June 2004.

Hoisting Bay Photograph

The Hoisting Bay in shown in Figure 7-37.

Figure 7-37. Photo G2-164, G2 Overlooking Hoisting Bay from 357-Foot Level, November 2004

7.5.5 LOWER SAMPLE AISLE

The Lower Sample Aisle (Figure 7-38) is inaccessible.

Lower Sample Aisle Functions

The Lower Sample Aisle, also called Sampling Room No. 1, is on the 337-foot level immediately below the 348-foot level Upper Sample Aisle (Sampling Room No. 2). Lower and Upper Sample Aisle information is often combined.

The Lower Sample Aisle is an explosion-proof room that contained equipment for sampling hot vessels and contactor stage fluids. Sampling equipment was cleaned and handled there (R-001932, p. 2; R-001932, p. 1).

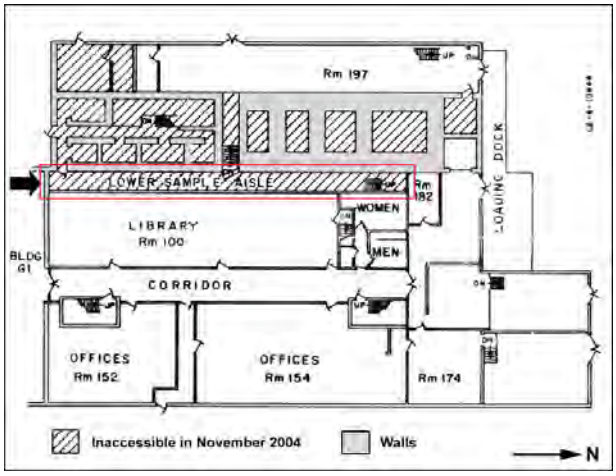

Figure 7-38. G2 337-Foot Level, Lower Sample Aisle

Lower Sample Aisle Components

Lower Sample Aisle contents include deactivated valves, piping, and components for hot and cold water, process cooling water, vacuum, breathing air, nitrogen, oxygen, carbon dioxide (for fire protection), compressed air, de-ionized water, concentrated nitric acid, and concentrated sodium hydroxide. Electrical service wiring and switches were isolated (fuses pulled, breakers opened, and wires disconnected) in April 1984 (C-000164, p. 8) (Figure 7-39).

Lower Sample Aisle Configuration

The Lower Sample Aisle is 683 square feet (100 feet long [north-south] by 6 feet 10 inches wide) and 11 feet 6 inches high (R-000059, Table 1).

Lower Sample Aisle Construction Drawings

The following Lower Sample Aisle construction drawings are provided in Appendix B, Drawings:

Drawing No. 2828-1-3, Layout Plan First Floor, April 12, 1948
Drawing No. 2828-801-13, Ground Floor Plan, July 24, 1948
Drawing No. G2-A-2401, OBS Modification Floor Plan, January 13, 1960
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G-337, SPRU Building G2-Floor Plans, Elevation 337', ERG, June 2004.

Figure 7-39. Photo G2-59, Lower Sample Aisle – Looking South (KS-60544), Post-SPRU Decommissioning, undated

Lower Sample Aisle Photographs

Features of the Lower Sample Aisle are shown on the following photographs and are provided in Appendix C, Photographs:

- G2-4 Lower Sample Aisle (KS-60545), undated
- G2-8 Lower Sample Aisle – Extreme North side. Five large pipes apparent above aisle, undated
- G2-9 Lower Sample Aisle – Looking North. Six large pipes apparent above aisle that appear to extend into area depicted on G2-8. Therefore, G2-8 and G2-9 may be different years, undated
- G2-61 Lower Sample Aisle – Looking South, photograph undated, appears to be similar time period to G2-13 because a ladder is common to the two photographs, undated
- G2-59 Lower Sample Aisle – Looking South (KS-60544), Post-SPRU Decommissioning. Photograph depicts where decontamination or other construction activity occurred (e.g., piping and equipment wrapped in plastic and other materials), undated
- G2-56 Lower Sample Aisle – Looking North (KS-60548). Photograph depicts decontamination or other construction activity occurred (e.g., piping and equipment wrapped in plastic and other materials), undated
- G2-57 Lower Sample Aisle – Looking North. Some equipment appears to be removed and wiring disconnected. Equipment and debris on floor, undated
- G2-58 Lower Sample Aisle – Looking North. Equipment covered. Debris on flooring, undated.

Lower Sample Aisle Radiation Survey and Decontamination History

Lower and Upper Sample Aisle decontamination was accomplished between December 13, 1965 and February 24, 1966. Loose debris was removed, partitions constructed, holes patched, and open pipes sealed to isolate the sample aisles from adjacent areas. Decontamination included vacuuming, two

damp wipe-downs and washing surfaces with water, and mopping floors several times. Strip coating was removed from the east wall at both levels. Decontamination was effective in reducing surface contamination, reducing airborne concentrations below permissible limits, and minimizing anti-contamination clothing required for non-work entry into the aisles. Fixed alpha (from 500 to 200,000 disintegrations per minute per 9.5 square inches) remained on sampling equipment and the tile floor under the equipment. An absolute filter (with dampers that close in the event of reverse airflow from the cell area) was installed in the Lower Sample Aisle doorway to the cell area. Summary results of the decontamination process are (R-002107, pp. 1-8):

- Average general background was lowered to 0.2 milliRoentgen per hour from 1.5 milliRoentgen per hour.
- Spot measurements on floors were lowered to 0.5 millirad per hour from 15 millirad per hour.
- No occupancy air concentrations remained less than 25 percent Maximum Permissible Concentration.
- Alpha air concentrations with occupancy were lowered to less than 5×10^{-13} microCuries per cubic centimeter (or less than 25 percent) from 10^{-10} microCuries per cubic centimeter (or 50 percent Maximum Permissible Concentration for air).
- Occupancy beta-gamma air concentrations were lowered to less than 3×10^{-11} microCuries per cubic centimeter (or less than 25 percent Maximum Permissible Concentration for air) from 10^{-9} microCuries per cubic centimeter (or 90 percent Maximum Permissible Concentration for air).
- Fixed alpha on floors and sampling equipment did not change (600 disintegrations per minute per 9.5 square inches average, some spots exceeding 200,000 disintegrations per minute per 9.5 square inches).
- Loose surface alpha on floors was lowered to 6 picoCuries per 100 square centimeters from 615 picoCuries per 100 square centimeters.
- Loose surface beta-gamma on floors was lowered to 300 picoCuries per 100 square centimeters from 17,000 picoCuries per 100 square centimeters.
- Loose surface alpha on sampling equipment was lowered to 18 picoCuries per 100 square centimeters from 200 picoCuries per 100 square centimeters.
- Loose surface beta-gamma on sampling equipment was lowered to 200 picoCuries per 100 square centimeters from 14,000 picoCuries per 100 square centimeters.

Table 7-28 provides Lower Sample Aisle summary data from identified radiological surveys between 1954 and 1989.

Table 7-28. Building G2, Lower Sample Aisle Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Sample Handling Room	None	Smear Results (on approx. 6 square feet of surface): Front of hood – 700 dpm alpha; 4,000 cpm beta-gamma Inside door – <200 dpm alpha; 3,200 cpm beta-gamma Radiation dose rates: North sink – 125 mrep/hr beta at 1 inch; 25 mR/hr gamma at 3 inches South sink – 100 mrep/hr beta at 1 inch; 15 mR/hr gamma at 3 inches Yellow sample holder No. 1 – 200 mrep/hr beta at 1 inch; 50 mR/hr gamma at 3 inches Yellow sample holder No. 2 at top – 1,000 mrep/hr beta at 1 inch; 30 mR/hr gamma at 3 inches	R-000059, pp. 22, 24

Date	Area	Observations	Summary Findings	Reference
			S. S. sample holder – 2,500 mrep/hr beta at 1 inch; 20 mR/hr gamma at 3 inches South hood – north edge – 800 mrep/hr beta at 1 inch; 20 mR/hr gamma at 3 inches South hood – center edge – 7,500 mrep/hr beta at 2 inches; 100 mR/hr gamma at 4 inches	
2/22/1954 (following decontamination)	Lower Sample Aisle	None	Smear Results (on approx. 6 square feet of surface): Stairs, North – 1,000 dpm alpha; 5,000 cpm beta-gamma North of H. Ph. Air sampler – 800 dpm alpha; 3,000 cpm beta-gamma Opposite stairs to cell access – <200 dpm alpha; 2,000 cpm beta-gamma South end – <200 dpm alpha; 1,300 cpm beta-gamma Radiation dose rates: North aisle, head level – 50 mrep/hr beta; 40 mR/hr gamma Floor near pipe guard – 150 mrep/hr beta at 1 inch LSA background – 8 mR/hr gamma Broom closet – 15 mR/hr gamma at 6 inches Under 502 sampler – 100 mR/hr gamma at 12 inches Wall under 502 sampler – 300 mR/hr gamma at 3 inches South of 502 sampler, face of next unit – 200 mR/hr gamma at 3 inches 527 and A519 samplers – <6 mrep/hr beta; <6 mR/hr gamma Floor by 1E bank sampler – 150 mrep/hr beta at 1 inch; 26 mR/hr gamma at 3 inches	R-000059, pp. 22, 24
2/16/1960	Lower Sample Aisle Floor	None	Average dose rate from floor areas – 5 mR/hr gamma at ~ 2"; 25 mrad/hr beta at near contact	C-000098, p. 3
1/23/1964	Lower and Upper Sample Aisles	Areas in complete darkness Floor area dry	Radiation levels – 10 mR/hr to 15 mR/hr Alpha contamination – 500 to 1000 dpm Loose surface contamination on smear of floor area in Lower Sample Aisle – 100 dpm alpha and 300 cpm beta-gamma per 100 cm^2 Air monitoring in sample aisles, access corridor, and cell areas indicates up to 45% of MPC for Pu-239 and beta-gamma up to 60% of MPC for Sr-90 Shoe covers checked for activity measured up to 10,000 dpm (for sample aisles, access corridor, and cell areas)	C-000112, pp. 1-3
12/1965 – 1/1966	Lower and Upper Sample Aisles	None	Air Sampling (alpha – 100% Pu-239 – inhalation hazard; beta-gamma – 50% Cs-137, 25% Sr-90, 25% Y-90 – surface contamination): (MPC_a for in-plant controls is 2 x 10^{-12} µCi/cc for alpha and 1.2 x 10^{-9} µCi/cc for beta-gamma) All G2 areas outside the sample aisles and cells (includes the library, crane deck, and constant head level) - <25% of $(MPC)_a$ Inside entrance enclosure – <25% of $(MPC)_a$ Outside entrance enclosure – <25% of $(MPC)_a$ Inside aisles from December 22 through December 29 – 75 x $(MPC)_a$, maximum (resulted from dry dusty condition of aisles) Inside aisles from December 30 through January 13 – 3.5 x $(MPC)_a$, average (aisles given a CD_2 treatment and dust held	C-000119, pp. 1, 3

Date	Area	Observations	Summary Findings	Reference
			down) Inside aisles January 14 through January 17 - >100 x $(MPC)_a$ (resulted from dry conditions returning; aisles evacuated and wet down) Inside aisles January 18 through January 24 – 2.5 x $(MPC)_a$ January 25 – >100 x $(MPC)_a$ (speedy-dry used for cleaning became dry and created dust when handled; aisles evacuated and wet down) January 26 through January 27 – 15 x $(MPC)_a$	
1/12/66	Lower and Upper Sample Aisles	None	Average general background – 1.5 mR/hr Average gamma measurements on surfaces – 2.0 mR/hr Average beta measurements on surfaces – 15 mrad/hr Maximum beta measurement on surfaces – 1.2 rad/hr (under a sampler in the upper aisle) Average alpha measurements – 1,700 dpm/9.5 in^2 Maximum alpha measurements – 70,000 dpm/9.5 in^2 (under a sampler in the lower aisle) Average loose surface alpha – 70 pCi/100 cm^2 Average loose beta-gamma – 5,200 pCi/100 cm^2	C-000119, p. 2
3/6/1968	Lower and Upper Sample Aisles	None	Results from floor in various areas – from <5 to 22 cpm corr and from <6 to 25 pCi alpha; from 15 to 645 cpm corr and from 23 to 968 pCi beta Results in two stair areas – from 10 to 11 cpm corr and from 11 to 12 pCi alpha; from 185 to 256 cpm corr and from 278 to 384 pCi beta	R-000372, p. 3
11/11/1971	Lower Sample Aisle	None	Frisking of filter canisters worn with the clearvue mask in Cell No. 2, No. 3, and Lower and Upper Sample Aisles for approximately 45 minutes indicated activity up to 350 cpm Results of loose surface contamination swipes: Wall (North end) – <100 dpm gamma; <200 cpm beta-gamma Floor (North end) – <100 dpm gamma; <200 cpm beta-gamma	C-000132, pp. 1, 3
6/29/1989 – 7/13/1989	Lower Sample Aisle	Area dry and clean Unused, empty drums from previous work staged next to one sample cabinet Stainless steel piping and tubing show no evidence of leakage or deterioration of insulation Door leading to adjacent unused lavatory facility in Building G2 covered with plywood Stairway at north end leading to Upper Sample Aisle shows minor damage of one step, apparently from some heavy object No operational lighting	General area radiation readings – <0.2 mRem/hr closed window and <0.2 mRem/hr open window Loose surface alpha contamination of floor areas is less than minimum sensitivity of portable instruments; however, swipes of personnel protective clothing show trace amounts of Pu-238/239 Loose surface beta-gamma contamination of floor areas from <450 to 2,250 pCi/100 cm^2 with 82 to 1,300 pCi/100 cm^2 due to Cs-137	C-002082, p. 2

Date	Area	Observations	Summary Findings	Reference
6/29/1989 - 7/13/1989	Lower and Upper Sample Aisle, Cell No. 5 – 2A Bank and 321 cubicles only	None	Personal air samplers – gross alpha radioactivity from < 9.8 x 10^{-13} to <1.2 x 10^{-12} µCi/ml MDA and maximum gross beta radioactivity of 4.4 x 10^{-12} µCi/ml from Cs-137	C-002082, p. 2

7.5.6 CHANGE AND WASH ROOM

Change and Wash Room Functions

Employees used the Change Rooms for changing clothes before entering radiation areas (R-001932, p. 2). The Contaminated Wash Room was located in the controlled area during SPRU activities (Figure 7-40).

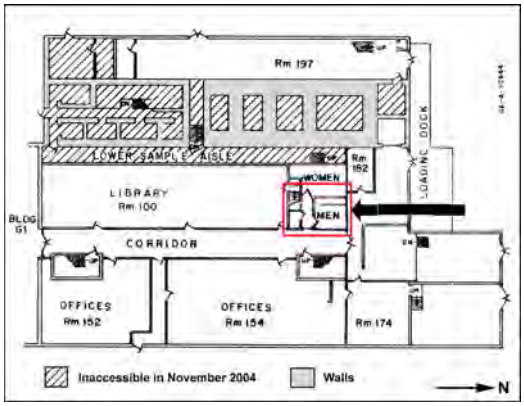

Figure 7-40. G2 337-Foot Level, Clean Change Room

Change and Wash Room Components

Change Room equipment included lockers, benches, urinal and toilets, sinks, hampers, pipelines, conduits, valves, and lights (R-001932, p. 2). The combined Contaminated Wash Room and Change Room areas were originally equipped with a chemical toilet, two wash sinks, and a urinal.

