

FINAL RADIOLOGICAL SURVEY
PERFORMED AT GENERAL ATOMICS'
Building 30 Office Areas & Transformer Pad
(Phase III)

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“Final Survey Plan for Building 30/31 Office Areas - Phase III,” dated 08/25/99.

INTRODUCTION

General Atomics (GA) is continuing its efforts directed at decontaminating, as appropriate, and obtaining the release to unrestricted use of selected facilities and land areas at General Atomics. GA has recently completed the Final Radiological Survey of selected office areas within the Building 30/31 Complex. These office areas are within the Building 30 portion of the Building 30/31 Complex. An adjacent transformer pad has also been surveyed. These office areas and the transformer pad have been designated as "Phase III."

GA has previously requested release of selected rooms within Building 30 in two phases, Phase I and Phase II. Both the NRC and the State of California have released the Phase I and II areas (which are shown in Figure 2).

This report documents the results of the radiological measurements completed within the building office areas and upon the transformer pad (as Phase III) and demonstrates that these areas meet the approved criteria for release to unrestricted use. The total surface area to be released to unrestricted use is approximately 5705 ft² (~ 530 m²).

GA is requesting both the Nuclear Regulatory Commission (NRC) and the State of California (RHB) to release these areas to unrestricted use.

SITE DESCRIPTION

A plan view of the GA Site is shown in Figure 1. The LINAC Facility (the Building 30/31 Complex) at GA's Torrey Pines Mesa Site is shown in Figure 2 (which also shows the Phase III area). A diagram of Building 30 Office Areas and Transformer Pad, to be released to unrestricted use in Phase III, is shown in Figure 3.

The LINAC Facility (Building 30/31 Complex) previously housed a 100 MeV linear accelerator and most recently housed a 14 MeV linear accelerator. D & D for this facility is being accomplished in various phases.

PREVIOUS ACTIVITIES (HISTORY OF USE) AND CLASSIFICATION

This survey is applicable only to Phase III which covers the areas as shown in Figures 2 and 3. These areas were isolated from the linear accelerator activities and have no known history of radioactive usage or storage, except for Room 106B which contained two (low level activity) alpha check sources for the calibration of an alpha counter (spectrophotometer). These alpha sources have been removed from Room 106B. Room 106B also contains an x-ray machine which currently remains in Room 106B and is registered with the State of California.

The office areas within Building 30 and the transformer pad area are classified as “non-impacted areas” (no history of use involving radioactive materials), except for Room 106B which is classified as an “unaffected area” (no contamination expected based on historical use). The total floor space of the “non-impacted” office areas and transformer pad area is ~ 5490 ft² (~ 510 m²). The total floor space within the “unaffected” Room 106B is ~ 215 ft² (~ 20 m²).

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Facilities and Equipment

U.S. NRC’s criterion for releasing facilities and equipment to unrestricted use is shown in Table 1. The State of California’s guidelines, “DHS Criteria for Release of Facilities and Equipment to Unrestricted Use,” also known as “DECON-1,” is shown in Table 2.

The contaminants of concern are Co⁶⁰ and other beta/gamma emitters. The applicable NRC guidelines for residual surface activity levels involving Co⁶⁰ and beta/gamma emitters are provided as follows:

- 5,000 dpm/100 cm² (averaged over a 1 m² area)
- 15,000 dpm/100 cm² (maximum in a 100 cm² area if the average over 1 m² is met)
- 1000 dpm/100 cm² (removable activity)

Exposure Rate Guideline

The guideline value for exposure rates measured at 1 meter above the surface is 10 μ R/hr above background levels.

INSTRUMENTATION

A list of instruments used during the radiological surveys is shown in Table 3. The table includes: (1) a description of the instrument, its model and serial number, (2) a description of the detector (if applicable) and its serial number, (3) instrument ranges, (4) calibration due dates, (5) typical background readings and (6) calibration efficiencies (if applicable). All of the instruments used were calibrated semiannually and after repair, except for exposure rate meters which were calibrated quarterly.

BACKGROUND MEASUREMENTS

Background Measurements for Instruments/Detectors

Building 13 and its surrounding area on GA's main site was used for conducting background measurements on instruments used for the Final Survey because: (1) there is no history involving radioactive materials or storage of radioactive materials in and around Building 13, and (2) the various surfaces and construction materials found within the Building 30/31 Complex and on the Transformer Pad could also be found inside and around Building 13.

For the fixed background measurements, shown in Table 4, the mean and standard deviation for each surface surveyed with the 100 cm² gas flow proportional detector were calculated using equations 8-11 and 8-12 from the draft version of NUREG/CR-5849¹ as shown below:

Equation (8-11)

$$\bar{x} = \frac{1}{n_s} \sum_{i=1}^{n_s} x_i$$

Equation (8-12)

$$s_x = \sqrt{\frac{\sum_{i=1}^n (\bar{x} - x_i)^2}{n-1}}$$

¹ Manual for Conducting Radiological Surveys in Support of License Termination (Draft for Comment), NUREG/CR-5849, ORAU-92/C57, Oak Ridge Associated Universities, June 1992.

Minimum detectable activities (MDA's) for each type of surface (see Table 4), were calculated using equation (5-2) from the NUREG/CR-5849 as shown below:

Equation (5-2)

$$MDA = \frac{2.71 + 4.65\sqrt{B_R \times t}}{t \times E \times \frac{A}{100}} \text{ (dpm/100cm}^2\text{)}$$

Where:

B_R = background rate (cpm)

t = count time (min)

E = efficiency

A = area of the detector (cm²)

Exposure Rate Background

Typical exposure rate background measurements for this site using a Ludlum Model 19 microR meter are about 15 μ R/hr measured at 1 meter from the surface (i.e., range of 12-18 μ R/hr). This value can be measured south of Building 15 (an office building on the eastern portion of the GA site). Measurements taken offsite in 10 different locations over a period of a year also give an average of about 15 μ R/hr (measured at 1 meter from the surface).

SURVEYS PERFORMED

Objectives and Responsibilities

The objectives of the survey plans were (1) to demonstrate that the average surface contamination levels for each survey unit were below the approved release criteria and (2) to show that exposure rate measurements taken throughout this area measured at 1 meter above the surface and at contact with the surface were less than 10 μ R/hr above background.

Surveys were taken in accordance with an approved survey plan only by qualified Health Physics Technicians having a minimum of three years health physics experience. Wipes (100 cm²) were counted in GA's Health Physics Laboratory which maintains an effective QA program.

Every survey taken was documented on a daily basis to a worksheet/drawing showing the approximate locations surveyed/sampled. The documentation included the results of the measurements (including units), the technician's signature, date, instrument(s) used (including the model and serial number of both the ratemeter and detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

Survey Plans

Survey Plans were developed based on the previous history of the Building 30/31 Complex and Transformer Pad, the radionuclides of concern for this area, the potential for contamination, the various types of surfaces encountered and the classification of the area (non-impacted or unaffected).

The Final Survey Plan for Building 30/31 Office Complex was developed in order to provide evidence that the residual radiation levels on the floors, walls, ceilings and overhead fixtures were below the approved release criteria specified in GA's Site Decommissioning Plan, thereby supporting GA's request for the release to unrestricted use of this building. The "Final Survey Plan for Building 30/31 Office Areas - Phase III," dated August 25, 1999 is provided in the Appendix.

SURVEY SUMMARY

A summary of the number of fixed measurements, wipes (100 cm²) and exposure rate measurements (μ R/hr) taken during the surveys are provided as follows:

Phase III - Survey Summary				
Survey	# of Fixed Measurements		# of Wipes (100 cm ²)	# of Exposure Rate Measurements (μ R/hr)
	α	β		
"Non-Impacted" Office Areas & Transformer Pad	---	3	39	158
"Unaffected" Office Area (Room 106B)	12	12	10	4
Totals	12	15	49	162

The survey plan for conducting the surveys is provided in the Appendix and the results of these surveys are summarized in Table 5. Survey locations are shown in Figures 4 through 24.

Scanning

Scans with the 434 cm² alpha gas-flow proportional detectors were conducted in the unaffected areas in order to identify elevated areas of activity. Areas with elevated readings would then be further investigated with hand-held α instruments/detectors to determine if the levels were above the release criteria. No elevated readings were discovered during scanning. The results of these α scans are provided in Table 5 and the approximate locations are shown in their respective figures.

Scans with the 434 cm² beta gas-flow proportional detectors were conducted in the non-impacted and unaffected areas in order to identify elevated areas of activity. Areas with elevated readings would then be further investigated with hand-held β instruments/detectors to determine if the levels were above the release criteria. No elevated readings were discovered during scanning. The results of these β scans are provided in Table 5 and the approximate locations are shown in their respective figures.

Fixed Measurements

A total of 12 fixed alpha measurements were performed within the unaffected area (i.e., Room 106B). The measurements were taken using a 50 cm² α hand-held detector.

The applicable background for the 50 cm² alpha detector was subtracted from the survey readings and these readings were converted from cpm to dpm/100 cm² using the appropriate count time, the efficiency of the detector and the geometry of the detector. The maximum fixed α result was 139 dpm/100cm². The fixed α measurement results are provided in Table 5 and the approximate locations are shown in their respective figures.

A total of 15 fixed beta measurements were performed within the non-impacted and unaffected areas. These measurements were taken using a 100 cm² gas-flow proportional detector.

Each fixed β measurement was counted for one (1) minute. The applicable background for the 100 cm² beta detector was subtracted from the survey readings and these readings were converted from cpm to dpm/100 cm² using the appropriate count time, the efficiency of the detector and the geometry of the detector. The maximum fixed β measurement results were all less than the corresponding MDA for each of the building surfaces that were surveyed (i.e., concrete block, drywall, Formica or carpet over concrete). The fixed β measurement results are provided in Table 5

and the approximate locations are shown in their respective figures.

Removable Contamination Surveys

A total of 49 wipes (100 cm²) were taken within the non-impacted and unaffected areas during the Final Survey. The wipes consisted of using a Whatman Filter Paper (4.7 cm² diameter) and wiping an area of approximately 100 cm². The wipes were counted in GA's Health Physics Laboratory using a Canberra 2400 low level alpha/beta counting system. The wipe results in dpm/100 cm² for both alpha and beta are provided in Table 5 and the approximate locations are shown in their respective figures. The maximum wipe results were < 10 dpm/100 cm² α and 13 dpm/100 cm² β .

Exposure Rate Measurements

A total of 162 direct radiation exposure rate measurements were taken within the non-impacted and unaffected areas during the Final Survey. Measurements were taken at contact with the surface and at ~ 1 meter from the surface. All exposure rate measurement results were less than 10 μ R/hr above background. The exposure rate measurement results are provided in Table 5 and areas surveyed are shown in their respective figures.

CONCLUSION

Final radiation survey results provided in this report demonstrate that the area designated as "Phase III" (Building 30 Office Areas and Transformer Pad) meets the approved guidelines for release to unrestricted use.

Table 1: USNRC'S ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides ^a	Average ^{b,c,f} (dpm/100cm ²)	Maximum ^{b,d,f} (dpm/100 cm ²)	Removable ^{b,e,f} (dpm/100cm ²)
U-nat, ²³⁵ U, ²³⁸ U, & associated decay products	5,000 α	15,000 α	1,000 α
Transuranics, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I	100	300	20
Th-nat, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³³ I, ¹³¹ I	1,000	3,000	200
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and other noted above.	5,000	15,000	1,000

- a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.
- b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency and geometric factors associated with the instrumentation.
- c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.
- d The maximum contamination level applies to an area of not more than 100 cm².
- e The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.
- f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mRad/hr at 1 cm² and 1.0 mRad/hr at 1 cm², respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

Table 2: STATE OF CA ACCEPTABLE SURFACE CONTAMINATION LEVELS ¹

Nuclides ^a	Average ^{b,c,f} (dpm/100cm ²)	Maximum ^{b,d,f} (dpm/100cm ²)	Removable ^{b,e,f} (dpm/100cm ²)
U-nat, ²³⁵ U, ²³⁸ U, & associated decay products	5,000	15,000	1,000
Transuranics, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I	100	300	20
Th-nat, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³³ I, ¹³¹ I	1,000	3,000	200
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and other noted above	5,000	15,000	1,000

- a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.
- b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency and geometric factors associated with the instrumentation.
- c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.
- d The maximum contamination level applies to an area of not more than 100 cm².
- e The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.
- f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm² and 1.0 mrad/hr at 1 cm², respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

¹ Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, also known as "Decon-1" incorporated into GA's State of CA Radioactive Materials License.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range	Background	Description
Ludlum Rate Meter Model 2221 S/N 148436	Ludlum Model 43-68 100 cm ² Beta	120477	01/17/2000	26.32%	Four Linear Ranges 0-500,000 & One Log 50-500,000 cpm	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 100 cm ² . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects and a portable gas bottle. Used for taking fixed measurements.
Ludlum Rate Meter Model 2221 S/N 86302	Ludlum Model 43-37 434 cm ² Beta	086215	01/24/2000	21.70%	Four Linear Ranges 0-500,000 & One Log 50-500,000 cpm	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted to a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N 97287	Ludlum Model 43-37 434 cm ² Alpha	086238	01/03/2000	21.33%	Four Linear Ranges 0-500,000 & One Log 50-500,000 cpm	See Table 4	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted to a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Model 12 S/N 138738	Ludlum 43-65 50 cm ² Alpha	142349	02/17/2000	21.58%	Four Ranges 0-500,000 cpm	0-5 cpm MDA = 121 dpm/100cm ²	This instrument is an alpha scintillator detector [ZnS(Ag)] with an active probe area of 50 cm ² .
Ludlum Model 19 Micro-R Meter S/N 144068	RCA 6199 coupled to a NaI (TI) Scintillator	N/A	10/06/99	N/A	Five Ranges 0-5 mR/hr	12-18 μR/hr	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground floor/surface surveys). The scintillator [1"x 1" NaI (TI)] is mounted internally.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range	Background	Description
Canberra Low Level α/β Counter	Gas Flow Proportional Counter	N/A	As needed	~ 26-36%	N/A	Varies with Sample	Canberra Model 2400 Low Level α/β gas proportional counting system used to count wipes for removable contamination. Results are usually reported as dpm/100 cm ² .