Change and Wash Room Configuration

The Clean and Contaminated Change Rooms are 16 feet wide by 20 feet long and 10 feet high.

Change and Wash Room Modifications Since Construction

Originally, the Clean Change Room and Contaminated Change Room were one space, separated only by a bench. The Clean Change area was converted to a men's room in 1959. Supporting utilities (power, water, HVAC, plumbing) were modified or installed to support the modified area. The Contaminated Change Room was converted to a women's room (R-001126). A janitorial closet is across from the men's room.

Change and Wash Room Construction Drawings

Clean Change Room construction and later modification drawings are provided in Appendix B, Drawings:

Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G-337, SPRU Building G2-Floor Plans, Elevation 337', ERG, June 2004
Drawing No. 2828-801-23, Crane Gallery Floor Plan, November 22, 1948
Drawing No. SK-6081, Second and Third Floor Plans – Building G2, February 17, 1977.

Change and Wash Room Photographs

Current Change and Wash Room configurations are shown in Figures 7-41, 7-42, 7-43, and 7-44.

Figure 7-41. Photo G2-116, G2 337-Foot Level, Janitor's Closet, November 2004

Figure 7-42. Photo G2-117, G2 337-Foot Level, Men's Room, November 2004

Figure 7-43. Photo G2-114, G2 337-Foot Level, Women's Room, View 1, November 2004

Figure 7-44. Photo G2-115, G2 337-Foot Level, Women's Room, View 2, November 2004

Change and Wash Room Radiation Survey and Decontamination History

In April 1952, Change Room general atmospheric samples were between 7.4×10^{-12} and 4.4×10^{-11} microCuries alpha activity. Subsequent surveys identified an estimated 433 micrograms total plutonium alpha contamination on the soapstone sink, primarily on a 3-square-foot area of the sink bottom. The area was decontaminated and the sink discarded as plutonium-contaminated waste (C-000037, p. 1).

In 1964 or 1965, a Building G2 radioactive drain backed up and radioactive liquid overflowed in the women's room (the former Contaminated Change Room). The facility record shows that radioactivity behind partitions, above ceilings, in pipe chases, and in other areas is presumed because of improper decontamination following this incident (R-001126).

On July 5, 1983, a radiological control technician performed a survey of the women's room fluorescent light fixture before ballast replacement. Ballast exterior results were less than 450 picoCuries beta-gamma per direct probe and less than 100 counts per minute per large area swipe, with no detectable alpha. A direct probe survey after removing the ballast cover yielded no indication of radioactivity; however, a large area swipe measured 500 counts per minute above background (2,250 picoCuries/ large area swipe) beta-gamma, and no detectable alpha. The area was isolated and additional internal ballast cover surface swipes measured 560 picoCuries per 100 square centimeters beta-gamma with no detectable alpha. Gamma multi-channel analysis determined the radioactivity to be Cs-137. On July 7, 1983, the other women's room light fixture was disassembled and determined to be in approximately the same condition. Additional surveys identified 4,500 picoCuries per direct probe beta-gamma (1,000 counts per minute) and 450 picoCuries per beta-gamma (measured by tape press) at the floor and wall juncture of a removed baseboard. Lavatory sink drain wall penetrations measured 1,800 picoCuries per 100 square centimeters (R-001126).

On April 28, 1984, a radiological technician performing a survey supporting radiological work in a nearby area, observed a suspicious substance (oily dust) and decided to survey the Janitor's Closet door. A direct probe measured 2,250 picoCuries (with a portable beta-gamma frisker) and no detectable alpha (with a portable alpha frisker). The area was secured, a controlled surface contamination area established, and the door removed and disposed as radiological waste. Additional surveys indicated that the top of the door was contaminated (1,125 picoCuries per 100 square centimeters swipe) and closet ceiling was contaminated (450-1,350 picoCuries per direct probe fixed) with beta-gamma activity. Swipes sent to radiochemistry for isotope identification indicated predominantly Cs-137 (R-001126, G2 Janitor's Closet Northwest Corner).

Table 7-29 provides summary Change Room area radiological data from 1954 and 1999 surveys.

Table 7-29. Building G2, Change Room Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Change Room	None	Smear Results (on approximately 6 square feet of surface): Entrance way to sample handling room - <200 dpm alpha; 2,000 cpm beta-gamma Locker area - <200 dpm alpha; <200 cpm beta-gamma Sink - <200 dpm alpha; <200 cpm beta-gamma Hampers - 500 dpm alpha; <200 cpm beta-gamma Sample handling room door - <200 dpm alpha; <200 cpm beta-gamma Glove and rubber rack - <200 dpm alpha; 300 cpm beta-gamma South area - <200 dpm alpha; 300 cpm beta-gamma Front entrance - <200 dpm alpha; 300 cpm beta-gamma Locker shelves - <200 dpm alpha; <200 cpm beta-gamma	R-000059, p. 21
11/22/1999	G2 Ladies Room	None (This room posted as fixed contamination area and RWP)	Contamination survey results following 34 direct probe readings – 60 cpm beta-gamma background; <20 cpm alpha net; <100 cpm beta-gamma net; <50 pCi alpha; <450 pCi beta-gamma	R-000281

7.5.7 ROTAMETER ROOM

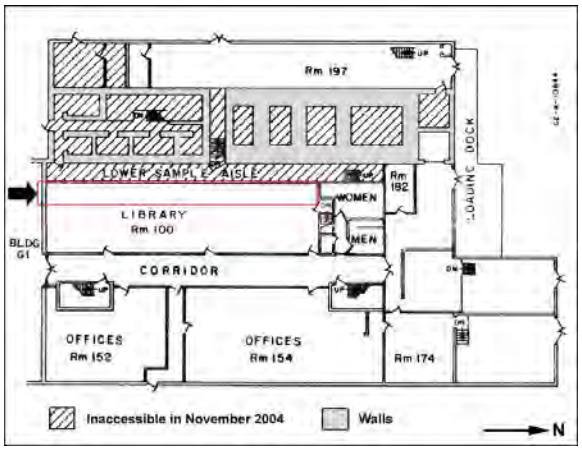

Figure 7-45. G2 337-Foot Level, Rotameter Room

Rotameter Room Function and Components

The Rotameter Room (Figure 7-45) contained cold feed stream flow control valves and flow-rate transmitting instruments (R-001932, p. 1).

Rotameter Room Configuration

The Rotameter Room was an explosion-proof room 80 feet long by 6 feet wide and 20 feet high, extending partially over the control room at the 357-foot level. Originally, it was located between the Lower Sample Aisle (to the west) and the Control Room (to the east). Stairs connected the Rotameter Room to the 325-foot level former Pipe and Motor Generator Room (R-002085, p. 5).

A reference in a 1950 document is made to a sump in Room 100 (R-001126). Room 100 is shown in an area that was the Rotameter Room during SPRU operations. It is unclear if this is the same Room 100 as referenced in R-001126.

Rotameter Room Modifications Since Construction

The Rotameter Room was cleared of equipment, decontaminated, and converted to library space at the 337-foot level and office space at the 348-foot level. Modifications included new partitions, suspended ceilings, lighting, and HVAC systems. The Library, (Room 100) (R-000164, Enclosure), occupied 1,600 square feet on the 337-foot level (but is no longer there as of 2004). A double wall partition consisting of transite on the library side and a metal partition on the sample aisle side separates the two spaces.

Rotameter Room Construction Drawings

Rotameter Room construction and modification drawings are provided in Appendix B, Drawings:

Drawing No. 2828-1-3, Layout Plan First Floor, April 12, 1948
Drawing No. 2828-801-2, First Floor Plan-Elevation 337', July 20, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G-337, SPRU Building G2-Floor Plans, Elevation 337', ERG, June 2004.

Rotameter Room Photographs

In November 2004, office areas in the former Rotameter Room office were similar to those elsewhere in G2.

Rotameter Room Radiation Survey History

Table 7-30 provides summary Rotameter Room radiological survey data from a 1954 survey.

Table 7-30. Building G2, Rotameter Room Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Rotameter Room	None	Smear Results (approximately 6 square feet of surface): North - <200 dpm alpha; 1,300 cpm beta-gamma Middle - <200 dpm alpha; 300 cpm beta-gamma South - <200 dpm alpha; 200 cpm beta-gamma	R-000059, p. 21

7.5.8 CONTROL ROOM

Control Room Functions and Components

The Control Room (Figure 7-46) contained instrument and control mechanisms for process operations control and operation recording instruments (R-001932, p. 1).

Control Room Modifications

The Control Room equipment, panels, and consoles were removed and the area was converted to Library (Room 100) space (C-000164, p. 8). The area is currently vacant.

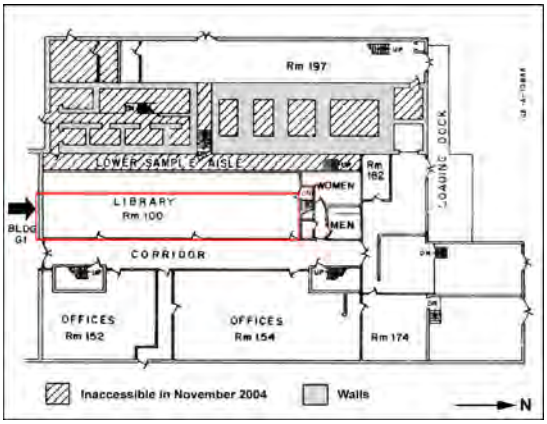

Figure 7-46. G2 337-Foot Level, Control Room

Control Room Construction Drawings

Control Room original construction and modification drawings provided in Appendix B, Drawings include:

Drawing No. 2828-1-3, Layout Plan First Floor, April 12, 1948
Drawing No. 2828-801-2, First Floor Plan Elevation 337', July 20, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G-337, SPRU Building G2-Floor Plans, Elevations 337', ERG, June 2004.

Control Room Photographs

G2-30, G2 SPRU Process Control Room (357-foot level), undated (Appendix C, Photographs).

Control Room Radiation Survey History

On November 28, 1955, approximately 1 gallon of radioactive solution was discovered on the Control Room floor, safe-files, and blueprints at the rear of the process control panel. The solution had spilled from an open line connected to a process vessel that had been disconnected from a control panel instrument. A dose rate of 100 milliRem per hour was detected 1 inch from the spill. The spill was confined to the immediate area and personnel radiation exposure did not occur. The area was posted and decontamination was initiated the next day (R-001126, p. G2-100).

Table 7-31 provides summary Control Room radiological data from a 1954 survey.

Table 7-31. Building G2, Control Room Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Front of G2 Control Room	None	Smear Results (on approximately 6 square feet of surface): Smears taken of the following areas measured <200 dpm alpha; 200 cpm beta-gamma: South end of control panel Middle of control panel North end of control panel South end of control room Middle of control room North end of control room	R-000059, p. 21
2/22/1954 (following decontamination)	Rear Control Panel	None	Smear Results (on approximately 6 square feet of surface): Step ladder - <200 dpm alpha; 400 cpm beta-gamma South, middle, and North sections - <200 dpm alpha; <200 cpm beta-gamma	R-000059, p. 21

7.5.9 BATCH COUNT EXTRACTION (BCE) AREA

BCE Area Functions

The BCE (Figure 7-47) was a head-end research and development area that dissolved slugs associated with SPRU (I-000418). The slugs were encased in zirconium and columbium (niobium). A September 28, 1949 letter outlined design and shielding requirements for a REDOX experimental unit operation in what was at the time called Room 151. The three-cell BCE unit contained batch experiment equipment including a slug dissolver, a centrifuge, and a 15-stage batch counter current contactor; small development bench equipment (R-001932, p. 2); and a sump (C-002043).

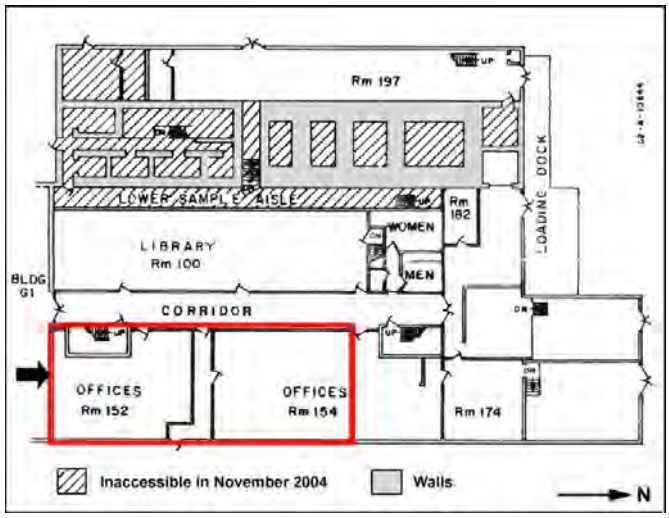

Figure 7-47. G2 337-Foot Level, Batch Count Extraction (BCE)

A room associated with this area, whose exact location is unknown, is Room 151, which was called the Engineering High Level Radiation Laboratory in July 1953 (C-000479; R-000533, p. 2).

Room 153 (currently part of Room 152) was an instrument repair room (R-001932, p. 2) and was last used as office space (Figure 7-47).

BCE Area Modifications Since Initial Construction

The BCE Area was part of the original construction of G2. It was dismantled, decontaminated, and converted to office space. Lead shielding currently covers approximately 25 feet by 25 feet of floor area.

BCE Construction Drawings

An October 7, 1949 letter from J. L. Gould to Dr. L. B. Bragg described the operation and costs associated with the BCE operations and provided drawings of the BCE room configuration and placement of equipment (C-002043).

Former BCE Area Photographs

Figure 7-48 shows the raised lead floor area in the former BCE area. The lead has been covered over with tile. Figure 7-49 shows the room north of the former BCE area. This room's recent modifications (in 2004) include a floor plan that can be seen in Figure 7-49.

Figure 7-48. Photo G2-127, G2 337-Foot Level, Room 154 formerly the BCE, June 2004

Figure 7-49. Photo G2-140, G2 337-Foot Level, Room in Northeast Corner of Room 154, June 2004

BCE Radiation Survey History

March 29, 1951 operation records reported a radioactive material spill in Room 151. During the head-end dissolver feed treatment in the BCE unit, the feed leaked through the sample line from the make-up vessel and onto the floor. The radiation was confined to a small zone and the area was decontaminated (C-000500).

Room 154, formerly the Engineering High Level Radiation Laboratory, contained localized contaminated spots over a 400-square-foot area of the concrete floor. Approximately in the middle of the room, the underground Pipe Trench contains a contaminated pipe, which was a direct line for transporting raw waste from the Engineering High Level Radiation Laboratory hot cell to SPRU collection tanks (R-001126, pp. G2-154/156). The concrete floor was covered completely with new tiles in 1958 (R-001126, pp. G2-154/156; C-000082, p. 1; C-000086, p. 1), and in December 1958, Room 154 was ready for occupancy (C-000082, p. 1).

The 1958 decontamination work failed to eliminate all of the contaminated spots in the Room 154 concrete floor. The fixed contamination in the concrete was reported to be 0.2 milliCuries of mixed fission products. Rooms 151 and 152 and the BCE equipment were dismantled and decontaminated during the second half of 1958 and early 1959. The effort involved removing walls, partitioning, equipment, piping, and additional measures (C-000082, p. 1; C-000084, p. 1; C-000085, p. 1; C-000086, p. 1; C-000087, p. 1; C-000088, p. 1), including:

- Decontaminating the former Air Lock floor
- Removing the Room 151 floor tile
- Scrubbing the Room 152 composition floor and removing hot sections
- Permanently sealing Rooms 151 and 152 sumps (floor drains) below the floor level.

A 1967 plan to convert the area to office space included complete covering of the concrete floor with new tiles and chipping out the concrete floor to completely remove the contamination (R-000533, p. 2). Lead shielding now covers the area.

On July 1, 1977, a radiological controls technician reported that paint on a known contamination area on the east wall of Rooms 154 and then named Room 156 (in the southeast corner of the 337-foot level) was blistering and peeling. The paint chips indicated less than 450 picoCuries of loose surface radioactive contamination; however, peeled areas indicated 2,000 counts per minute of fixed beta-gamma radioactivity greater than background levels. A detailed area survey identified approximately 1 teaspoon of rubble in a not readily accessible 2-inch space between a beam and the building wall. The material measured 2,700 picoCuries, determined to be a combination of cesium-137 and strontium-yttrium-90. The material was cleaned up and the area painted with latex paint (R-001126, pp. G2-154/156).

On May 10, 1984, a direct probe (alpha, beta) survey meter indicated 6,750 picoCuries (1,500 counts per minute above background) near the bottom of three metal U-shaped window frames in Room 154. No alpha contamination was detected. The contamination was determined to be loose. Repeated washing of the area showed consistent levels of about 1,800 picoCuries (400 counts per minute) loose activity, while the direct probe reading of the same area showed no decrease from the initial indications (R-001126, pp. G2-154/156).

On December 14, 1984, a portable beta-gamma frisker direct probe measurement detected 2,700 picoCuries of beta-gamma radioactivity in the G2 south stairwell area (near Room 152). A multi-channel (germanium-lithium detector) gamma analysis indicated the presence of cesium-137, cesium-134, and a small amount of cobalt-60. Containment barriers were installed following the December 1984 incident. The area was cleaned again after radiation was detected on a rag used to clean up a roof leak in the area. Floor tiles loosened by the leakage were replaced (R-001126, G2 South Stairwell).

Subsequent surveys indicated less than 50 picoCuries by portable alpha frisker direct probe measurement and mop tailing surveys indicated 450 picoCuries beta-gamma and less than 50 picoCuries alpha by direct probe measurements. Surrounding area surveys indicated less than 450 picoCuries beta-gamma and less than 50 picoCuries alpha per 100 square centimeters.

The BCE area radiological history is provided in Table 7-32.

Table 7-32. Building G2, BCE Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
1/4/00	Room G2-154	None (This room posted for radioactive material)	Contamination survey results for 19 direct probe readings – 50 cpm beta-gamma background; <20 cpm alpha net; <100 cpm beta-gamma net; <50 pCi alpha; <450 pCi beta-gamma Radiation survey results - <0.2 mR/hr open and closed window, in the general area and on contact	R-000281

7.5.10 REMAINDER OF 337-FOOT LEVEL

The 337-foot level areas are shown in construction drawings provided in Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-3, Layout Plan First Floor, April 12, 1949
Drawing No. 2828-701-13, Piping Plan Inert Gas Generator, September 2, 1948
Drawing No. 2828-801-2, First Floor Plan- Elevation 337', July 20, 1948
Drawing No. G2-A-2405, Stairs Plans and Sections Building G2, January 27, 1960
Drawing No. G2-A-2890, Modifications-Truck Dock, May 27, 1961
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Drawing No. G2-E-3820, Autoclave Facility Area Equipment Plan, October 30, 1964
Figure G-337, SPRU Building G2-Floor Plans, Elevations 337', ERG, June 2004.

Make-up and Dilution Area

The Make-up and Dilution Area originally contained the 330 make-up tank, the 329 dilution tank, and several pumps (Drawing No. 101E7602.3). Large quantities of aluminum nitrate and nitric acid were made in the area (R-001932, p. 3). Individual headers for de-ionized water, concentrated HNO_3, and concentrated NaOH were supplied by outside storage tanks and pumps located in the area (R-000059, p. 5) (Figure 7-50). This area was converted to office space.

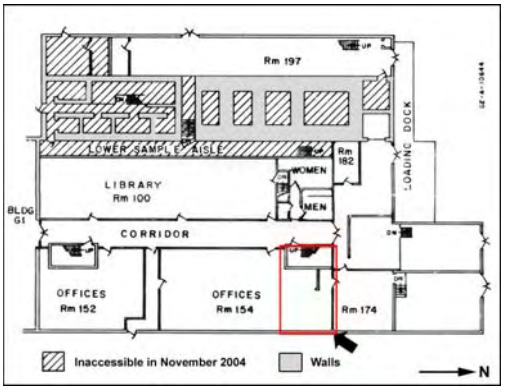

Figure 7-50. G2 337-Foot Level, Make-up and Dilution Area

Machine Shop (Room 174)

Room 174 was the machine shop during SPRU operations. The machine shop was used for repairing hot equipment on a small scale (R-001932, p. 3). Both the sump and the sump pit are depicted in the upper left quadrant of the drawing (Drawing No. G2-PE-2520).

When SPRU ended, Room 174 became an autoclave testing and lab area for the Experimental Engineering Laboratories (Figure 7-51). Drawing No. G2-E-3820, Autoclave Facility Area Equipment Plan, October 30, 1964 in Appendix B provides a detailed plan of the autoclave area that was comprised of the four rooms in the northeast corner of the 337-foot level.

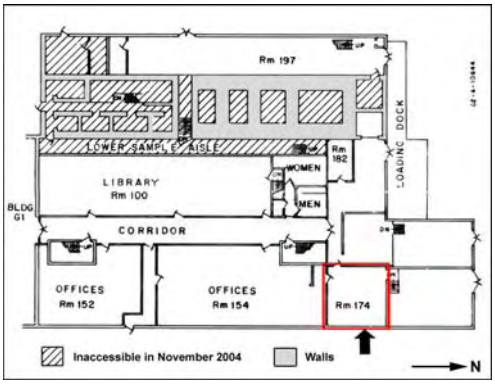

Figure 7-51. G2 337-Foot Level, Machine Shop

Room 174 operations ended in January 1999, followed by an inspection in March 1999. Control panels, a resin loop cabinet, two sinks, one hood, one bench vise, and an old 300-liter autoclave heater located in the pit remained in the room. Chemical hazards were identified in the pickling sink area and possible asbestos and radiological hazards were identified with the sinks, hood, bench vise, and the 300-liter autoclave heater and heater jacket located in the pit. The pit was identified as requiring Confined Space Entry (C-001950, Appendix A) (Figures 7-52 and 7-53).

Figure 7-52. Photo G2-148, G2 337-Foot Level, Room 174 (Southeast Corner), November 2004

Figure 7-53. Photo G2-130, G2 337-Foot Level, Room 174 (Northeast Corner), November 2004

Machine Shop radiological history is provided in Table 7-33.

Table 7-33. Building G2, Machine Shop Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	G2 Machine Shop (Rm. 174)	None	Smear Results (on approximately 6 square feet of surface): Smears taken of the following areas measured <200 dpm alpha; <200 cpm beta-gamma: Area around doors South aisle North section	R-000059, p. 22
9/1/1999	Room G2-174	None (This room posted for radioactive material)	Contamination survey results for 15 direct probe readings – 50 cpm beta-gamma background; <20 cpm alpha net; <100 cpm beta-gamma net; <50 pCi alpha; <450 pCi beta-gamma Radiation survey results - <0.2 mR/hr open and closed window, in the general area	R-000281

Inert Gas Generator Room (Room 176)

The Inert Gas Generator Room (Figures 7-54 and 7-55) originally contained a compressor and surge tank that supplied an air header that furnished air stations in various areas of Building G2 and H2 (R-001949, p. 34). When SPRU research ended, the generator was used only to supply nitrogen to Building H2 (R-000059, p. 4).

The Inert Gas Generator Room was also called the Cardox Room because Cardox fire suppression tanks were located in the space. The space is now designated only as Room 176.

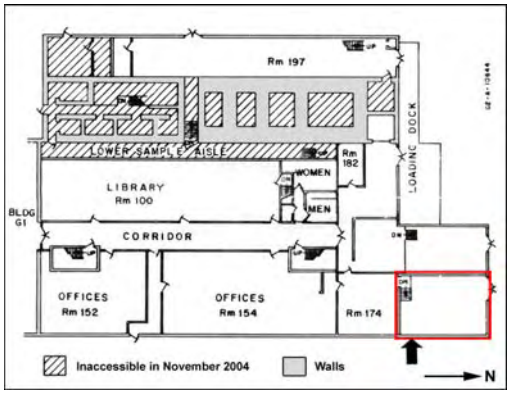

Figure 7-54. G2 337-Foot Level, Inert Gas Room

Figure 7-55. Photo G2-131, G2 337-Foot Level, Room 176 Lower Deck, November 2004

Contamination was found on a door handle and multiple internal surfaces of the sink cabinet in the southeast corner of Room 176 during an annual radiological survey, on January 23, 1986. The contaminated areas counted between 100 and 300 counts per minute (450-1,350 picoCuries) beta-gamma and 20 to 30 counts per minute (50-75 picoCuries) alpha. One area inside of the left hand cabinet door measured approximately 200 counts per minute (500 picoCuries) alpha and 200 counts per minute (500 picoCuries) beta-gamma by direct probe. The survey was terminated because loose contamination exceeded KAPL release limits and the sink cabinet was sealed and stabilized with yellow plastic sheeting (facilon) and white cloth tape. A swipe was transferred to radiochemistry for isotopic analysis (R-001126, p. G2-176).

A March 1999 inspection was performed following completion of Room 176 operations in January 1999. The lower deck of this room was identified as part of the autoclave test area for the Experimental Engineering Laboratories and the upper (equipment) deck was identified as housing the feed tank farm and demineralizer systems. (See Drawing No. G2-E-3820, Autoclave Facility Area Equipment Plan, October 30, 1964.)

No property was left on the upper deck, but control panels, a sink, and all autoclave stands with heaters remained on the Room 176 lower deck following turnover of the laboratories in 1999. Chemical hazards were identified around the caustic autoclave; possible asbestos hazards were identified at the autoclave heaters, cooling water pipes, autoclave stands, and control panels; and possible radiological hazards were identified at the control panels and autoclave stands with heaters.

Room 176 radiological history is provided in Table 7-34.

Table 7-34. Building G2, Inert Gas Generator Room Radiological Survey History

Date	Area	Observations	Summary Findings
2/22/1954 (following decontamination)	Inert Gas Room	None	Smear Results (on approximately 6 square feet of surface): Smears taken of the following areas measured <200 dpm alpha; <200 cpm beta-gamma: Stair landing top and bottom Floor in front of CO_2 tank

Reference: R-000059, p. 23

Truck Dock and Truck Well (Room 178 and Room 180)

The Truck Dock area (Figure 7-56) used an electrically operated 5-ton crane for loading and unloading trucks (R-001932, p. 3). A motor-generator control system for centrifuge operation also was located in the truck dock area (see Figure 7-57) (R-000059, p. 8).

On April 9, 1952, approximately 1 quart of flush solution containing 1,242 disintegrations per minute per milliliter plutonium alpha activity was poured on the truck dock floor and drained to the storm sewer. The solution contained approximately 10 micrograms of plutonium; following the incident, approximately 5 micrograms of plutonium were detected over a 10-square-foot area of the truck dock floor (C-000035, p. 1).

On June 30, 1983, loose alpha contamination was found near the door between Room 174 and Room 176, in a corner crevice of the floor between a cabinet and sidewall. Fixed beta-gamma contamination was then

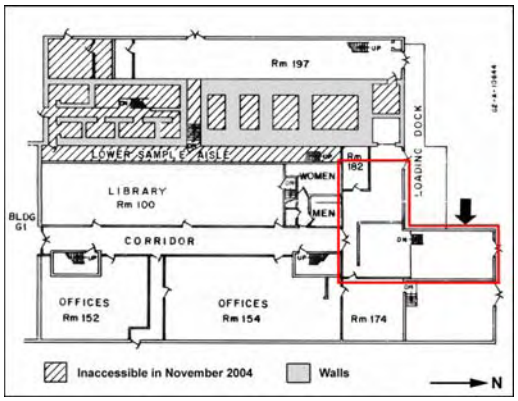

Figure 7-56. G2 337-Foot Level, Truck Dock and Truck Well

detected. Direct probe surveys of the wall and floor detected alpha contamination (80 to 100 counts per minute) on the service area floor, but no beta-gamma contamination. Plutonium-239 was identified on swipes measuring a maximum of 60 picoCuries per 100 square centimeters alpha. Floor contamination was in an area where floor sweepings and dust accumulates. No detectable contamination was found on wall surfaces. Incomplete cleanup of isolated areas of a past spill may have resulted in the contamination (R-001126, p. G2-174).

A partial Room 180 (previous truck dock area) survey in September 1988 identified four spots with fixed beta-gamma contamination. Collected paint samples contained uranium (less than or equal to 30 picoCuries per gram) and plutonium (greater than three picoCuries per gram). Areas with fixed contamination above limits were not labeled at the time, but Room 180 was surveyed again in June 1991 and both known and new fixed contamination areas were identified. No loose contamination or air sample radioactivity above KAPL limits was identified (R-001126, p. G2-180).

In January 1999, activities in Room 178 and 180 ended. An inspection was performed in March 1999. Room 178, lower deck, was identified as part of the autoclave test area for the Experimental Engineering Laboratories (Figure 7-58) (see Drawing No. G2-E-3820, Autoclave Facility Area Equipment Plan, October 30, 1964.)

Control panels, autoclave stands and heaters, two workbenches, and one bench vise remained on the lower deck in 1999. An old floor fan with unknown history and ruptured disk assemblies remained on the upper deck. No chemical hazards were identified during the walkthrough. Possible asbestos and radiological hazards associated with the control panels, autoclave stands and heaters, and bench vise were identified (C-001950, Appendices D and E).

Figure 7-57. Photo G2-137, G2 337-Foot Level, Truck Dock, November 2004

Figure 7-58. Photo G2-135, G2 337-Foot Level, Room 178 Upper and Lower Decks, November 2004

The radiological history of Rooms 178 and 180 is provided in Table 7-35.