Table 4: Background Measurements (Obtained from Building 13)

Ludlum Model 2221 Ratemeter s/n 97287 with Model 43-37 Probe s/n 086238
Alpha Floor Monitor Background Scan Results: 434 cm² Detector (Efficiency = 22.33%)

Background Material	Alpha Scan Range (cpm)
Linoleum Over Concrete	0-17
Concrete	0-20
Drywall	0-15
Concrete Block	0-20

Ludlum Model 2221 Ratemeter s/n 86302 with Model 43-37 Probe s/n 086215
Beta Floor Monitor Background Scan Results: 434 cm² Detector (Efficiency = 21.70%)

Background Material	Beta/Gamma Scan Range (cpm)
Linoleum Over Concrete	867-1134
Concrete	1478-1765
Drywall	693-951
Concrete Block	1253-1538

Ludlum Model 2221 Ratemeter s/n 148436 with Model 43-68 Probe s/n 120477
100 cm² Beta Detector (Efficiency = 26.32%)

Background Material	Average of 10 Measurements 1 minutes each (cpm \pm 2 σ)	MDA (dpm/100 cm ²)
Concrete Block (at 25.04% Efficiency)	437 \pm 36	399
Drywall (at 25.04 % Efficiency)	273 \pm 40	318
Formica (at 26.32% Efficiency)	283 \pm 38	308
Carpet over Concrete (at 26.32% Efficiency)	441 \pm 130	381

Table 5: Final Survey Results in the Office Areas of Building 30 & Transformer Pad

Figure #	Locations	Scan Results 434cm ² Beta (β) (cpm range)	# of fixed β Measurements (100 cm ² detector)	Maximum Fixed β Results (dpm/100cm ²)	# of Smears	Maximum Results (dpm/100cm ²)		Exposure Rate Range (μ R/hr)	
						α	β	contact	@1m
Non-Impacted Area									
4 thru 6	Floors - Rooms: 101, 102A, 103, 106(A, D, H, G & F) (carpet over concrete)	---	---	---	---	---	---	12-16	12-15
5, 7, & 9 thru 14, & 16, 17 & 19 thru 21	Floors - Rooms: 102, 105, 106(C, E, J & K), 109, 109 (A, B & C), H110, H120 & H140 (linoleum tile over concrete)	850-1300 (> 5% scan)	---	---	13	< 10	< 10	12-18	11-17
4 thru 7, & 9, 11, & 13 thru 20	Ceilings - Rooms: 101, 102, 102A, 103, 105, 106(A, C, D, E, F, G, H, J & K), 109, 109(A & B), H110, H120, & H140	---	---	---	21	< 10	< 10	---	---
11 & 12	Floor - Room: 109A (green ceramic tile)	1700 (> 5% scan)	---	---	---	---	---	14	14
7 & 8	South Wall - Hallway: H110 (concrete block)	---	3	< 399 (MDA)	3	< 10	< 10	---	---
22	Transformer Pad: Ground Surface (concrete)	1350-1500 (> 5% scan)	---	---	1	< 10	< 10	14-15	13
22	Transformer Pad: Overhead Surface (metal)	---	---	---	1	< 10	< 10	---	---

Table 5: Final Survey Results in the Office Areas of Building 30 & Transformer Pad

Figure #	Location	Scan Results 434cm ² Alpha (α) (cpm range)	Scan Results 434cm ² Beta (β) (cpm range)	# of fixed α Measurements (50 cm ² detector)	Maximum α Results (dpm/100cm ²)	# of fixed β Measurements (100 cm ² detector)	Maximum β Results (dpm/100cm ²)	# of Smears	Maximum Results (dpm/100cm ²)		Exposure Rate Range (μ R/hr)	
									α	β	contact	@1m
Unaffected Area												
23 & 24	Room 106B (Floor) carpet over concrete	0-16 (>10% scans)	900-1050 (>10% scans)	5	139	5	< 381 (MDA)	5	<10	13	14-16	12-14
24	Room 106B (Walls) concrete block	0-12 (>10% scans)	900-1050 (>10% scans)	1	139	1	< 399 (MDA)	0	---	---	NA	NA
	drywall	0-10 (>10% scans)	700-1000 (>10% scans)	3	139	3	< 318 (MDA)	0	---	---	NA	NA
23	Room 106B (Ceiling) & (Counter Tops- Formica)	---	---	---	---	---	---	2	<10	<10	NA	NA
		---	---	3	139	3	< 308 (MDA)	3	<10	<10	NA	NA

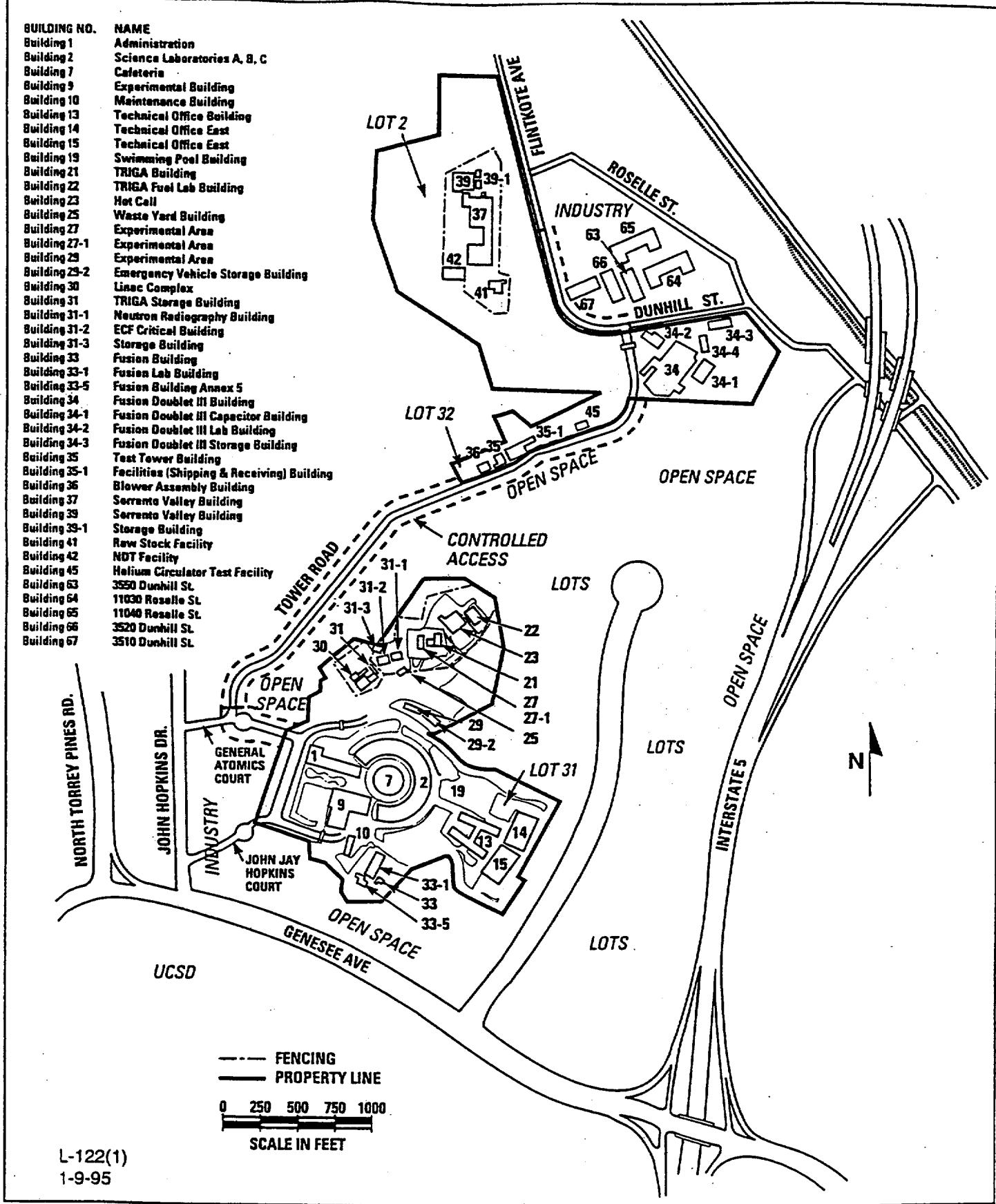


Figure 1: Plan View of General Atomics Site

Figure 2: Building 30/31 Complex (Phases I, II & III)

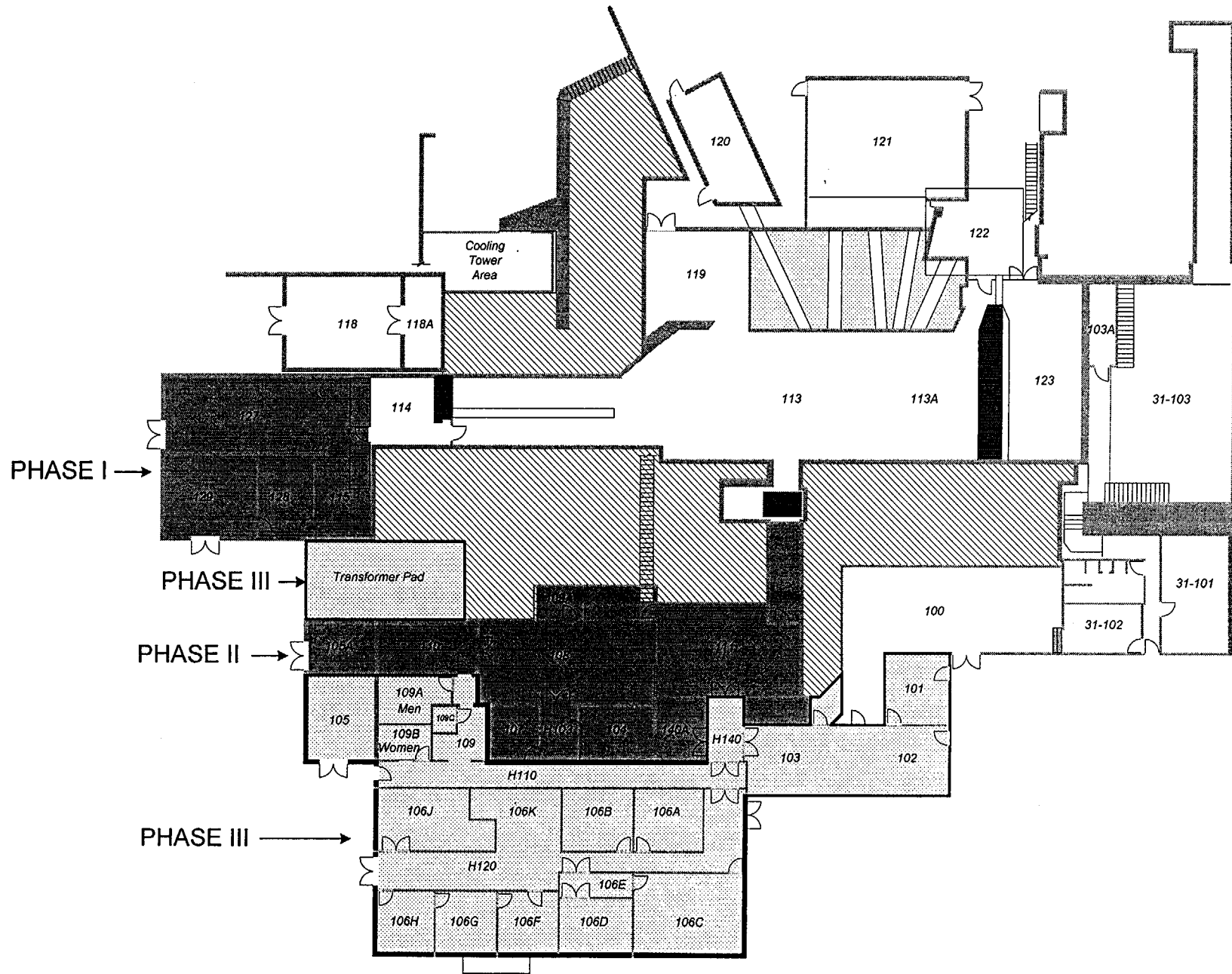


Figure 3: Building 30 Office Complex & Transformer Pad (Phase III)