Table 7-35. Building G2, Truck Dock and Truck Well Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	G2 Ramp (outside of truck dock area)	None	Smear Results (on approximately 6 square feet of surface): Smears taken of the following areas measured <200 dpm alpha; <200 cpm beta-gamma: Dog house Ramps	R-000059, p. 22
2/22/1954 (following decontamination)	G2 Truck Dock	None	Smear Results (on approximately 6 square feet of surface): Smears taken of the following areas measured <200 dpm alpha; <200 cpm beta-gamma: Front of centrifuge panel Loading door Welder's aisle Crane gallery roll-up door	R-000059, p. 22
2/22/1954 (following decontamination)	Truck Well	None	Smear Results (on approximately 6 square feet of surface): Smears taken of the following areas measured <200 dpm alpha; <200 cpm beta-gamma: North end Middle part South end	R-000059, p. 23
2/8/1999	Room G2-176	Loose floor tiles (controlled as RAM) (This room posted for RWP)	Contamination survey results for 1 direct probe reading and 4 swipes – 50 cpm beta-gamma background; <8 cpm alpha net; <100 cpm beta-gamma net; <20 pCi alpha; <450 pCi beta-gamma	R-000281

Other Rooms

In 1999, Room 182, north of the Women's Room and Lower Sampling Aisle (Figure 7-59), was referred to as the "former sludge lab for the Experimental Engineering Laboratories." It had been a SPRU storage and paint room. A walkthrough performed in March 1999 following completion of operations in January 1999, revealed two sinks, all countertops, and one hood remaining after turnover (C-001950, Appendix G).

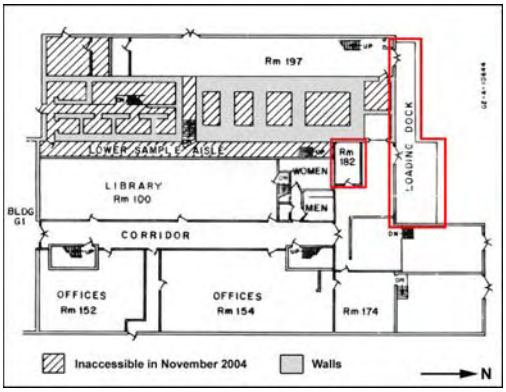

Figure 7-59. G2 337-Foot Level, Room 182 and the Loading Dock

7.6 Building G2 348-Foot Level

The Building G2 second floor is approximately 4,522 square feet. Major areas and components include the Crane Gallery and hoisting bay, removable stepped concrete cell hatches, weigh scales, decontamination area, and ventilation exhaust equipment (C-000014, p. 13). This level is also sometimes called the 349-foot level in drawings and historical documents. Figure 7-60 shows the current configuration of this elevation.

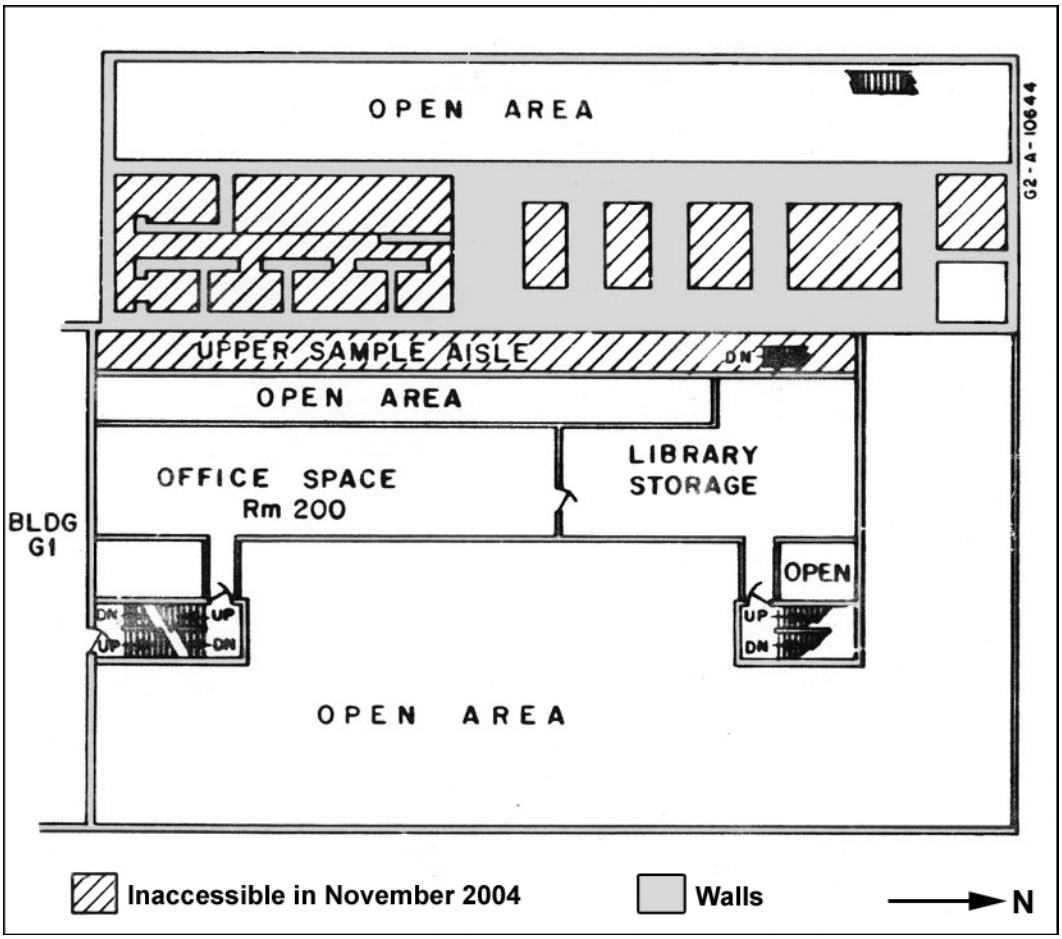

Figure 7-60. Building G2, 2nd Floor, 348-Foot Level (modified from Drawing No. G2-A-10644, February 17, 1984; approximates 2004 configuration)

The open areas are areas that have no floor on this level. Figure 7-61 shows the narrow open area east of the Upper Sample Aisle and Figure 7-62 shows the suspended ceiling above the 337-foot level, as seen from the 348-foot level.

Figure 7-61. Photo G2-112, G2 348-Foot Level Open Area East of Upper Sample Aisle, undated

Figure 7-62. Photo G2-111, G2 348-Foot Level Suspended Ceiling, November 2004

The 348-foot level construction and later modifications are depicted in the following drawings provided in Appendix B, Drawings:

Drawing No. 2828-701-38, Plan Below Elevation 352', November 20, 1948
Drawing No. 2828-701-39, Plan Below Elevation 352', November 15, 1948
Drawing No. 2828-801-3, Balcony Floor Plan- Elevation 350'-6", July 22, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Drawing No. SK-6081, Second and Third Floor Plans- Building G2, February 17, 1977.

Building G2 348-foot level current conditions are the result of the following modifications:

- The Upper Sampling Aisle was not used after SPRU operations.
- Constant Head Balcony and the upper portion of the Rotameter Room were stripped of equipment and converted to library storage and office space (Room 200). A utility pipe chase on the west office area wall can be accessed from the southwest corner of the library storage room.
- One of the filter rooms (Upper or Lower Filter Room) was converted to a laundry facility in 1961; the reference is not specific as to which (C-000106, pp. 1-2). The Upper Filter Room was converted to office space in 1968.

Figure 7-63 illustrates the current configuration and radiological status of the 348-foot level. Terminology used in this figure is explained in Table 5-1.

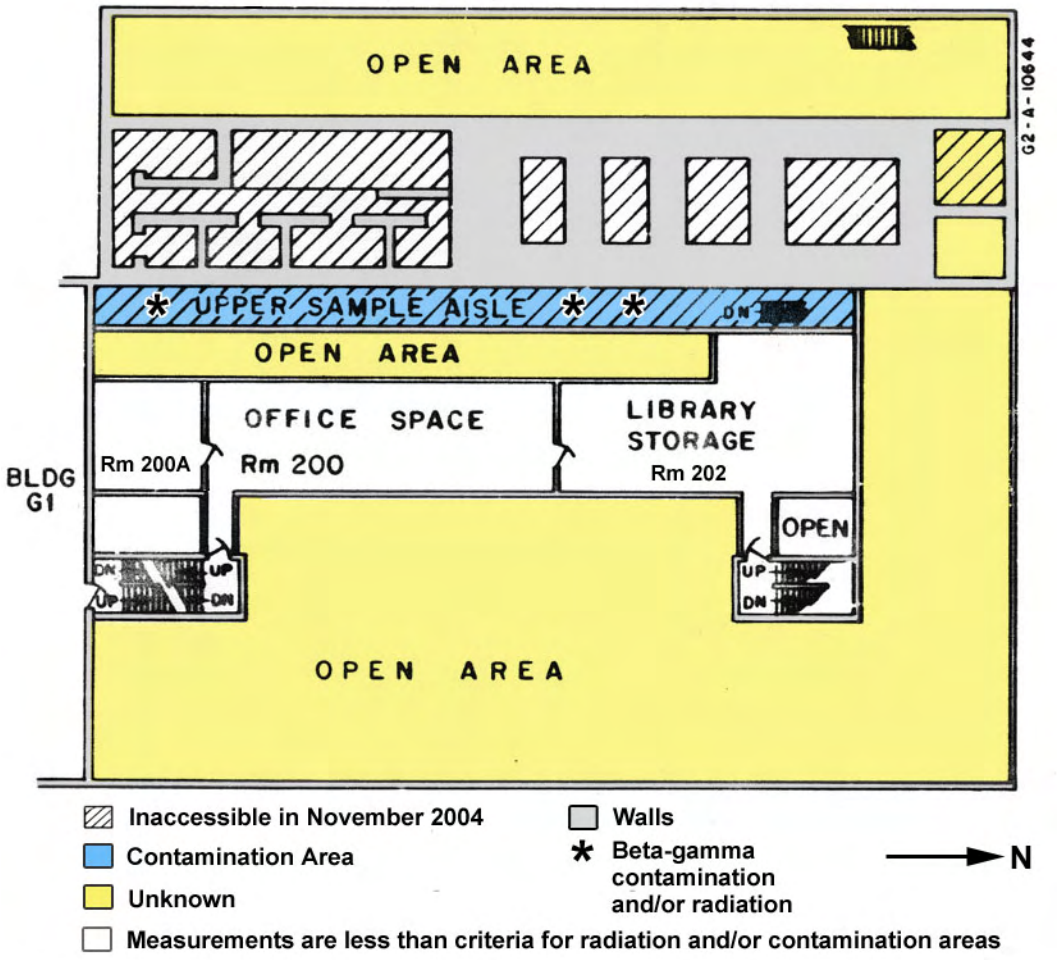

Figure 7-63. Radiological Conditions of the G2 348-Foot Level (based on 1989 survey data)

The Upper Sampling Aisle and Decontaminating Chamber are currently under radiological control and inaccessible. Rooms 200 and 202 and the adjacent 348-foot level stairwells were measured with a direct frisk/probe during a routine quarterly survey in July 2004. The survey identified less than 450 picoCuries (999 disintegrations per minute) beta-gamma and less than 50 picoCuries (111 disintegrations per minute) alpha. Survey notes indicated particular attention to areas with sealed surfaces (R-000525). Therefore, surveyed Building 348-foot level areas are not currently considered contaminated. Radiation (dose to individuals recorded in Rem per hour) was not assessed because the 2004 survey only measured contamination.

The last known Upper Sampling Aisle survey was conducted in 1989 (C-002082, p. 2). Loose surface beta-gamma contamination of floor areas from less than 450 to 2,700 picoCuries per 100 square centimeters (999 to 5,994 disintegrations per minute) was identified, indicating that the Upper Sampling Aisle is a contamination area. Additionally, localized open window readings of a shielded sample station measured 10 milliRem per hour, which is in the range of a radiation area.

7.6.1 UPPER SAMPLE AISLE

The Upper Sample Aisle (Figure 7-64) is inaccessible.

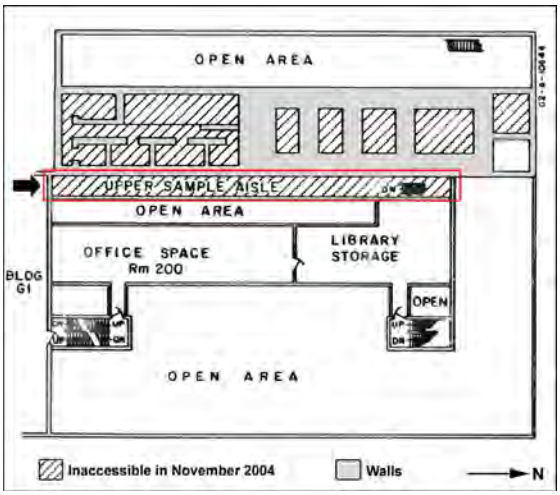

Figure 7-64. G2 348-Foot Level, Upper Sample Aisle

Upper Sample Aisle Functions

The Upper Sample Aisle, also called Sampling Room No. 2, contained sample units for hot vessels and units for sampling stages of contactors (R-001932, p. 1). It is located on the 348-foot level, immediately above the Lower Sample Aisle (Sampling Room No. 1). Historical documentation often combines information about the two sampling rooms.

Upper Sample Aisle Components

Upper Sample Aisle contents include deactivated valves, piping, and components for hot and cold water, process cooling water, vacuum, breathing air, nitrogen, oxygen, carbon dioxide (for fire protection), compressed air, steam, condensate, de-ionized water, concentrated nitric acid, and concentrated sodium hydroxide. The Upper Sample Aisle also contained units for sampling hot vessels and contactor stages (R-001932, p. 1). Electrical service wiring and switches remain, but are isolated. Fuses were pulled, breakers opened, and wiring was disconnected in the 1960s (C-000164, p. 8).

Upper Sample Aisle Configuration

The Upper Sample Aisle is 626 square feet (100 feet [north-south] and 10 feet 5 inches [east-west]), and 7 feet 8 inches in high.

Upper Sample Aisle Modifications Since Construction

The Upper Sample Aisle structure is intact, but as in the Lower Sample Aisle, most utility and service lines were disconnected and abandoned during G2 modifications in the 1960s.

Upper Sample Aisle Construction Drawings

The following Upper Sample Aisle construction drawings are provided in Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-2, Layout Typical Elevation, April 4, 1948
Drawing No. 2828-1-3, Layout Plan First Floor, April 12, 1948.

Upper Sample Aisle Photographs

The Upper Sample Aisle is shown in Figure 7-65 as it looked during SPRU research activities.

Figure 7-65. Photo G2-38, G2 348-Foot Level, Upper Sample Aisle Looking South, undated

Upper Sample Aisle Radiation Survey and Decontamination History

Between December 1965 and February 1966, lighting was installed, loose debris and overhead piping removed, partitions constructed, holes patched, and open pipes capped to isolate the sample aisles from adjacent areas. Wall, floor, and fixture decontamination took place between December 1965 and February 1966 (C-000119, p. 1). Decontamination reduced surface contamination and airborne concentrations below permissible limits and minimized anti-contamination clothing required for non-work entry into the aisles. Decontamination included vacuuming followed by two damp wipe-downs, washing surfaces with water, and mopping floors several times. Strip coating was removed from the east wall of both sample aisles. Fixed alpha (from 500 to 200,000 disintegrations per minute per 9.5 square inches) remains on sampling equipment and on the tile floor under sampling equipment. An absolute filter (with dampers that close in the event of reverse airflow from the cell area) was installed in the Lower Sample Aisle doorway to the cell area. Summary results of the decontamination process are (R-002107, pp. 1-8):

- Average general background was lowered to 0.2 milliRoentgen per hour from 1.5 milliRoentgen per hour
- Spot measurements on floors were lowered to 0.5 millirad per hour from 15 millirad per hour
- No occupancy air concentrations remained less than 25 percent Maximum Permissible Concentration
- Alpha air concentrations with occupancy were lowered to less than 5×10^{-13} microCuries per cubic centimeter (or less than 25 percent) from 10^{-10} microCuries per cubic centimeter (or 50 percent Maximum Permissible Concentration for air)
- Occupancy beta-gamma air concentrations were lowered to less than 3×10^{-11} microCuries per cubic centimeter (or less than 25 percent Maximum Permissible Concentration for air) from 10^{-9} microCuries per cubic centimeter (or 90 percent Maximum Permissible Concentration for air)
- Fixed alpha on floors and sampling equipment did not change (600 disintegrations per minute per 9.5 square inches average, some spots exceeding 200,000 disintegrations per minute per 9.5 square inches)
- Loose surface alpha on floors was lowered to 6 picoCuries per 100 square centimeters from 615 picoCuries per 100 square centimeters

- Loose surface beta-gamma on floors was lowered to 300 picoCuries per 100 square centimeters from 17,000 picoCuries per 100 square centimeters
- Loose surface alpha on sampling equipment was lowered to 18 picoCuries per 100 square centimeters from 200 picoCuries per 100 square centimeters
- Loose surface beta-gamma on sampling equipment was lowered to 200 picoCuries per 100 square centimeters from 14,000 picoCuries per 100 square centimeters.

Table 7-36 provides Upper Sample Aisle summary data from identified radiological surveys between 1954 and 1989.

Table 7-36. Building G2, the Upper Sample Aisle Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Upper Sample Aisle	None	Smear Results (on approximately 6 square feet of surface): Stairs and landing near 346 – <200 dpm alpha; 2,200 cpm beta-gamma South end – <200 dpm alpha; 2,200 cpm beta-gamma Middle part – <200 dpm alpha; 1,700 cpm beta-gamma Near 304 sampler – 800 dpm alpha; 7,500 cpm beta-gamma Along railing N end of USA – 500 dpm alpha; 3,000 cpm beta-gamma Radiation dose rates: Top of stairs to USA – 15 mR/hr gamma Center of face of 304 unit – 30 mrep/hr beta at ½ inch; 60 mR/hr gamma at 2 ½ inches Left side of 304 unit – 500 mrep/hr beta Angle iron rack, South of 304 – 4,000 mrep/hr beta at 2 inches; 25 mR/hr gamma at 4 inches Corridor opposite rack – 100 mrep/hr beta at 15 inches Under 1AW weir box section – 450 mrep/hr beta; 25 mR/hr gamma Floor by column north of 304 sampler – 125 mrep/hr at 1 inch; 25 mR/hr gamma at 3 inches North side of 346 sampler – 75 mR/hr at 12 inches Stairway opposite 346 sampler – <10 mR/hr gamma Top of landing to crane gallery – <10 mR/hr gamma	R-000059, pp. 22, 24
1/23/1964	Lower and Upper Sample Aisles	Areas in complete darkness Floor area dry	Radiation levels – 10 mR/hr to 15 mR/hr Alpha contamination – 500 to 1000 dpm Loose surface contamination on smear of floor area in lower sample aisle – 100 dpm alpha and 300 cpm beta-gamma per 100 cm^2 Air monitoring in sample aisles, access corridor, and cell areas indicates up to 45% of MPC for Pu-239 and beta-gamma up to 60% of MPC for Sr-90 Shoe covers checked for activity measured up to 10,000 dpm (for sample aisles, access corridor, and cell areas)	C-000112, pp. 1-3
12/1965 – 1/1966	Upper and Lower Sample Aisles	None	Air Sampling (alpha – 100% Pu-239 – inhalation hazard; beta-gamma – 50% Cs-137, 25% Sr-90, 25% Y-90 – surface contamination): (MPC_a for in-plant controls is 2×10^{-12} µCi/cc for alpha and 1.2×10^{-9} µCi/cc for beta-gamma)	C-000119, pp. 1, 3

Date	Area	Observations	Summary Findings	Reference
			All G2 areas outside the sample aisles and cells (includes the library, crane deck, and constant head level) – <25% of $(MPC)_a$ Inside entrance enclosure – <25% of $(MPC)_a$ Outside entrance enclosure – <25% of $(MPC)_a$ Inside aisles from December 22 through December 29 – 75 x $(MPC)_a$, maximum (resulted from dry dusty condition of aisles) Inside aisles from December 30 through January 13 – 3.5 x $(MPC)_a$, average (aisles given a CD_2 treatment and dust held down) Inside aisles January 14 through January 17 – >100 x $(MPC)_a$ (resulted from dry conditions returning; aisles evacuated and wet down) Inside aisles January 18 through January 24 – 2.5 x $(MPC)_a$ January 25 – >100 x $(MPC)_a$ (speedy-dry used for cleaning became dry and created dust when handled; aisles evacuated and wet down) January 26 through January 27 – 15 x $(MPC)_a$	
1/12/66	Upper and Lower Sample Aisles	None	Average general background – 1.5 mR/hr Average gamma measurements on surfaces – 2.0 mR/hr Average beta measurements on surfaces – 15 mrad/hr Maximum beta measurement on surfaces – 1.2 rad/hr (under a sampler in the upper aisle) Average alpha measurements – 1,700 dpm/9.5 in^2 Maximum alpha measurements – 70,000 dpm/9.5 in^2 (under a sampler in the lower aisle) Average loose surface alpha – 70 pCi/100 cm^2 Average loose beta-gamma – 5,200 pCi/100 cm^2	C-000119, p. 2
2/2/66 (following decontamination and prior to painting)	Upper Sample Aisle	None	East wall, average loose surface contamination (34 smears) – 3 pCi/100 cm^2 alpha; 70 pCi/100 cm^2 beta-gamma; <100 dpm/9.5 in^2 alpha; <0.1 mR/hr gamma over ½ inch dist. East wall, maximum loose surface contamination (1 smear) – 22 pCi/100 cm^2 alpha; 280 pCi/100 cm^2 beta-gamma Floor, average loose surface contamination (13 smears) – 20 pCi/100 cm^2 alpha; 200 pCi/100 cm^2 beta-gamma; <0.1 mR/hr gamma over ½ inch dist. Floor, maximum loose surface contamination (1 smears) – 60 pCi/100 cm^2 alpha; 625 pCi/100 cm^2 beta-gamma Sampling units, average loose surface contamination (15 smears) – 140 pCi/100 cm^2 alpha; 2,500 pCi/100 cm^2 beta-gamma Sampling units, maximum loose surface contamination (1 smears – North sampler) - 700 pCi/100 cm^2 alpha; 23,000 pCi/100 cm^2 beta-gamma General background, top of stairs – 0.3 mR/hr gamma General background, remainder of aisle – <0.1 mR/hr gamma Top of lead shielded sampler, north end of aisle – 10 mR/hr gamma Bottom of lead shielded sampler, north end of aisle – 10	C-002106, pp. 1-3

Date	Area	Observations	Summary Findings	Reference
			mR/hr gamma over 2 inch dist.; 2,500 mrad/hr beta over 2 inch dist. Small area between second and third beams from south (beta-gamma) – 0.7 mR/hr over ½ inch dist. Remainder of floor surfaces (beta-gamma) – <0.1 mR/hr over ½ inch dist. Fixed alpha on floor surfaces, minimum – <100 dpm/9.5 in^2 Fixed alpha on floor surfaces, maximum – 100,000 dpm/9.5 in^2 Fixed alpha on sampling equipment, minimum – <100 dpm/9.5 in^2 Fixed alpha on sampling equipment, maximum – >200,000 dpm/9.5 in^2 Catwalk around stairwell – 2,000 dpm/9.5 in^2; 3 mR/hr gamma over ½ inch dist.	
3/6/1968	Upper and Lower Sample Aisles	None	Results from floor in various areas – from <5 to 22 cpm corr and from <6 to 25 pCi alpha; from 15 to 645 cpm corr and from 23 to 968 pCi beta Results in two stair areas – from 10 to 11 cpm corr and from 11 to 12 pCi alpha; from 185 to 256 cpm corr and from 278 to 384 pCi beta	R-000372, p. 3
11/11/1971	Upper Sample Aisle	None	Frisking of filter canisters worn with the clearvue mask in Cell No. 2, 3, and upper and lower sample aisles for approximately 45 minutes indicated activity up to 350 cpm Results of loose surface contamination swipes: Floor (South end) – <100 dpm gamma; <200 cpm beta-gamma Wall (East and West sides) – <100 dpm gamma; <200 cpm beta-gamma Floor (center) – <100 dpm gamma; 500 cpm beta-gamma Stairs – <100 dpm gamma; 600 cpm beta-gamma	C-000132, pp. 1, 3
6/29/1989 - 7/13/1989	Upper Sample Aisle	Area dry, clean, and free of tools and equipment Stainless steel piping and tubing show no evidence of leakage Limited deterioration of insulation exists between north most shielded sample cabinet and adjacent unshielded cabinet – from the shielded sample cabinet Limited evidence of damage to floor covering and ceiling covering and/or paint No evidence of oil leakage from or damage to two shrouded pumps at	General area radiation readings – <0.2 to 0.4 mRem/hr closed window and <0.2 to 1.6 mRem/hr open window with a maximum reading on a shielded sample station of 1 mRem/hr closed window and 10 mRem/hr open window Air sample data indicated 8.13 x 10^{-12} µCi/ml gross alpha radioactivity (too low to discern isotope) and <1.22 x 10^{-11} µCi/ml MDA gross beta radioactivity Loose surface alpha contamination of floor areas is less than minimum sensitivity of portable instruments, <50 pCi/100 cm^2 with Pu-238/239 present in trace amounts, as determined in the lower sample aisle Loose surface beta-gamma contamination of floor areas from <450 to 2,700 pCi/100 cm^2 with 63 to 570 pCi/100 cm^2 due to Cs-137	C-002082, p. 2

Date	Area	Observations	Summary Findings	Reference
		the south end of this area No operational lighting		
6/29/1989 - 7/13/1989	Lower Sample Aisle, Upper Sample Aisle, Cell No. 5 – 2A Bank and 321 cubicles only	None	Personal air samplers – gross alpha radioactivity from $<9.8 \times 10^{-13}$ to $<1.2 \times 10^{-12}$ µCi/ml MDA and maximum gross beta radioactivity of 4.4×10^{-12} µCi/ml from Cs-137	C-002082, p. 2

7.6.2 CONSTANT HEAD BALCONY

Constant Head Balcony Functions

Maintaining a constant head in the feed tanks was necessary to ensure a constant cold stream flow rate. Differential head was maintained by a sealed tank with a dip leg at the cell discharge point. Gas was drawn into the dip leg as liquid was withdrawn, maintaining a constant head at the bottom of the dip leg. A constant nitrogen purge was maintained in the balance leg, preventing radioactive gases in the cells from entering the constant head tanks (R-000034, p. 36).

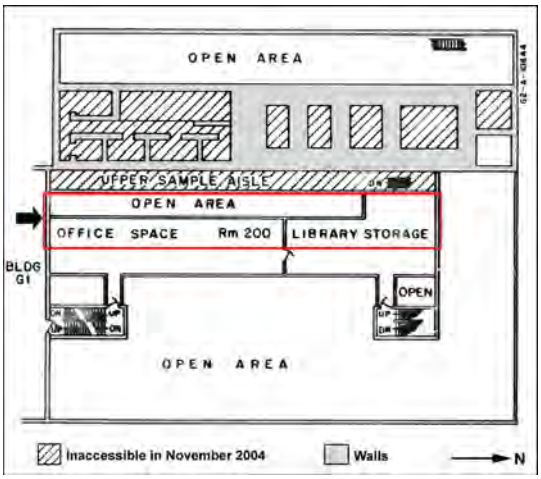

Figure 7-66. G2 348-Foot Level, Constant Head Balcony

The KAPL boiler house supplied 140 psig steam to Building G2. The main G2 steam station was in the northwest corner of the 348-foot level. Steam pressure was reduced to high pressure (80 psig) and low pressure (30 psig) at the main station. Station valves were closed after SPRU research activities ended (R-000059, p. 6).

Constant Head Balcony Components

The Constant Head Balcony contained 10 make-up solution tanks that were supplied from weigh tanks on the balcony above. A filter backwash pump and mechanical feed pump were located at either end, and a steam distribution station was located on the north end of the balcony.

Constant Head Balcony Configuration

The Constant Head Balcony is 12 feet wide by 100 feet long and 8 feet high.

Constant Head Balcony Modifications Since Construction

Constant Head Balcony and upper Rotameter Room equipment was removed and the spaces converted to library storage and office areas. The office area west wall utility chase can be accessed from the Library Storage Room southwest corner (Figure 7-66).

Constant Head Balcony Construction Drawings

Constant Head Balcony original construction and subsequent modifications are shown in the following Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-6, Layout Plan View Below Roofs, April 20, 1948
Drawing No. 2828-801-3, Balcony Floor Plan-Elevation 350' 6", July 22, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Drawing No. SK-6081, Second and Third Floor Plans- Building G2, February 17, 1977
Figure G-349, SPRU Building G2-Floor Plans, Elevations 349', ERG, June 2004.

Constant Head Balcony Photograph

Constant Head Balcony photograph, G2-24, Constant Head Balcony Looking Northwest at Head Balcony and Weigh Tank Floor During Construction, December 22, 1948 is in Appendix C, Photographs.

Constant Head Balcony Radiation Survey History

On July 21, 1983, a Library Storage Area (Room 202) (previously the Constant Head Balcony) follow-up survey was performed subsequent to identification of contamination in the 337-foot level Women's Room. A direct probe measured 1,500 counts per minute beta-gamma and 200 counts per minute alpha at the base of an abandoned ventilation duct on the west side of the area. Swipe measurements indicated less than 450 picoCuries per 100 square centimeters beta-gamma (less than 100 counts per minute) and 160-200 picoCuries per 100 square centimeters alpha (80 to 100 counts per minute with portable frisker). A swipe counted on a Nuclear Chicago Counter Scaler equipped with an alpha scintil-lation detector indicated 80 picoCuries per 100 square centimeters (40 counts per minute). Gamma multi-channel analysis of the radioactivity indicated natural uranium (which implies the uranium had not been irradiated) (R-001126, G2 1st Floor Women's Room and p. G2-202).

Loose surface contamination was detected on a blank, yellow PVC-wrapped ventilation/ductwork flange on the west Library Storage Area wall during a routine monthly survey on May 11, 1984. Direct probe measurements indicated 4,500 picoCuries (1,000 counts per minute) fixed beta-gamma activity per probe area. A tape press of the area found 1,350 picoCuries beta-gamma (300 counts per minute) and detectable alpha less than 50 picoCuries (less than 20 counts per minute) loose activity. Loose contamination on the floor behind the safes on the west wall also measured 1,350 picoCuries beta-gamma (300 counts per minute) by direct probe with no alpha activity detected. A tape press of the spot removed the activity. The top of an I-beam was contaminated what appeared to be concrete dust measuring 1,350 to 2,250 picoCuries (300 to 500 counts per minute) of loose beta-gamma activity due to cesium-137. The alpha activity was due to low levels of plutonium related to the SPRU facility. During follow-up surveys performed on August 9, 1984, mouse droppings behind safes next to the west wall measured 6,500 counts per minute (29,250 picoCuries) and droppings by the north wall measured 150 counts per minute (675 picoCuries), both due to cesium-137. No alpha contamination was detected (R-001126, p. G2-202).