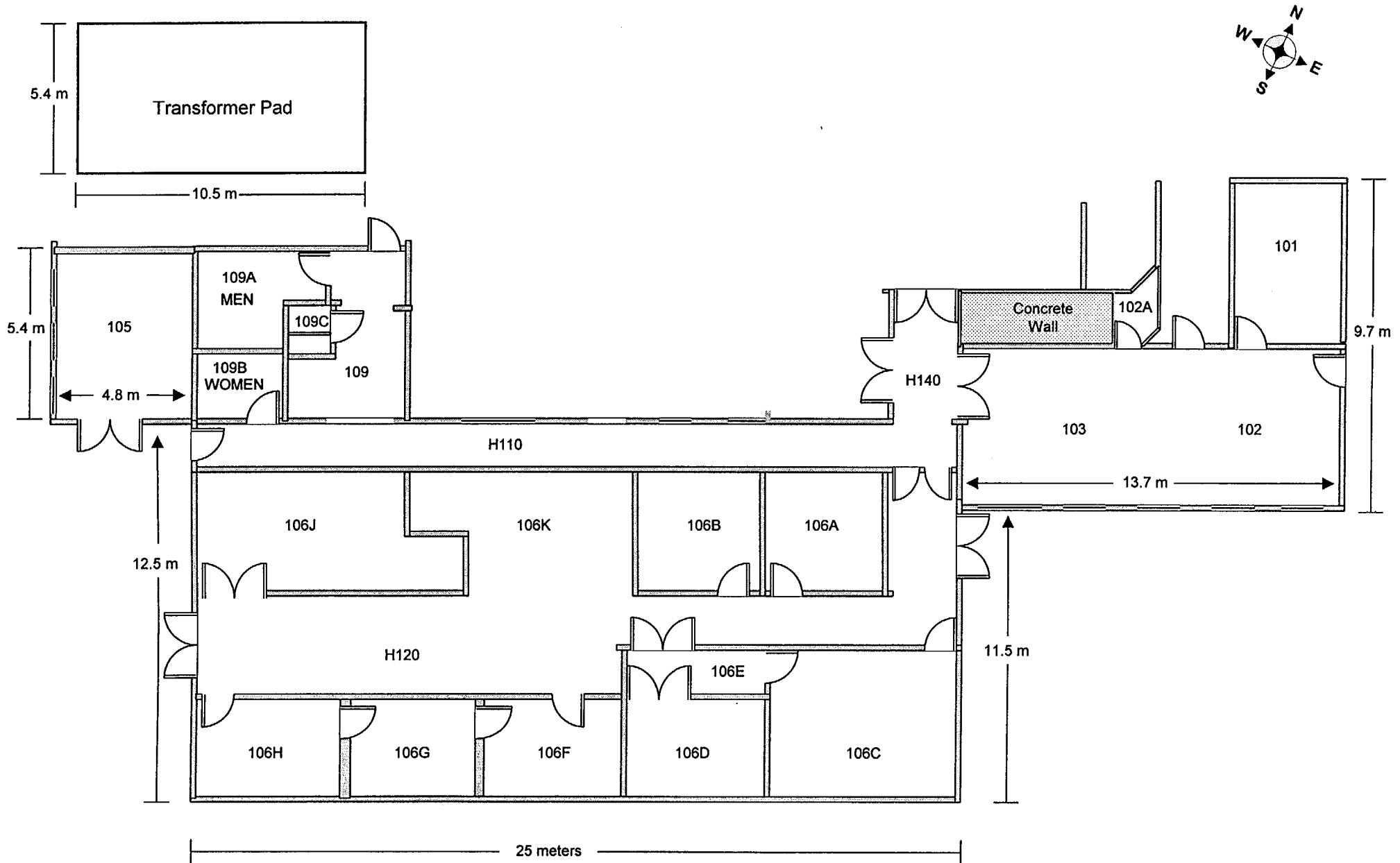
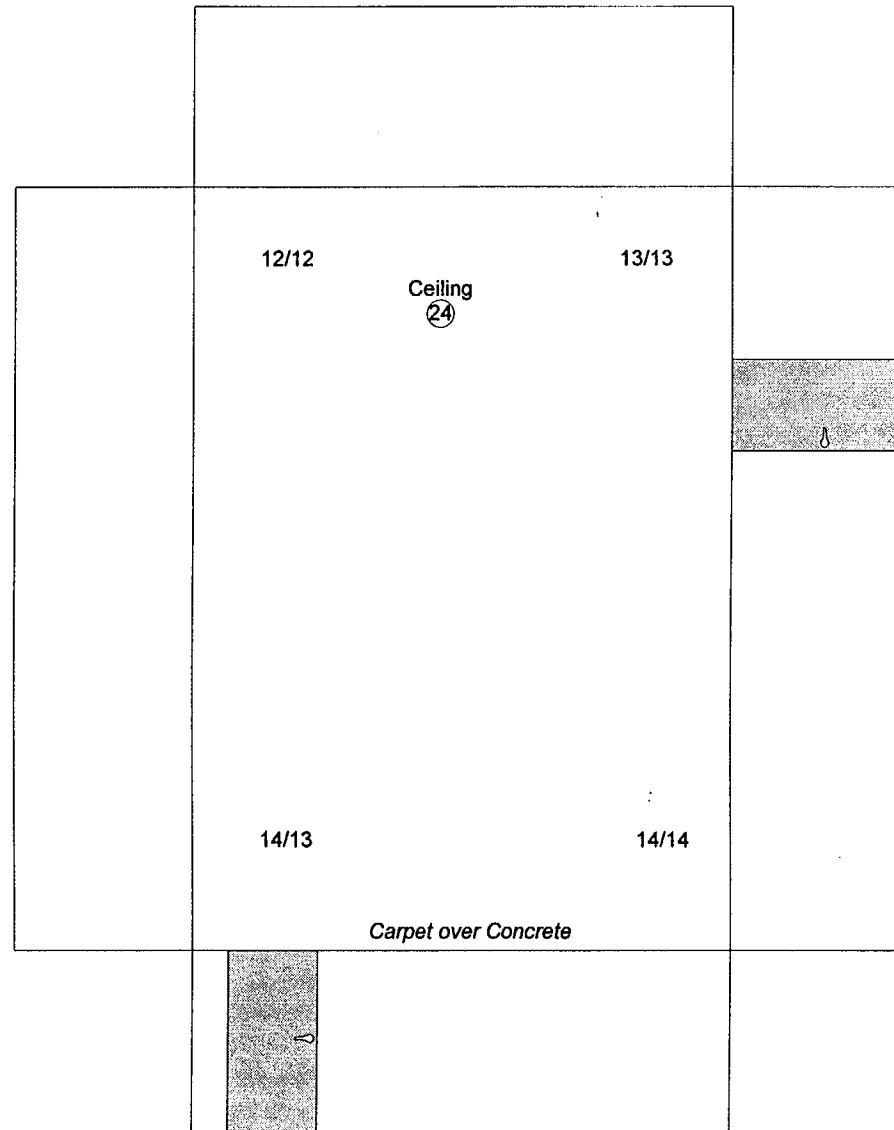


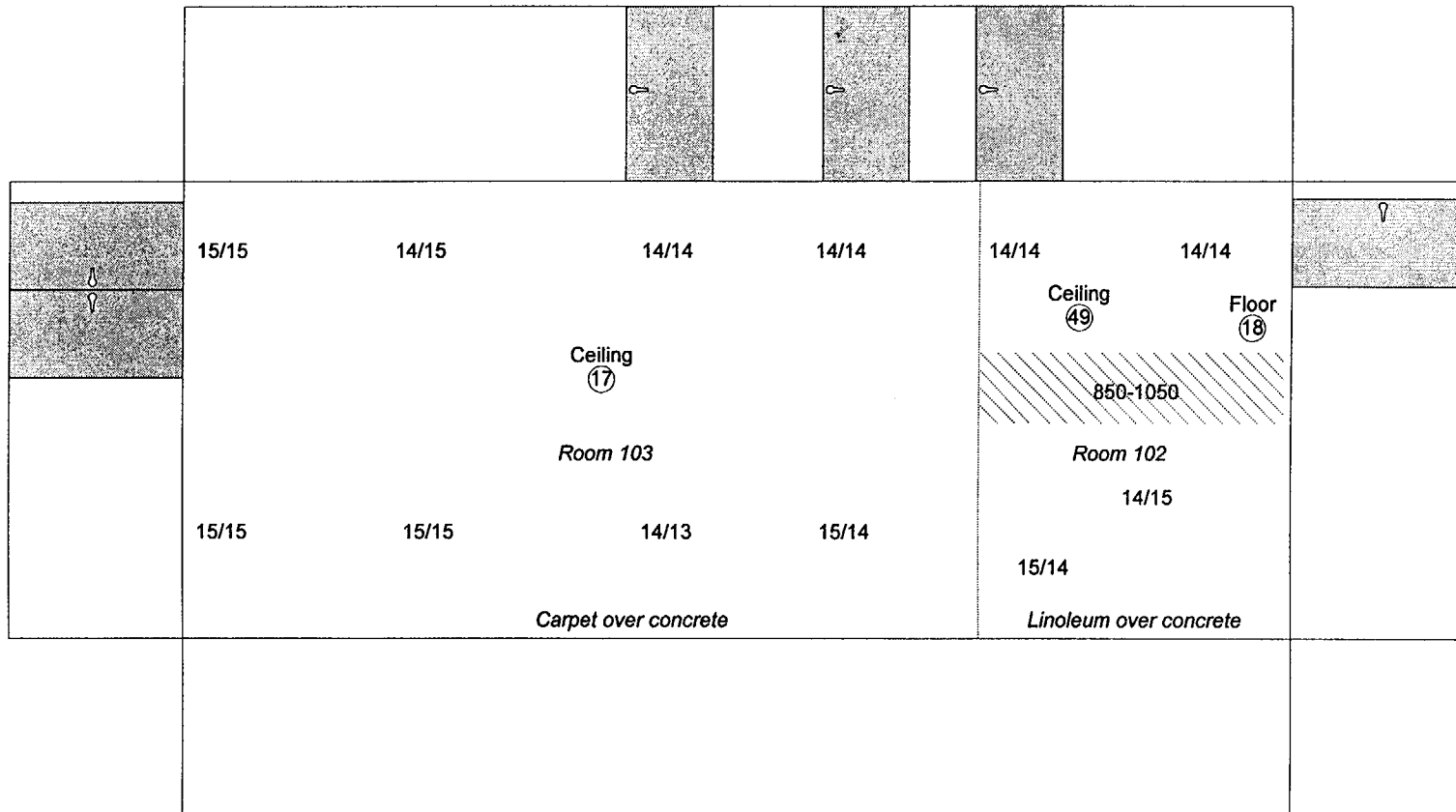
Figure 4: Room 101



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Number circled is the approximate location of wipe (100cm^2) taken.