Isolated fixed and loose radioactive contamination areas were detected in previously unexposed areas on April 13, 1990 during renovation of Room 210 (believed to be part of Rooms 200 and 202). The contamination was controlled and renovations continued until additional contamination areas were detected on April 17, 1990 (R-001126, p. G2-200).

Table 7-37 provides Constant Head Balcony summary data for the radiological survey performed in 1954.

Table 7-37. Building G2, Constant Head Balcony Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Constant Head Balcony	None	Smear Results (on approximately 6 square feet of surface): Smears taken of the following areas measured <200 dpm alpha; <200 cpm beta-gamma: (NOTE: the reference refers to the following as "specific locations") 1DX , 1DS, 1HX, N D tank, 1DS going, 1EX from 2BX North, 2AS to 2AX South, 1CU, CHT South end, Catwalk South, Stair landing South, Floor center CHT, Floor N end catwalk, CHT under South stairs	R-000059, p. 21

7.6.3 UPPER FILTER ROOM

Upper Filter Room Functions

A solvent used in the liquid extraction of uranium and plutonium, TBP (tributyl phosphate)/diluent, was received at the G2 Filter Room in drums and pumped to the 316 tank (solvent still) by solvent transfer pump and other Crane Gallery piping (R-001949, p. 29). Note: this reference did not specify whether the transfer was from the Upper or Lower Filter Room.

Process area air was exhausted directly into the G3 stack through glass wool filters by blowers located in the Upper and Lower Filter Room (R-000059, p. 3).

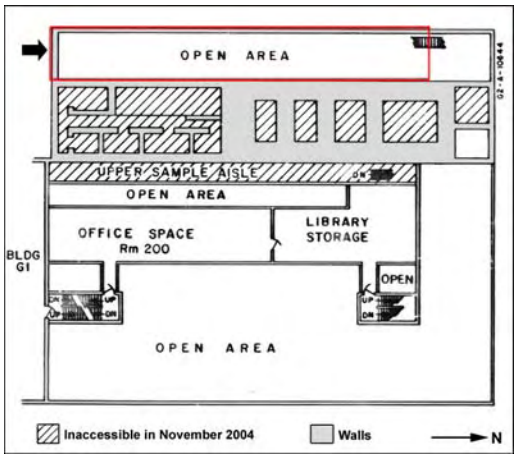

Figure 7-67. G2 348-Foot Level, Upper Filter Room

Upper Filter Room Components

The filter room contained banks of conventional and HEPA filters and associated ductwork to exhaust to the atmosphere through a vent or scrubber stack.

Upper Filter Room Modifications Since Construction

Either the Upper or Lower Filter Room was converted to a laundry facility in 1961; the reference is not specific as to which (C-000106, pp. 1-2). The area was subsequently modified to office space, in 1968. Filter banks and vent stack exhaust ducts were removed during the initial modification. The area is empty office space as of November 2004 (Figure 7-67).

Upper Filter Room Construction Drawings

The following Filter Room original construction and modifications are provided in Appendix B, Drawings:

Drawing No. G2-A-2833, Modifications-Building G2 Filter Aisles, April 10, 1961
Drawing No. SK-6081, Second and Third Floor Plans – Building G2, February 17, 1977
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Figure G-349, SPRU Building G2-Floor Plans, Elevation 349', ERG, June 2004.

Upper Filter Room Radiation Survey History

No radiation survey records for the Filter Rooms were found.

7.6.4 REMAINDER OF 348-FOOT LEVEL

Enclosed stairwells from the 337-foot level are the only other 348-foot level modifications and are depicted in the following Appendix B, Drawings:

Drawing No. G2-A-2401, OBS Modification Floor Plans, January 13, 1960
Drawing No. G2-A-2402, OBS Modification Floor Plans, January 6, 1960
Drawing No. G2-A-2405, Stairs Plans and Sections Building G2, January 27, 1960.

7.7 Building G2, 357-Foot Level

The G2 357-foot level current configuration is shown in Figure 7-68. This level originally contained the Equipment Room, Weight Tank Area, and Crane Gallery Floor.

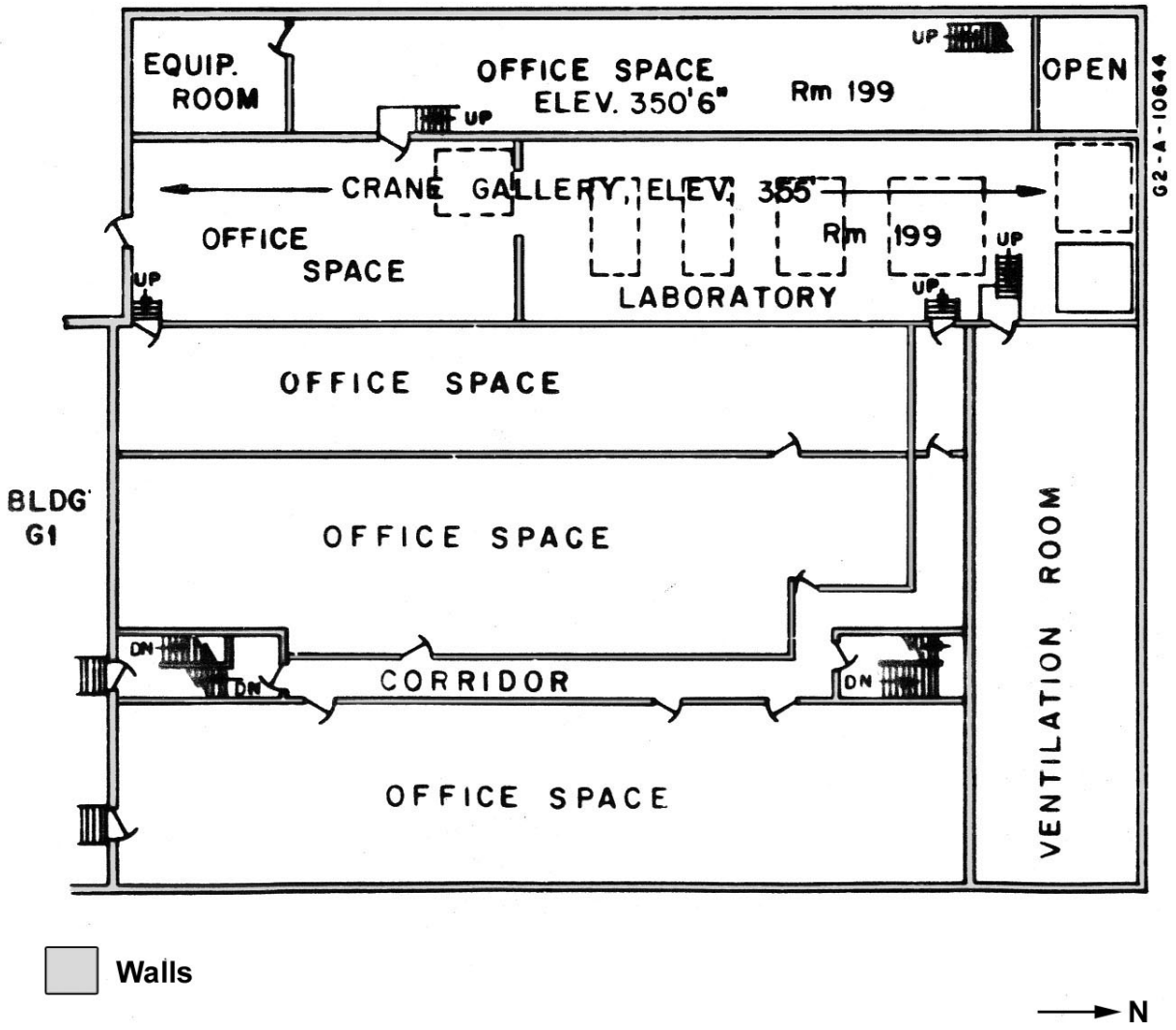

Figure 7-68. Building G2, 3rd Floor, 357-Foot Level,
(modified from Drawing No. G2-A-10644, February 17, 1984; approximate 2004 configuration)

The G2 357-foot level consists of the following rooms and areas:

- Ventilation and Equipment Room and ventilation equipment, as of November 2004
- Office space and an access corridor between enclosed stairwells at either end of the floor
- Weigh tanks, scales, pumps, and supporting equipment and components were removed and the weigh tank floor was extended east to the equipment balcony to add this area
- Laboratory and office space configured by moveable partitions in parts of the Crane Gallery
- Former office space (Room 199).

Figure 7-69 illustrates the current configuration and radiological status of the 357-level. Terminology used in this figure is explained in Table 5-1.

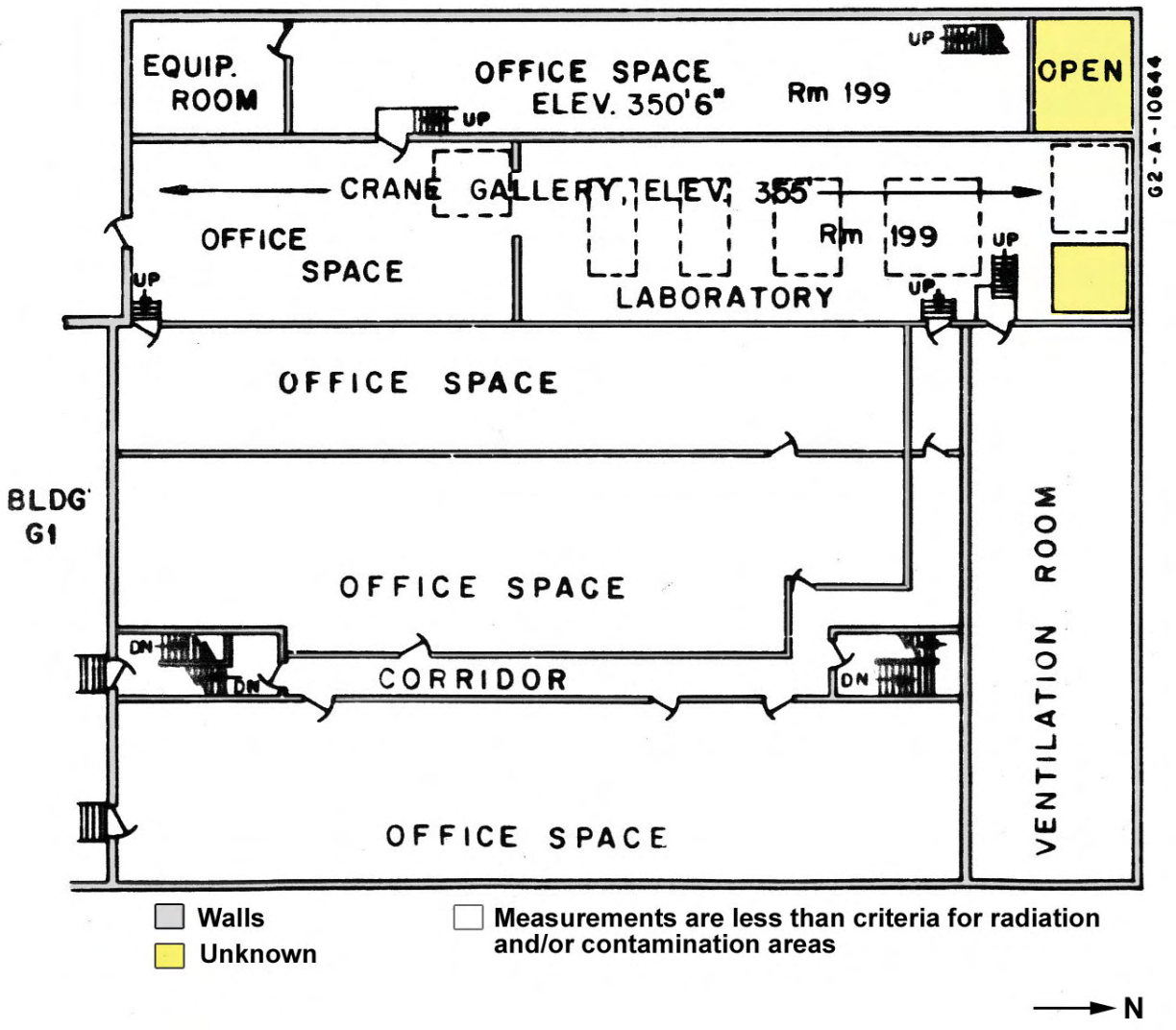

Figure 7-69. Radiological Conditions of the G2 357-Foot Level (based on 2004 survey data)

The 357-foot level (except the Hoisting Bay and open areas) was measured with a direct frisk/probe during a July 2004 routine quarterly survey. Survey notes indicate particular attention to areas with sealed surfaces (R-000525). Less than 450 picoCuries (999 disintegrations per minute) beta-gamma

and less than 50 picoCuries (111 disintegrations per minute) alpha were identified, indicating that the 357-foot level is not currently contaminated. Radiation (dose to individuals recorded in Rem per hour) was not assessed.

No current or historical Hoisting Bay or open area survey information was identified.

7.7.1 CRANE GALLERY

Crane Gallery Functions

The Crane Gallery (east half of Room 199) was originally used as shop space and for cell access (C-000164, Enclosure, p. 12). An electrically operated 6-ton bridge crane was used to remove the concrete floor plugs for equipment access or egress from the cells (R-000059, p. 7). After decontamination in 1954, the Crane Gallery was used as office area and workspace for test equipment (C-000164, p. 9).

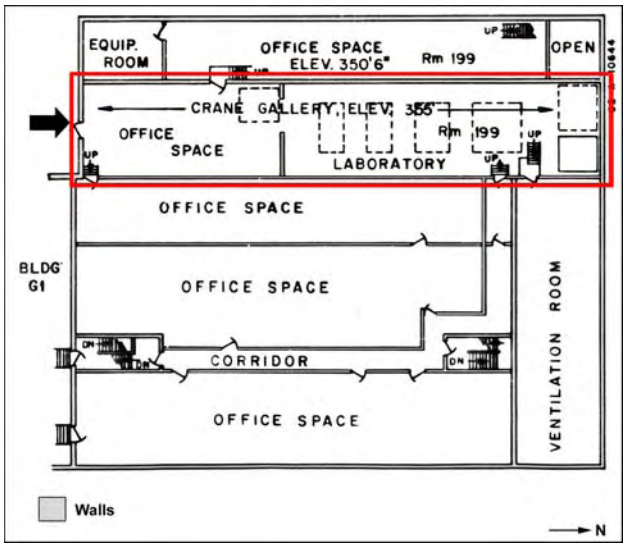

Figure 7-70. G2 357-Foot Level, Crane Gallery Floor

Crane Gallery Components

Two electrically operated cranes remain in G2; a 6-ton in the Crane Gallery and a 5-ton over the truck well and truck dock. In addition, several monorails and chain falls remain in the building (C-002043, p. 16). Overhead cranes remain (R-001932, p. 4). Other Crane Gallery components, including 12 scales, a 54-gallon tank, a heater unit, 50 conduit runs, and other equipment were removed.

Crane Gallery Configuration

The Crane Gallery is a 2,400 square foot (120 feet long [north-south], 20 feet wide [east-west] and 20 feet high) (R-000059, Table 1).

Crane Gallery Modifications Since Construction

The Crane Gallery was converted to laboratory and office space by adding moveable partitions. The floor contains five sealed (under floor tile) concrete access hatchways to the SPRU cells and the sealed top of the slug chute. Upper Sample Aisle access to the 357-foot level is completely blocked off and entry is not permitted (R-002085, p. 4). The top of the Decontaminating Chamber is sealed and covered. The Hoisting Bay is still accessible; a rail was added around the west and south ends (Figure 7-70).

Crane Gallery Construction Drawings

Original Crane Gallery construction and subsequent modifications are depicted in the following Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-6, Layout Plan View Below Roofs, April 20, 1948
Drawing No. 2828-801-4, Plan – Crane Gallery and Weigh Tank, July 20, 1948
Drawing No. 2828-801-23, Crane Gallery Floor Plan, November 22, 1948
Drawing No. G2-A-2402, OBS Modification Floor Plan, January 6, 1960
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984

Drawing No. SK-6081, Second and Third Floor Plans – Building G2, February 17, 1977
Figure G-349, SPRU Building G2-Floor Plans, Elevation 349', ERG, June 2004.

Crane Gallery Photographs

Crane Gallery features are shown in the following figures and provided in Appendix C, Photographs:

- G2-34 Crane Gallery Floor (357-Foot Level), Crane Gallery Under Construction, undated
- G2-79 357-Foot Level, Crane Gallery Floor, Room 199 General Photograph of the Crane Gallery. Not same view as G2-94 below, 1984
- G2-88 357-Foot Level, Crane Gallery Floor, Crane Gallery, 1997
- G2-94 357-Foot Level, Crane Gallery Floor, Crane Gallery Looking North. Equipment and lighting apparent. Some construction activity based on workers in photograph, March 29, 1949.

The remainder of Room 199 (west of the Crane Gallery) is shown in Figures 7-71 and 7-72. Other former Crane Gallery areas, as of November 2004, are shown in Figures 7-73 through 7-76.

Figure 7-71. Photo G2-152, G2 357-Foot Level, Room 199, November 2004

Figure 7-72. Photo G2-153, G2 357-Foot Level, Room 199 South End, November 2004

Figure 7-73. Photo G2-158, G2 357-Foot Level, Crane Gallery, West Wall, November 2004

Figure 7-74. Photo G2-157, G2 357-Foot Level, South End of Crane Gallery, November 2004

Figure 7-75. Photo G2-155, G2 357-Foot Level, Crane Gallery, East Wall, November 2004

Figure 7-76. Photo G2-156, G2 357-Foot Level, Crane Gallery, North End, November 2004

Crane Gallery Radiation Survey History

On April 20, 1983, a large roof leak introduced water on an air particle detector instrument and in adjacent Building G2 areas known to contain fixed radioactivity. The roof leak dislodged small amounts of radioactivity and required extensive cleanup. After drying, the Crane Gallery and adjacent areas were surveyed, concentrating primarily on occupied areas. Two of 300 wipes showed evidence of loose radioactivity: 20 picoCuries per 100 cubic centimeters of plutonium-239 or two times the plutonium-239 10 picoCuries per 100 cubic centimeters limit for loose radioactivity. In addition, beta-gamma radioactivity was indicated in a small dirt pile behind a beam. Additional surveys taken after water under floor tiles had dried showed that no loose radioactivity was present (R-001126, G2 Crane Gallery).

Table 7-38 provides Crane Gallery summary data from radiological surveys performed in 1954 and 1998.

Table 7-38. Building G2, Crane Gallery Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Crane Gallery	None	Smear Results (on approximately 6 square feet of surface): Cell No. 5 addition funnel – <200 dpm alpha; <200 cpm beta-gamma 553 decontamination tank. – <200 dpm alpha; <200 cpm beta-gamma Cell No. 1 addition funnel – <200 dpm alpha; <200 cpm beta-gamma Cell No. 1 cover – <700 dpm alpha; 2,000 cpm beta-gamma Decontamination cell cover – <200 dpm alpha; <200 cpm beta-gamma Floor around 346 sampler – <500 dpm alpha; 1,500 cpm beta-gamma Cell No. 2 cover – <200 dpm alpha; 200 cpm beta-gamma Cell No. 3 cover – <200 dpm alpha; <200 cpm beta-gamma Cell No. 4 cover – <200 dpm alpha; <200 cpm beta-gamma Cell No. 5 cover - <200 dpm alpha; <200 cpm beta-	R-000059, p. 20

Date	Area	Observations	Summary Findings	Reference
			gamma Scale platform (all) – <200 dpm alpha; <200 cpm beta-gamma Crane well cover – <200 dpm alpha; 2,500 cpm beta-gamma South door – <200 dpm alpha; <200 cpm beta-gamma	
8/24/98	Crane Gallery Mezz	None (This area posted for RWP; CSCA following identification of contamination in plenum)	Contamination survey results from 1 direct probe (within wire mesh in filter plenum) reading – 50 cpm beta-gamma background; 1,600 cpm beta-gamma net; 7,200 pCi beta-gamma Swipe in same area as above direct probe – 50 cpm beta-gamma background; <20 cpm alpha net; 100 cpm beta-gamma net; <50 pCi alpha; 450 pCi beta-gamma Contamination survey results from 5 direct probe (within wire mesh in filter plenum) readings – 50 cpm beta-gamma background; <100 cpm beta-gamma net; <450 pCi beta-gamma Contamination survey results from 7 direct probe (deck) readings – 50 cpm beta-gamma background; <20 cpm alpha net; <100 cpm beta-gamma net; <50 pCi alpha; <450 pCi beta-gamma Portable air sample airborne activity survey – 5.6 x 10^{-12} µCi/ml alpha; <2 x 10^{-10} µCi/ml beta-gamma	R-000281

Potential Crane Gallery Chemical Hazards

The Crane Gallery was used as office area and test equipment workspace after 1984 for unknown length of time (C-000164, p. 9). A handwritten note (R-000059, p. 20) indicates that the area at some point following SPRU was "George Martin's Machine Shop." Machine shops typically use oil and grease, solvents, welding equipment, and compressed gases. However, no compressed gas cylinders or containers of oil or other hazardous substances were observed on the Crane Gallery level as of April 2004.

7.7.2 EQUIPMENT ROOM

Equipment Room Functions

The Equipment Room is also called the SPRU Exhaust Ventilating Room (R-001949, p. 65). Modifications to this room are unknown. Its location is shown in Figure 7-77.

Equipment Room Components

Equipment Room components in November 2004 are shown in Figure 7-78.

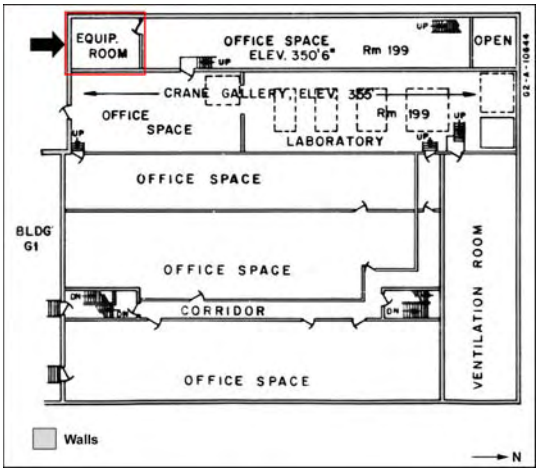

Figure 7-77. G2 357-Foot Level, Equipment Room

Figure 7-78. Photo G2-105, G2 357-foot Level, Equipment Room, November 2004

7.7.3 VENTILATION ROOM

Ventilation Room Functions

The Ventilation Room (Figure 7-79) contains air handler units that provide general Building G2 heat and ventilation to (R-000059, p. 2). In construction drawings, it was also called the Equipment Room. The Ventilation Room is accessed by a narrow stairway to elevation 361 feet.

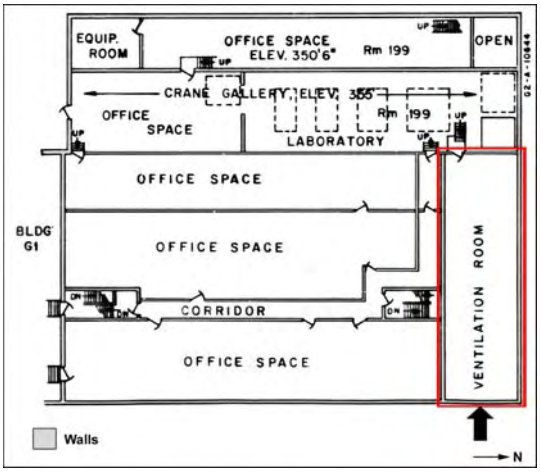

Figure 7-79. G2 357-Foot Level, Ventilation Room

Ventilation Room Components

The Ventilation Room contains a large air handler unit located between column lines three and four and extending from the east Crane Gallery wall to the G2 east exterior wall (Figures 7-80 through 7-82). The air handler supplies heat and ventilation to office and library areas throughout the building.

Ventilation Room Modifications Since Construction

No known Ventilation Room modifications have occurred.

Ventilation Room Construction Drawings

The following Ventilation Room construction drawings and later modifications are provided in Appendix B, Drawings:

Drawing No. 2828-1-2, Layout Typical Elevation, April 4, 1948
Drawing No. 2828-1-6, Layout Plan View Below Roofs, April 20, 1948

Drawing No. 2828-801-4, Plan – Crane Gallery and Weigh Tank, July 20, 1948
Drawing No. G-A-2, Equipment Room Floor Plan, August 19, 1948
Drawing No. G2-A-2402, OBS Modification Floor Plans, January 6, 1960
Drawing No. G2-A-10644 Building G2 Floor Plans, February 17, 1984
Drawing No. SK-6081, Second and Third Floor Plans - Building G2, February 17, 1977
Figure G-357, SPRU Building G2-Floor Plans, Elevation 357', ERG, June 2004.

Ventilation Room Photos

Figure 7-80. Photo G2-162, G2 357-Foot Level Ventilation Room, Looking West, November 2004

Figure 7-81. Photo G2-109, G2 357-Foot Level Ventilation Room, Looking East, November 2004

Figure 7-82. Photo G2-108, G2 357-Foot Level Ventilation Room, Looking North, November 2004

Ventilation Room Radiation Survey History

No Ventilation Room radiation survey record has been found. Radioactive warning signs are posted on one of the doors to the interior of the ventilation equipment.

Potential Ventilation Room Chemical Hazards

No surveys have been completed for chemical hazards in the Ventilation Room.

7.7.4 WEIGH TANK AREA

Weigh Tank Area Functions

Weigh tanks used to prepare and deliver the cold (i.e., non-radioactive) process feed solutions (R-001949, p. 14) were located in the Weigh Tank Area.

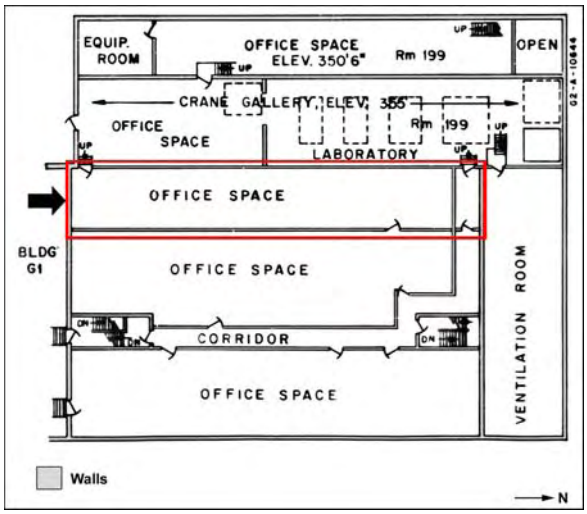

Figure 7-83. G2 357-Foot Level, Weigh Tank Area

Weigh Tank Area Components

Sixteen stainless steel weigh tanks ranging in capacity from 15 to 800 gallons were mounted on individual weighing scales and arranged in a north-south line. Two tanks were used for preparing solutions transferred to the vent scrubber basin in Cell No. 1 and/or dissolver in Cell No. 2 and another for solutions to adjust the Cell No. 1 Tank 304 initial feed solutions. The remaining tanks were used for preparing cold solutions fed through constant head tanks to cell mixer-settler banks (R-001949, p. 14). Tank gravity discharge lines were filtered. Weigh tank contents were drained for disposal or transferred to the H2 evaporator storage tanks after SPRU research activities ceased (R-001949, p. 14).

Weigh Tank Area Configuration

The Weigh Tank Area was 100 feet by 168 feet and 30 feet high.

Weigh Tank Area Modifications Since Construction

All weigh tanks, scales, pumps, and supporting equipment and components were removed and the weigh tank floor was extended east to the Equipment Balcony. The added area was used as office space and as an access corridor between the two enclosed stairwells at either end of the floor (Figure 7-83). The area is currently empty.

Weigh Tank Area Construction Drawings

The following Weigh Tank Area construction and modification drawings are provided in Appendix B, Drawings:

Drawing No. 2828-1-1, Layout Building G2, March 26, 1948
Drawing No. 2828-1-6, Layout Plan View Below Roofs, April 20, 1948
Drawing No. G2-A-10644, Building G2 Floor Plans, February 17, 1984
Drawing No. SK-6081, Second and Third Floor Plans – Building G2, February 17, 1977
Figure G-349, SPRU Building G2-Floor Plans, Elevation 349', ERG, June 2004.

Weigh Tank Floor Photographs

G2-24, Constant Head Balcony Looking Northwest at Head Balcony and Weigh Tank Floor During Construction, December 22, 1948 (Appendix C, Photographs).

Weigh Tank Floor Radiation Survey History

Table 7-39 provides summary data from a Weigh Tank Floor radiological survey performed in 1954.

Table 7-39. Building G2, Weigh Tank Level Radiological Survey History

Date	Area	Observations	Summary Findings	Reference
2/22/1954 (following decontamination)	Weigh Tank Floor	None	Smear Results (on approximately 6 square feet of surface): Sink – <200 dpm alpha; 400 cpm beta-gamma Smears taken of the following areas all measured <200 dpm alpha; <200 cpm beta-gamma: Top of landing – N end Front of weigh tanks Access from HPh. Sampler Floor opposite tank door Floor opposite 312 1CX tank. Floor opposite sink South end of wt. tank. Inside hood Cabinet under hood Inside stainless tubing Weigh tank platforms 503, 301, 302, 303, 308, 311, and 310 Wt. tank. platforms 332, 312, 326, 328, 334, 327, 344, and A548	R-000059, p. 20

Potential Weigh Tank Floor Chemical Hazards

Residual hazardous chemicals are not anticipated on the Weigh Tank Floor. Nitric acid and aluminum nitrate were used extensively in the weigh tanks (R-001949, p. 14); it is assumed that remaining contamination was cleaned up during tank and equipment removal activities.

7.7.5 SLUG CHUTE

Slug Chute Functions

The slug chute carried irradiated slugs from the Crane Gallery to the Cell No. 2 Dissolver Unit (Tank 501) (Figure 7-84).

Slug Chute Components

The slug chute consists of the chute hatch at the Crane Gallery floor and a tube that transitions from a 5-inch diameter to a 6-inch diameter and finally to 8-inches in diameter at the dissolver tank.