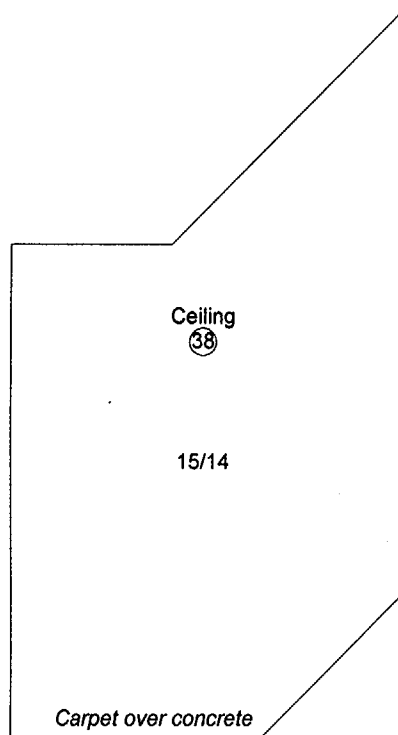
Figure 5 : Rooms 102 & 103



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
4. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

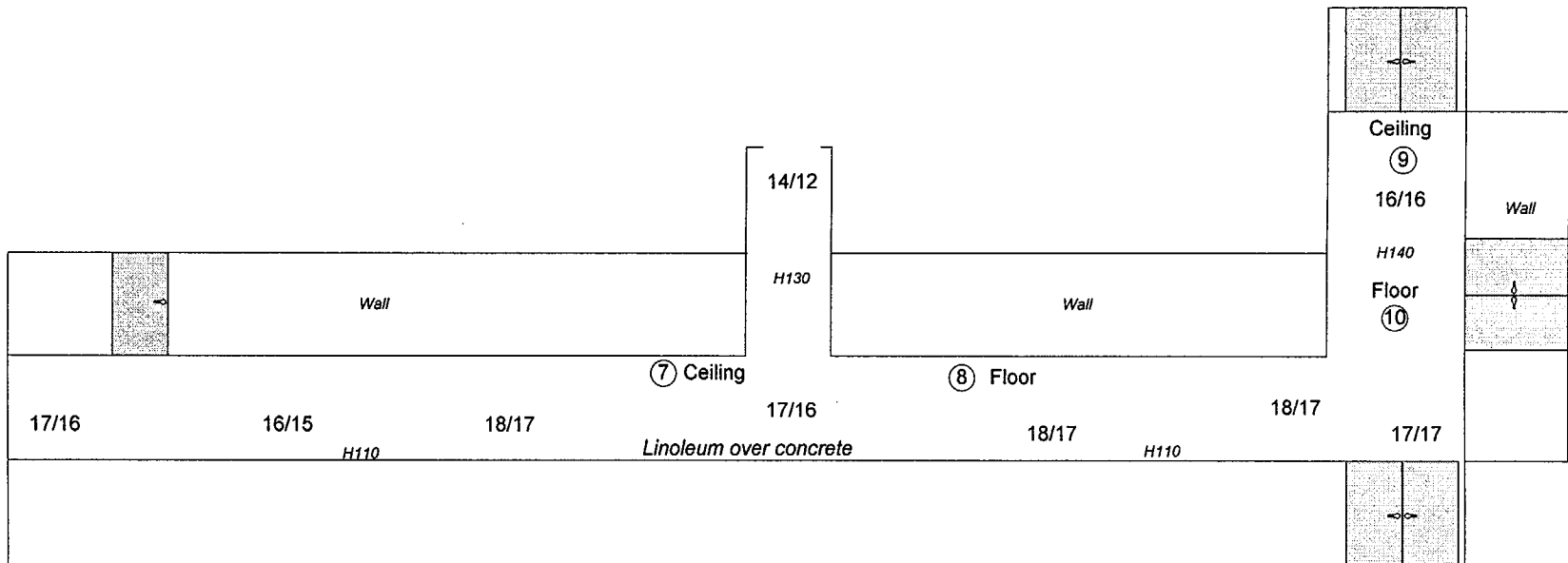
Figure 6: Room 102A



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate location of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Number circled is the approximate location of wipe (100cm^2) taken.

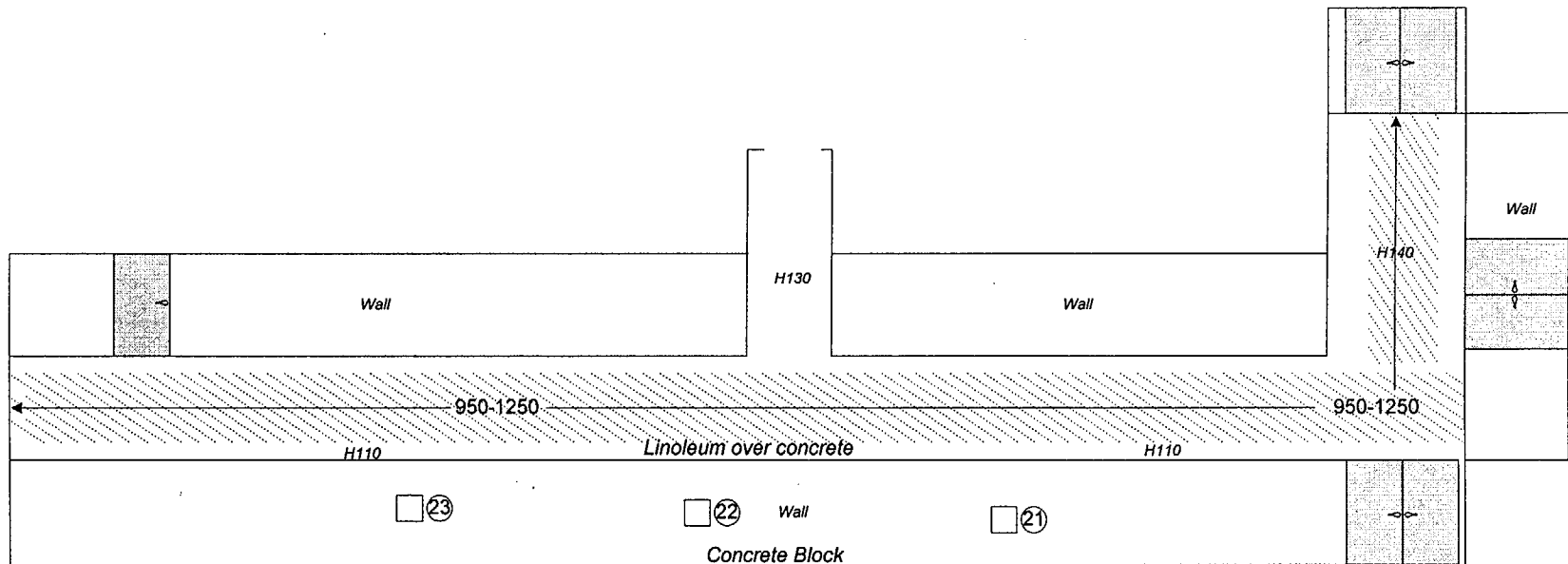
Figure 7: Hallway H110



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

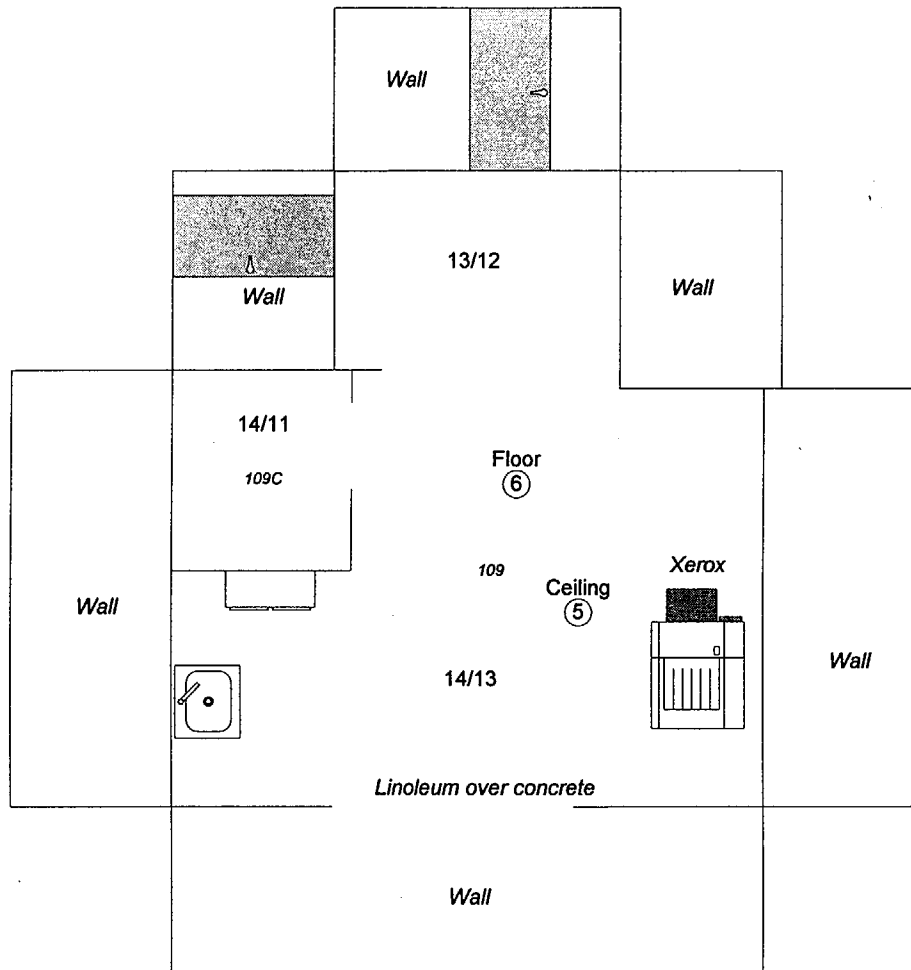
Figure 8: Hallway H110



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The Numbers circled are the approximate locations of wipes (100cm²) taken.
4. The Squares are the approximate locations of one minute fixed Beta measurements.

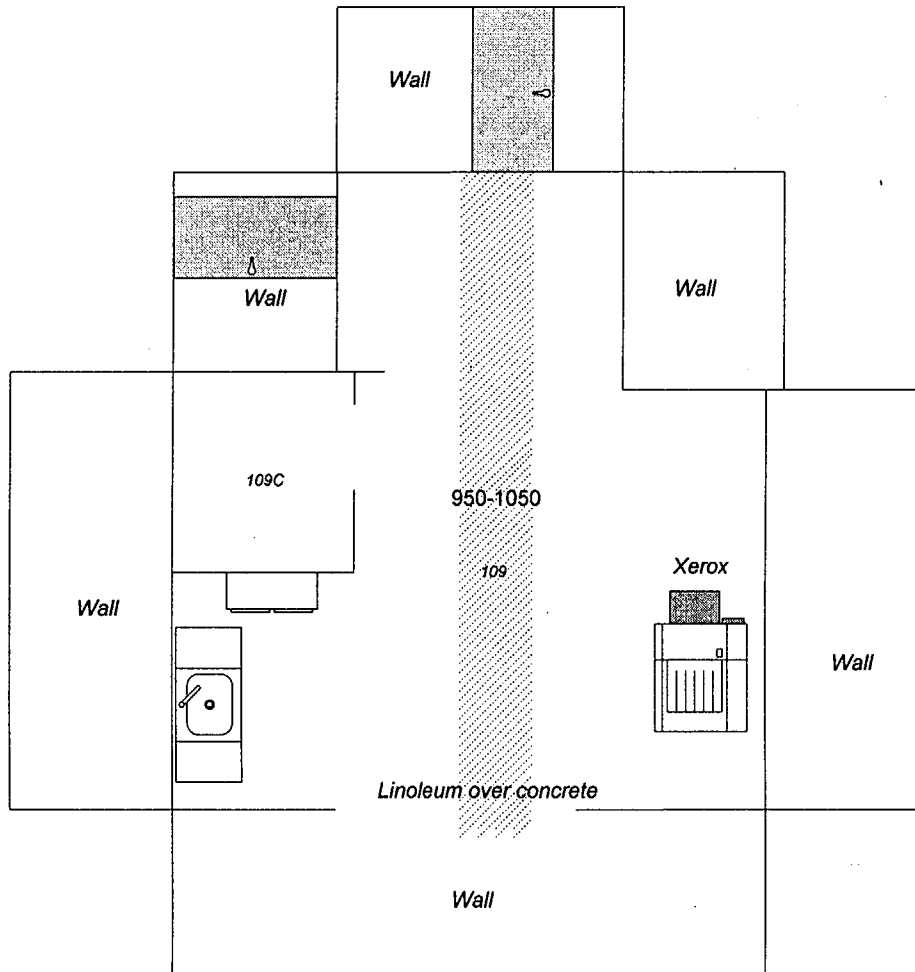
Figure 9: Room 109



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

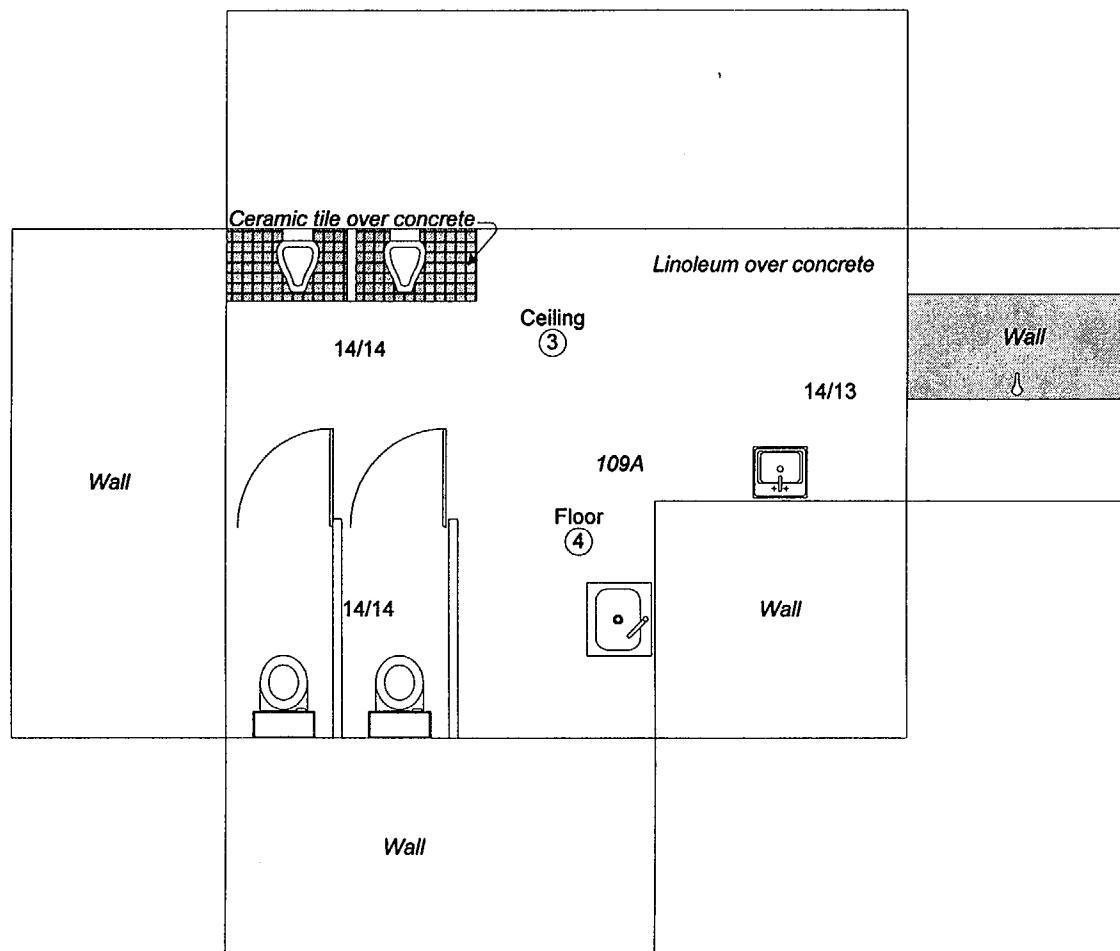
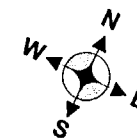
Figure 10: Room 109



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.

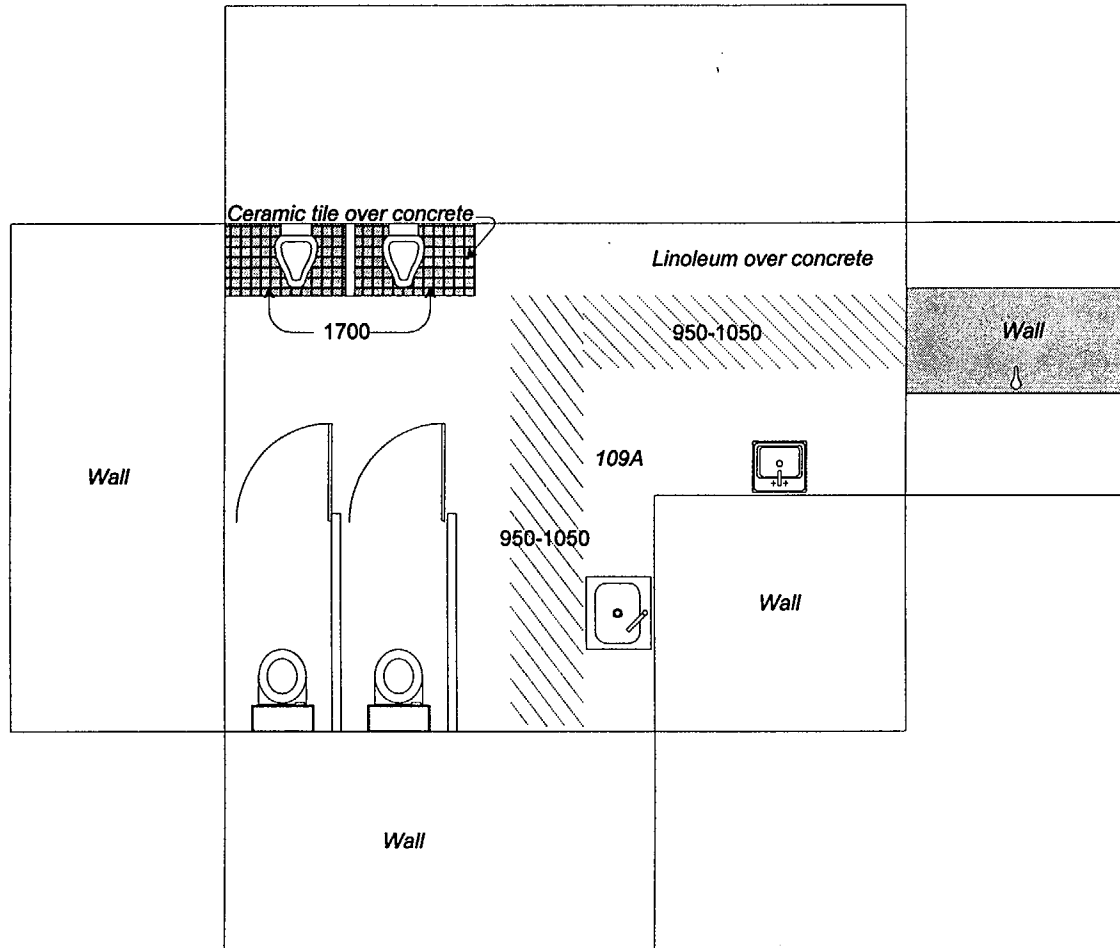
Figure 11: Mens Room



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

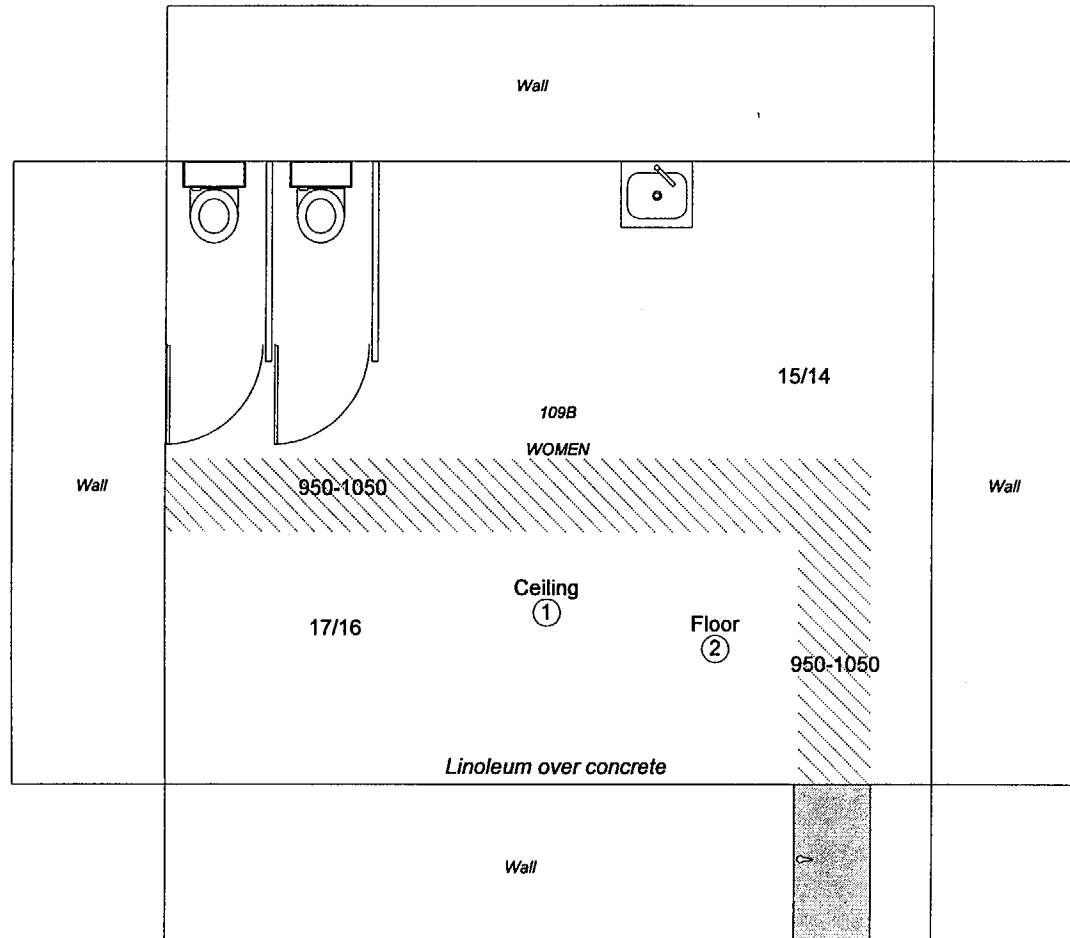
Figure 12: Mens Room



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.

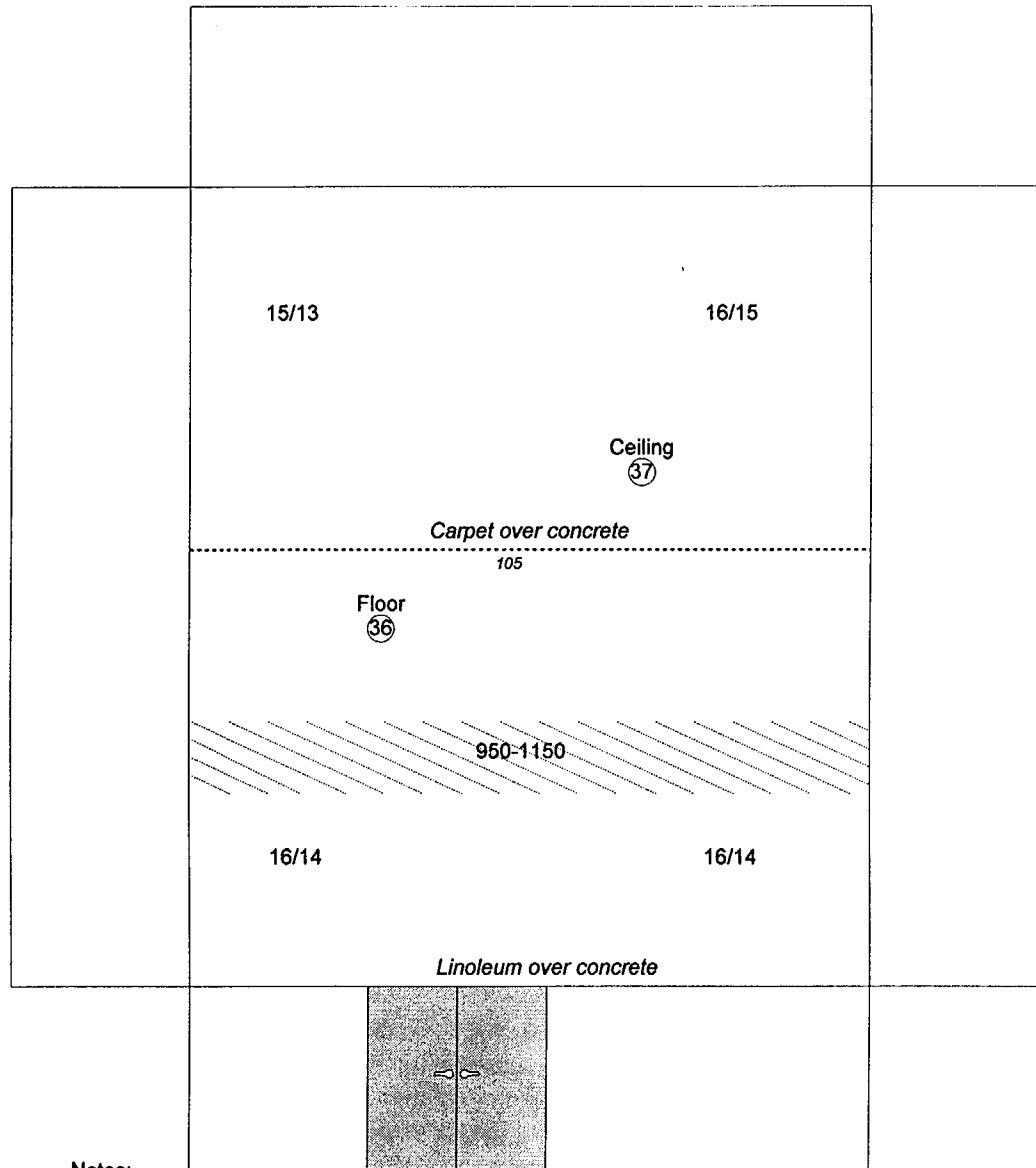
Figure 13: Womens Room



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
4. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