Slug Chute Configuration

The slug chute is an integral part of Cell No. 2. It is located between Cell No. 1 and Cell No. 2, extending from the Crane Gallery floor to the Dissolving Unit at the base of Cell No. 2.

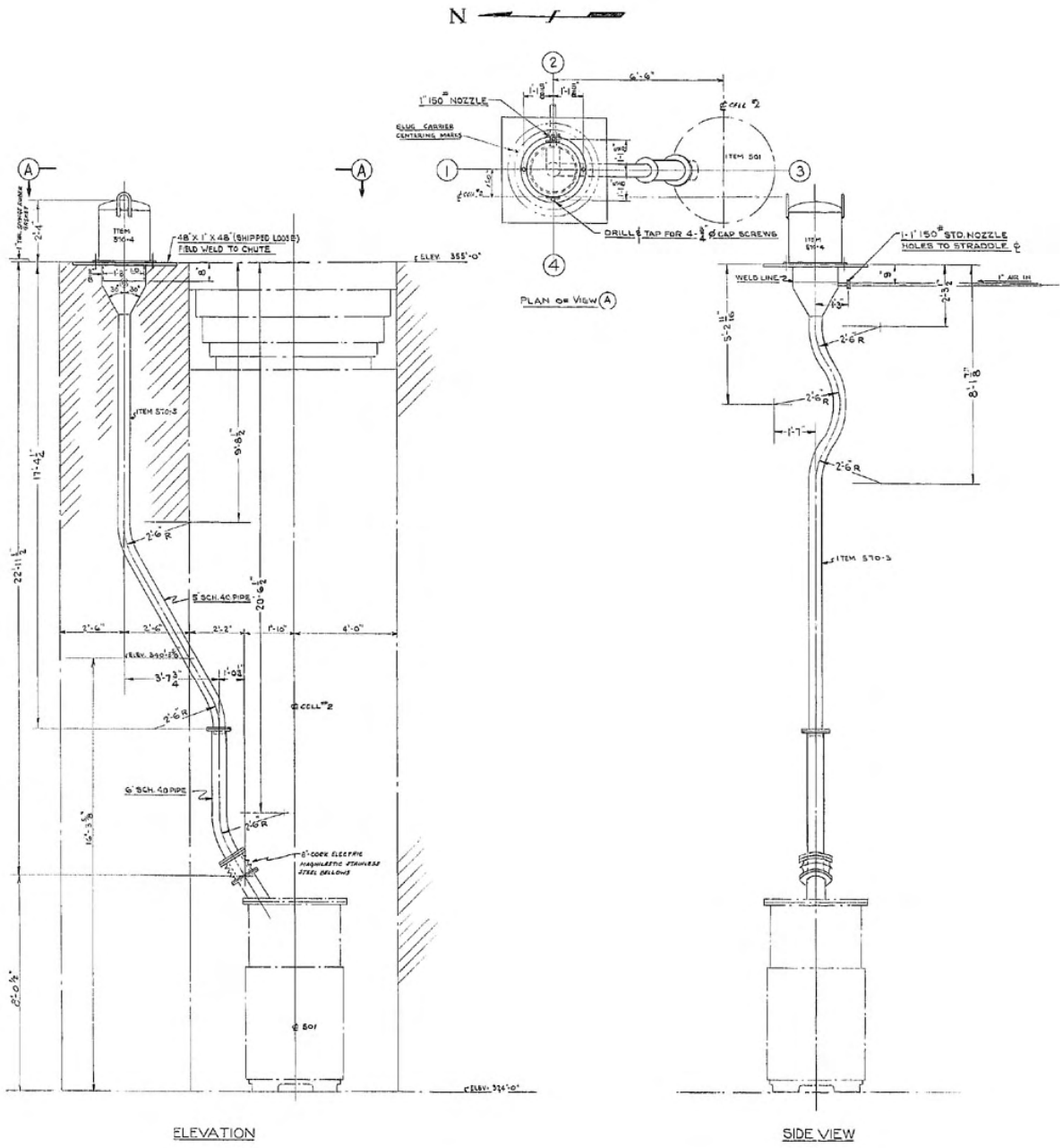

Figure 7-84. Drawing No. 2828-570-2 Slug Chute, October 14, 1948

Modifications to the Slug Chute Since Initial Construction

Slug Chute access was sealed at the Crane Gallery floor but remains intact in Cell No. 2 (Figure 7-85).

Figure 7-85. Photo G2-107, G2 357-Foot Level Laboratory and Slug Chute Plug, June 2004

Slug Chute Construction Drawings

The following Slug Chute construction drawings are included in Appendix B, Drawings:

Drawing No. 2828-1-5, Layout Equipment in Cells 1, 2, 3, 4; April 19, 1948
Drawing No. 2828-1-6, Layout Plan View Below Roofs, April 20, 1948
Drawing No. 2828-92-1, Flow Diagram, June 10, 1948
Drawing No. 2828-570-2, Chute from Item 570, October 14, 1948
Drawing No. 2828-602-10, Instrument Wiring Diagram, Bldg H, Main Control Panel Area 2, June 13, 1949
Drawing No. 2828-801-4, Crane Gallery and Weigh Tank Floor Plan, July 20, 1948.

Slug Chute Radiation Survey History

No Slug Chute radiation survey history was found.

7.7.6 REMAINDER OF BUILDING G2 357-FOOT LEVEL

The remainder of the 357-foot level is shown in Figure 7-86 and in the following Appendix B, Drawings:

Drawing No. SK-6081, Second and Third Floor Plans – Building G2, February 17, 1977
Drawing No. G-A-2, Equipment Room Floor Plan, August 19, 1948.

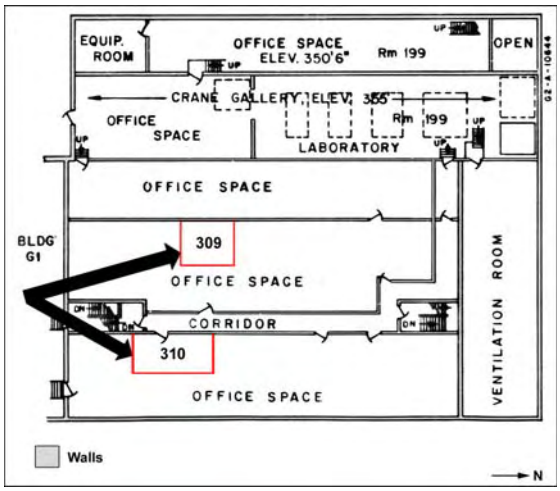

Figure 7-86. G2 357-Foot Level, Rooms 309 and 310

Room 309

On January 1, 1991, a survey swipe indicated 50 picoCuries on the frame of a blackboard removed from the Room 309 north wall. A complete survey of the office area confirmed that the contamination was limited to the back of the blackboard. The contamination was identified as removable radium-226 and daughters (R-001126, p. G2-309).

Room 310

On April 3-4, 1993, swipes were taken on an I-beam above the Room 310 ceiling. One indicated 8.9 picoCuries gross alpha activity. Alpha spectrometry analysis indicated 13.2 picoCuries plutonium-239/240 present, exceeding the limit of 9 picoCuries (R-001126, p. G2-310). Office space near Room 310 is shown in Figure 7-87. The corridor is shown in Figure 7-88.

Figure 7-87. Photo G2-159, G2 357-Foot Level, Office Space Center-West, November 2004

Figure 7-88. Photo G2-154, G2 357-Foot Level, Corridor, November 2004

7.8 Outside Storage Tanks East of G2

Outside storage tanks located on the Chemical Storage Tank Support Area concrete pad included an air surge tank, caustic tank, nitric acid tank, water tank, and a gas surge tank (see Figure 7-4, G2 Support Area Isometric Drawing). Storage tanks were supported by reinforced concrete slabs for vertical tanks and concrete saddles for horizontal tanks. The tanks have been removed. Two low-wall pedestals and a slab foundation are all that remain of the tank supports.

The Chemical Storage Tank Support Area is shown in Drawing No. 2828-1-1, Layout Building G2, March 26, 1948 (Appendix B, Drawings). No radiation surveys of this area have been found.

7.9 Building G3

Building G3, shown in Figure 7-4, was removed in 1986. Located near the southwest corner of G2, G3 consisted of a pump house; scrubber stack; a pump, filter and blower house, and the vent scrubber and vent stack. The vent stack was removed in the early 1960s and relocated to the Radioactive Materials Laboratory (R-000255, p. 3). The vent stack and scrubber tower foundation is still intact at 2 feet below grade.

Drawing No. 2828-401-13, July 20, 1948, depicts the Vent Stack and Vent Scrubber. Drawing No. 2828-1-1, Layout Building G2, March 26, 1948, shows Pump, Filter, and Blower House construction. The drawings are provided in Appendix B, Drawings.

7.10 Findings

Data Gaps

The following data gaps are identified for Building G2:

1. The most recent radiological data for G2 inaccessible areas is from 1989.
2. It is unknown what residual chemicals remain in cell areas and pipes.
3. Asbestos and PCB surveys have not been conducted in Building G2.

Impacted and Non-Impacted Areas In G2

MARSSIM defines impacted areas as those with a reasonable possibility of containing residual radioactivity in excess of natural background or fallout levels (MARSSIM, Glossary, p. Gl-10). In 1982, an aerial radiological survey showed a reading of 1.4 times background in the immediate vicinity of G2 (R-001949, p. 141). Further study of this data would be necessary to draw conclusions about the source of this reading. However, based on the MARSSIM definition and aerial survey results, all G2 areas are considered impacted.

Some G2 areas are more impacted than others. Contaminated areas maintained under negative HEPA-filtered ventilation and radiological controls include: Cells 1, 2, 3, 4, and 5; Upper and Lower Sample Aisles; Cell Access Aisle; Hot and Process Tunnels; and Pipe Room. Sporadic contamination in non-radiological controlled areas is covered with metal plates and labeled. Lead shielding currently covers approximately 25 feet by 25 feet of Office 154 (the former BCE) floor over known contaminated concrete and a contaminated sump. Less impacted G2 areas were converted to office and engineering spaces. These areas are immediately adjacent to the inaccessible G2 areas, including the cell areas. Office space conversion involved removing surface contamination and sealing off access to areas with significant fixed contamination. Surface contamination on floorboards and windowsills is fixed and clearly labeled.

G2 offices were eventually relocated because of concerns about contamination remaining in G2. Although these areas are no longer used for day-to-day office work, they can be entered without personal protective equipment or dosimetry.

Potential Sources of Contamination

Table 6-2 and Table 6-3 summarize the radiological and chemical materials used during SPRU research activities or identified in historical survey data. Although decontamination and cleaning activities since 1954 removed much contamination, radiological and chemical hazards remain. Potential contaminants revealed through document review are identified in sections describing process areas and other spaces.

Although potential contamination sources remain in G2, structural integrity, original protective design features (e.g., stainless steel floors in cell areas), isolated ventilation systems, and surveillance and maintenance activities reduce the likelihood of contamination spreading from contaminated areas.

Chemical hazards such as asbestos remain in G2. Chemical hazards may remain in process vessels, equipment, ventilation, chemical feed lines and valves, drains, and sumps.

Building G2 construction materials that are potential contamination sources include:

- Asbestos-containing materials – transite concrete structure, flooring, ceilings, walls, jacketed vessels and piping, roofing, sealant, noise-dampening equipment, mastic.
- PCBs – Fluorescent light ballasts and paint may contain PCBs. A PCB survey of the building has not been conducted.

- Lead – Lead-based paint and shielding.
- Mercury – Fluorescent light tubes, Mercoid switches, and other meters and equipment.

Likelihood of Contamination Migration

Migration onto Surfaces and Soils. Deterioration of G2 construction materials and remaining equipment could result in contaminant releases and migration; however, there is no current evidence of migration occurring. Routine building maintenance and periodic inspections of inaccessible areas ensure a low likelihood of contaminant migration. Videotape inspections of inaccessible building areas and routine surveillance and maintenance of accessible areas do not indicate deterioration (V-002008 and R-001949, p. 122).

Air Migration. Negative pressure maintained by a filtered ventilation system designed to keep airborne contamination inside G2 provides protection against airborne releases. The ventilation system is monitored by the KAPL environmental monitoring program and includes alarms to provide indication of containment integrity (C-000164, p. 2).

Groundwater Migration. G2 was excavated in glacial till consisting principally of clay. The depth from ground surface to bedrock is about 70 feet. The till has very low permeability to water. Water that vertically permeates undisturbed till beneath G2 must travel 30 to 25 feet to bedrock, which is lithified shale that is also relatively impermeable. The bedrock is fractured and therefore a potential lateral migration path (R-002126, p. 1).

G2 foundation walls are at least 2 feet thick and sumps are stainless steel-lined. Videotaped building inspections and other surveillance and maintenance inspections document flooring material integrity. Continued surveillance and maintenance and corrective actions for building floor deterioration result in a low likelihood of contaminant migration from the building.

Threat to Human Health

Radiological controls and surveillance and maintenance programs ensure that the G2 facility remains in stable condition and does not present unacceptable risk to the public, environment, or on-site personnel (R-001949, p. 6).

Public. Current G2 conditions do not endanger public health. Potential radiological airborne and groundwater contamination from KAPL is routinely monitored. KAPL works cooperatively with regulators, including the New York State Department of Environmental Conservation (NYSDEC) and the U.S. Environmental Protection Agency Region II to monitor potential public health concerns. The U.S. Environmental Protection Agency Region II KAPL fact sheet states, "… no imminent danger to human health or the environment has been identified. The on-going routine monitoring programs conducted by KAPL, in addition to the corrective action programs, are designed to alert KAPL and the NYSDEC of any health or environmental risks" (R-000430).

Workers. Before G2 office space was occupied in 1961, a complete G2 wall, floor, and ceiling survey was completed. Radioactivity was found in the accessible areas. In addition, fixed contamination in accessible areas was becoming loose and contaminating occupied areas. As a result, KAPL moved G2 personnel to a different location (C-000164, Enclosure, p. 11).

KAPL conducts routine G2 surveillance and maintenance, including monitoring dosimetry stations throughout the building. Personnel currently walk through accessible G2 areas without wearing protective equipment. Inaccessible areas are marked with radiological control signs (C-000164, p. 4). Cell areas and many support areas require dosimetry and anti-contamination clothing (R-000255, p. 4).

Entering currently restricted areas could result in radiological exposures. Future entry into inaccessible areas will be conducted under the KAPL radiological control program. Safety-basis documents will be prepared prior to further characterization, decontamination, and/or removal of G2 equipment and building materials, including evaluating potential radiological exposures. Safety basis documentation will provide engineering and administrative controls to protect the public and workers.

Further Characterization Needs

Repeating the 1989 survey supplemented by on-contact measurements would provide confirmation that 1989 survey results represent current conditions. The following areas require additional characterization for chemical and radiological hazards:

- Hot and Process Tunnel areas including tunnel
- G2 vessels, piping, and ventilation ducts
- Cells 1 through 5 and Pump Room
- Decontamination Room and Hoisting Bay
- Sumps
- Concrete surfaces (concrete is likely to be the greatest volume of waste if the building is demolished)
- Soil and groundwater near the building (subsurface excavation or demolition activity may affect adjacent soils).