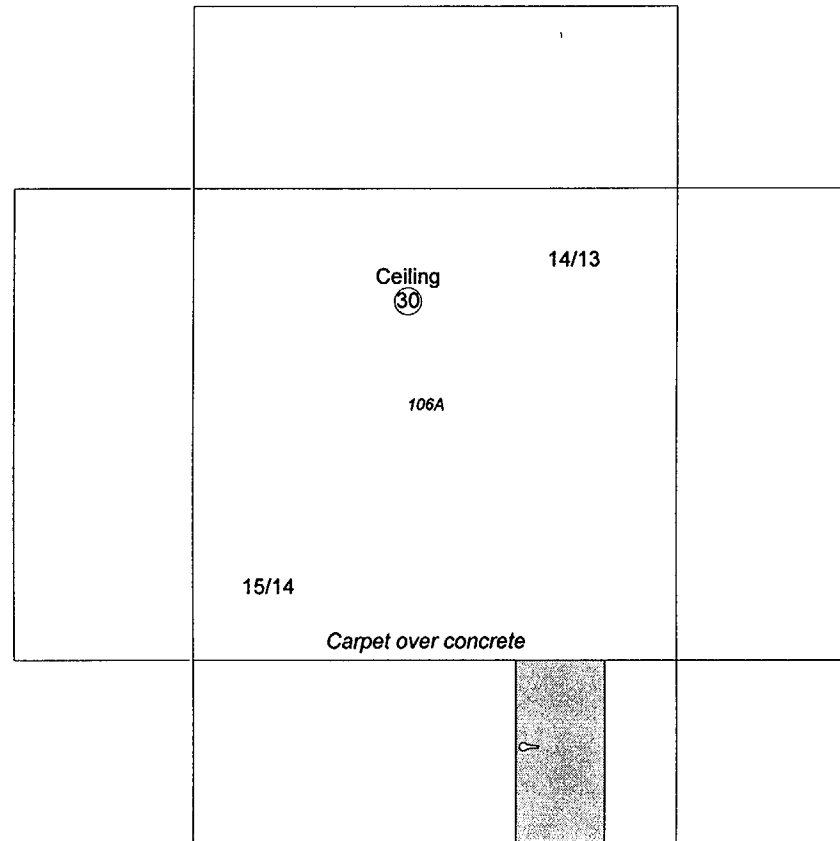
Figure 14: Room 105



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
4. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

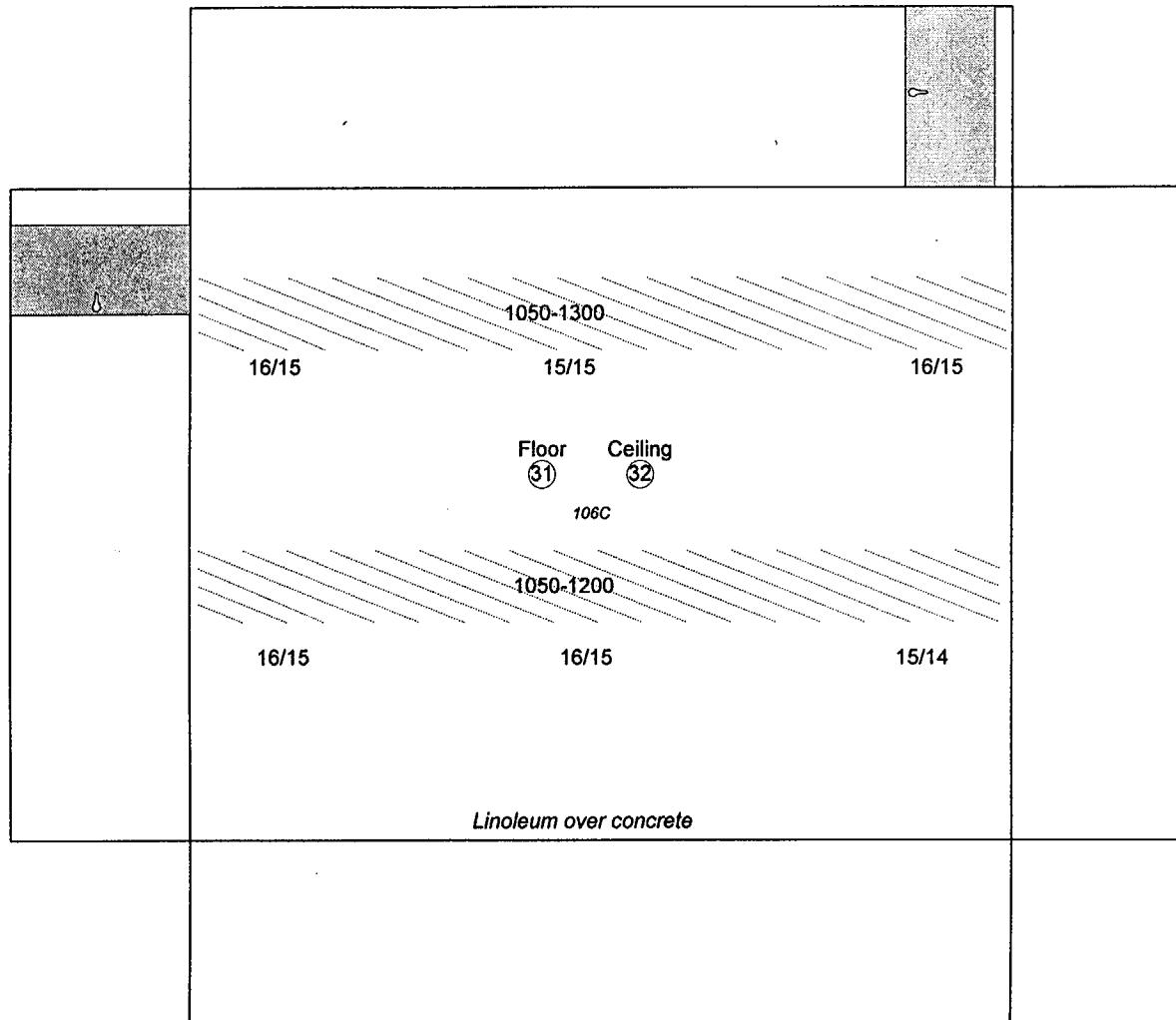
Figure 15: Room 106A



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

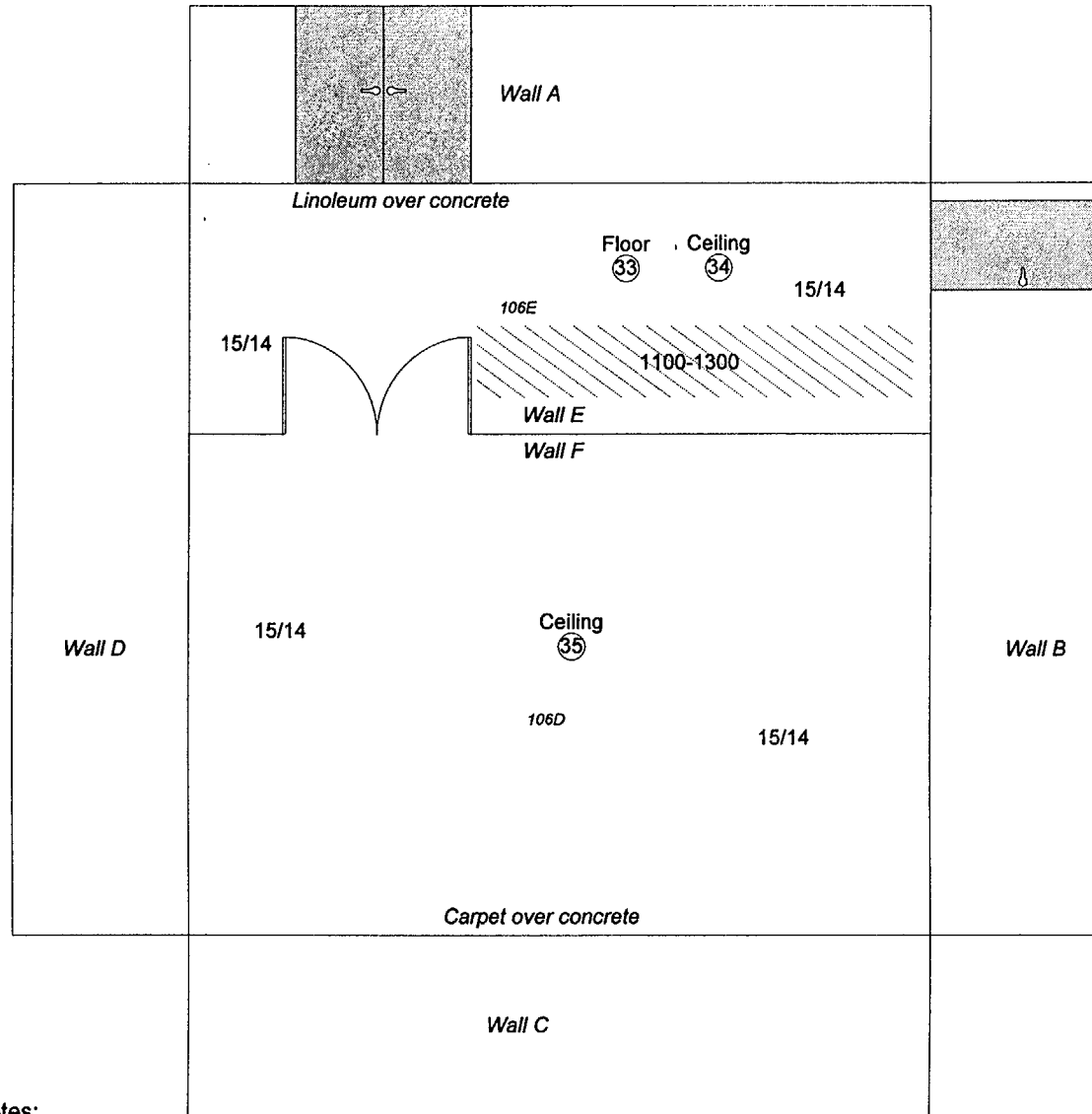
Figure 16: Room 106C



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
4. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

Figure 17: Rooms 106D & 106E

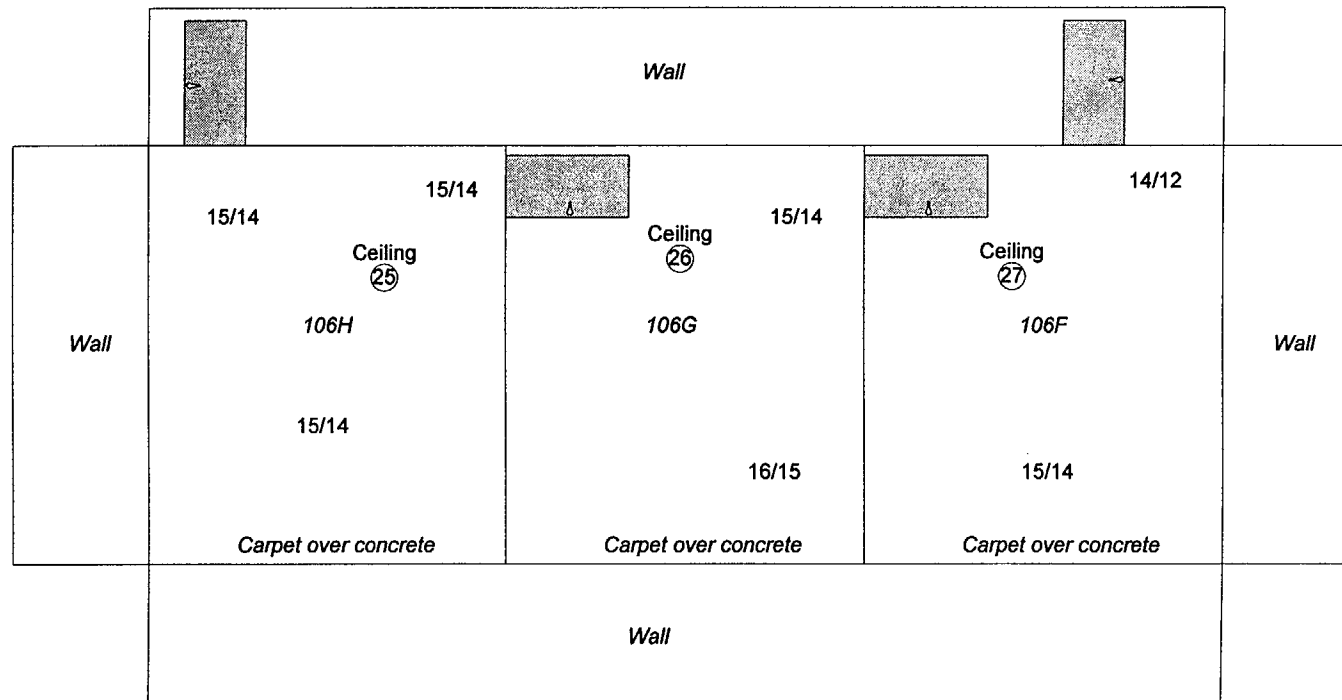


Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
4. The Numbers circled are the approximate locations of wipes (100cm^2) taken.



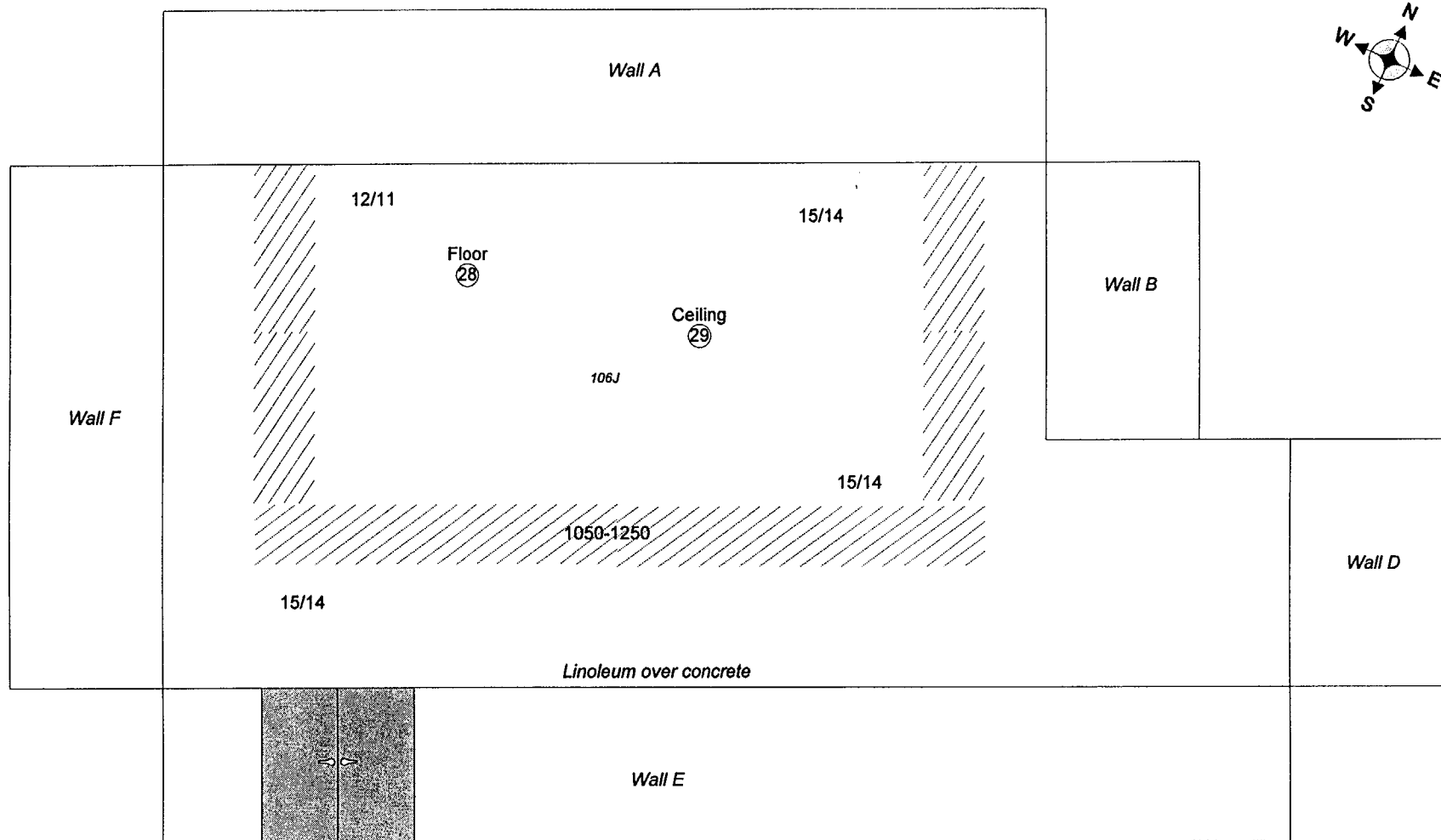
Figure 18: Rooms 106 H,G and F



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

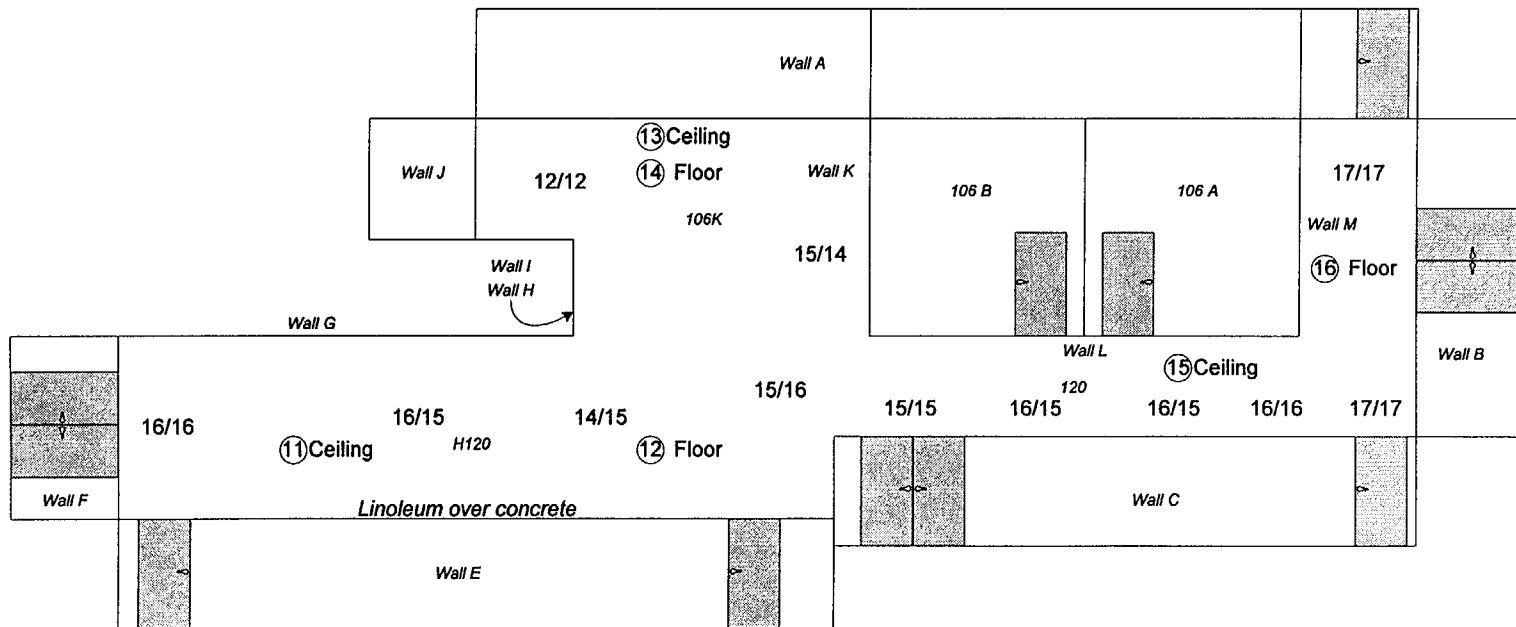
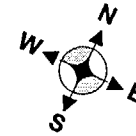
Figure 19: Rooms 106J



Notes:

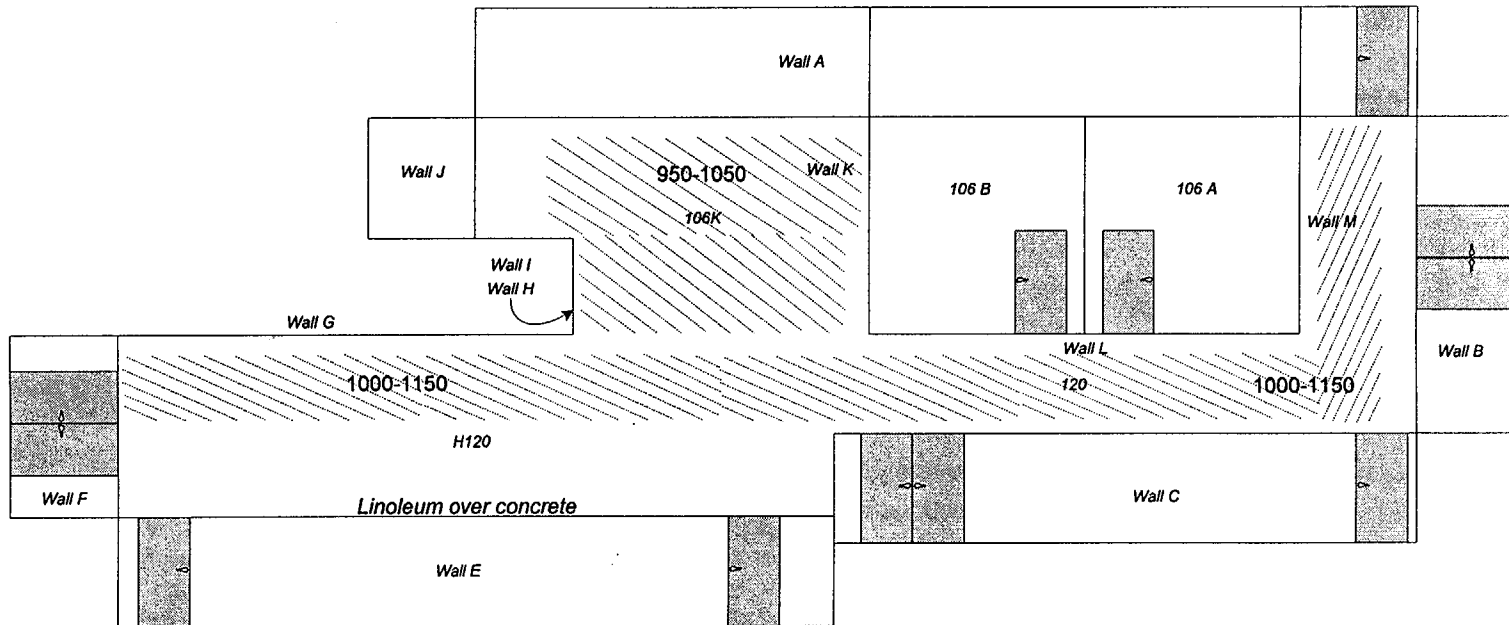
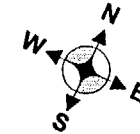
1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
4. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

Figure 20: Rooms 106K & H120



1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

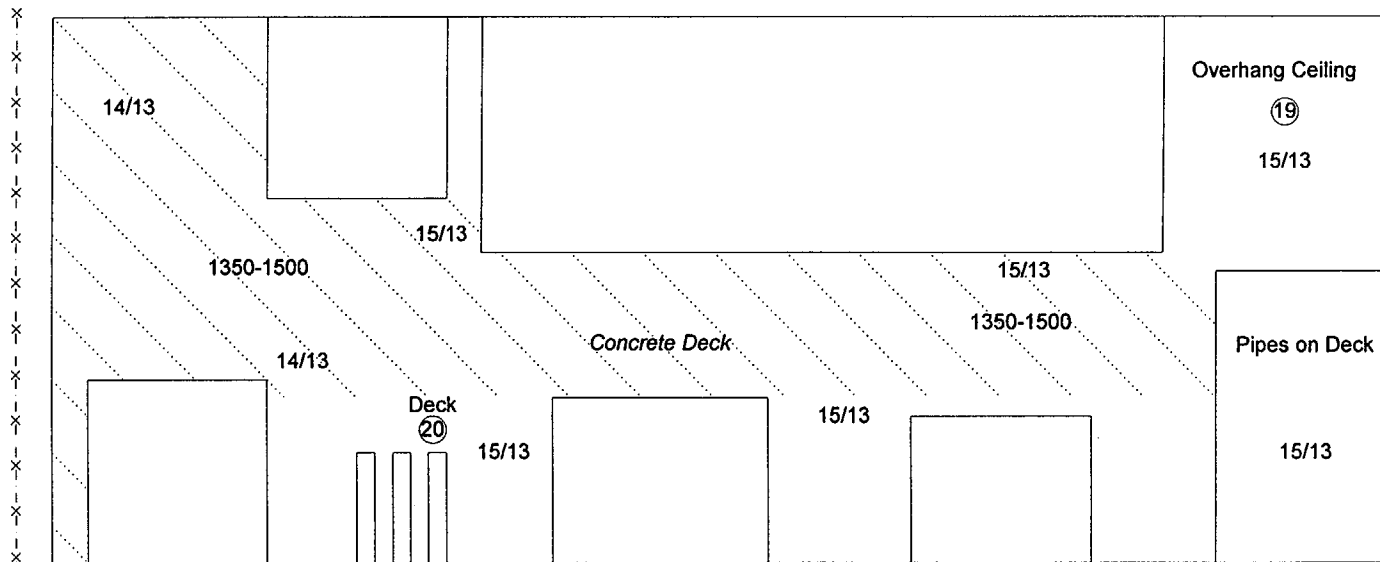
Figure 21: Rooms 106K & H120



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.

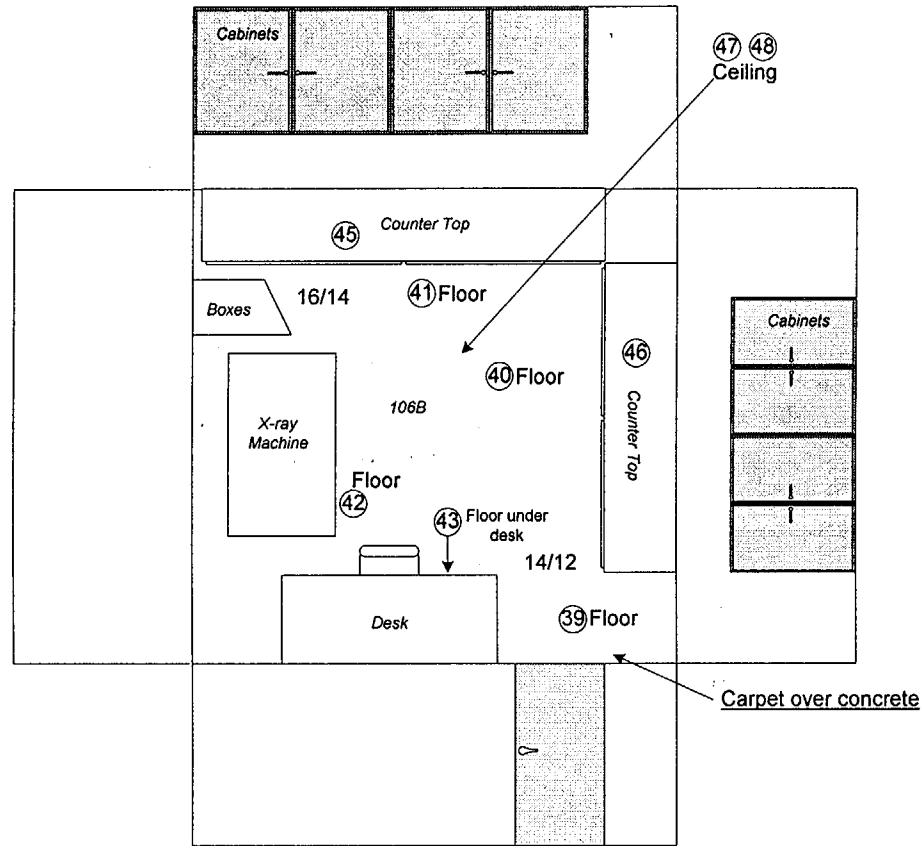
Figure 22: Transformer Pad



Notes:

1. Survey results are provided in Table 5.
2. ~5% Beta scans were conducted in the cross hatched area.
3. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
4. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

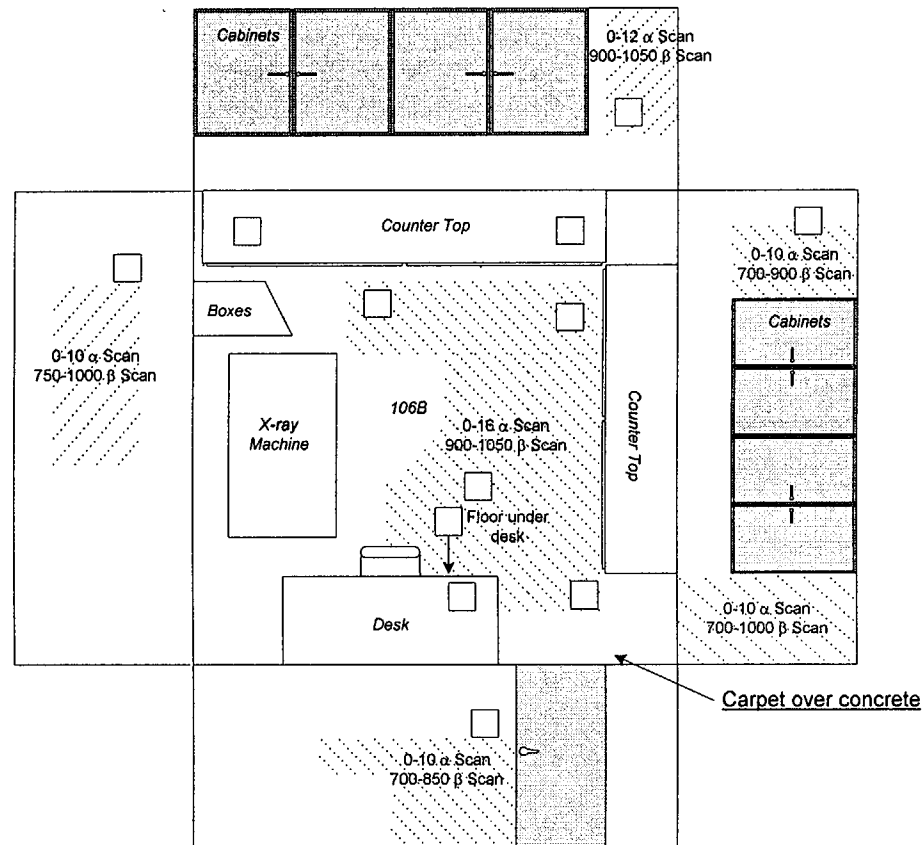
Figure 23: Room 106B



Notes:

1. Survey results are provided in Table 5.
2. The values are micro R per hour ($\mu\text{R/hr}$) and indicate the approximate locations of Exposure Rate Measurements taken ~ every 3m at contact/1m above ground surface.
3. The Numbers circled are the approximate locations of wipes (100cm^2) taken.

Figure 24: Room 106B



Notes:

1. Survey results are provided in Table 5.
2. ~10% Alpha and Beta scans were conducted in the cross hatched area.
3. The Numbers circled are the approximate locations of wipes (100cm²) taken.
4. The Squares are the approximate locations of Fixed Alpha and Beta measurements.

Appendix

Final Radiological Survey Performed at General Atomics'

Building 30 Office Areas & Transformer Pad

(Phase III)

dated January 27, 2000

"Final Survey Plan for Building 30/31

Office Areas - Phase III," dated August 25, 1999

Date: 08/25/99

Prepared by: John Turner

Approved: Laura Gonzales

Laura D Gonzales

Date: 8/26/99

Paul Maschka

Paul R Maschka

Date: 8/26/99

Final Survey Plan for Building 30/31 Office Areas - Phase III

Purpose

The purpose of this survey is to demonstrate that the radiological conditions in Building 30/31 office complex satisfy the NRC and State of CA guidelines for release to unrestricted use, and ensures that the radiological conditions are below the approved release criteria specified in GA's Site Decommissioning Plan.

Site Description

Building 30/31 complex is located on General Atomics' Torrey Pines Mesa Site. A plan view of the GA Site is shown in Figure 1. A diagram of the 30/31 complex at GA's Torrey Pines Site is shown in Figure 2. A diagram of Building 30/31 office complex is shown in Figure 3.

Background

The Linac Facility (Building 30/31 complex) previously housed a 100 MeV linear accelerator and most recently housed a 14 MeV linear accelerator. D & D for this facility is being accomplished in 5 phases. This survey plan is applicable only to Phase III which covers office areas as shown in Figure 3. These office areas were isolated from the linear accelerator activities and have no known history of radioactive usage or storage, except for Room 106B which contained two (low level activity) alpha check sources for the calibration of an alpha counter (spectrophotometer). These alpha sources have been removed from Room 106B. Room 106B also contains an x-ray machine which remains in Room 106B.

Classification of Building 30/31 Office Complex

The office areas within the Building 30/31 complex are "non-impacted areas" (no history of use involving radioactive materials), except for Room 106B which is an "unaffected area" (no contamination expected based on historical use). The total floor space of all the office areas is ~ 5685 ft² (~ 528 m²). The total floor space within Room 106B is ~ 216 ft² (~ 20 m²).

Release Limits (per GA site Decommissioning Plan)

Facilities and Equipment

The primary contaminant of concern for this site is Co⁶⁰ and other beta/gamma emitters. The applicable guidelines for residual contamination on building surfaces are:

- 5,000 dpm/100cm² (averaged over a 1 m² area)
- 15,000 dpm/100cm² (maximum in a 100 cm² area if the average over 1 m² is met)
- 1,000 dpm/100cm² (removable activity)

Exposure Rate Level

The guideline value for exposure rates measured at 1 m above the surface is 10 $\mu\text{R/hr}$ above background.

Alert Levels

Beta Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage or reclassification is required.

- > 300 cpm above the appropriate background using the large area (434 cm^2) β probe
- > 200 cpm above the appropriate background using the 100 cm^2 β probe
- > 50 cpm above the appropriate background using the GM 15 cm^2 pancake probe

Alpha Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage or reclassification is required.

- > 150 cpm using the large area (434 cm^2) α probe
- > 75 cpm using the hand-held 50 cm^2 α probe

Note: Alpha contamination is not expected in any of these office areas. Alpha surveys are being conducted on the floor and wall surfaces within Room 106B due to the storage and usage of the low level activity α check sources. The alpha surveys should verify that no α contamination is present in Room 106B.

Exposure Rate Alert

Background is typically ~ 15 $\mu\text{R/hr}$ (i.e., an average of 12-18 $\mu\text{R/hr}$ range) at 1 meter above the surface (but may vary with type of facility & location). The alert level is 20 $\mu\text{R/hr}$ at 1 meter from the surface and 25 $\mu\text{R/hr}$ on contact with the surface.

Documentation

Every radiological survey conducted must be documented on a daily basis to a worksheet/log book and on a drawing showing the appropriate locations surveyed. The documentation must include the results of the measurements (including units), the technician's printed name and signature, date, instrument(s) used (including the model and serial number of both the ratemeter and the detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

Final Surveys for Building 30/31 Office Complex

Type of Survey	Non-impacted Area Surveys to be Performed ⁽¹⁾
Conduct surveys using instruments/probes with known background levels or determine background levels at Building 13 before usage. Structural materials that may be encountered are concrete block, drywall, metal, brick, carpet, linoleum, etc.	
Grid	Not Required
Linoleum Floor Scans (scan w/ 434 cm ² β probe)	~ 5% β (accessible floor area)
Concrete Block Wall Measurements ⁽²⁾ (along south side of hallway H110)	Take a minimum of 3 fixed β measurements & 3 wipes (100 cm ²), evenly spaced, @ ~ 1 meter up from the floor surface (~ 1 per 3 m).
Number of Planned Measurements ⁽²⁾	Minimum of 30 measurements: ~ 1 wipe (100 cm ²) per each room on the overheads & the linoleum (only) floor surfaces (i.e., office, work areas, restrooms, hallways and include the concrete surface of the transformer pad).
μR/hr Measurements @ contact w/surface & @ 1 m from the surface	Conduct μR/hr readings @ contact w/surface and @ 1 meter above the floor surface ~ 1 every 3 meters of floor areas and concrete transformer pad area.
Type of Survey	Unaffected Area (Rm 106B) Surveys to be Performed ⁽¹⁾
Conduct surveys using instruments/probes with known background levels or determine background levels at Building 13 before usage. Structural materials that may be encountered are concrete block, drywall, metal, brick, carpet, linoleum, etc.	
Grid	Not Required
Floor Scans within Room 106B (scan w/434 cm ² α & β probe)	~ 10% α & ~ 10% β (accessible floor area)
Lower Wall Scans within Room 106B (Below 2 m) (scan w/434 cm ² α & β probe)	~ 10% α & ~ 10% β (accessible wall area)
Number of Planned Measurements ⁽²⁾	Take a minimum of 30 measurements: ~ 10 fixed α measurements, ~ 10 fixed β measurements and 10 wipes (100 cm ²) on the floor, desk, counter tops & overheads.
μR/hr Measurements @ contact w/surface & @ 1 m from the surface	Conduct μR/hr readings @ contact w/surface and @ 1 meter above the floor surface ~ 1 every 3 meters.

- (1) Survey coverage will be increased if contamination levels above 75% of release levels are detected (the Site Plan requires reclassification if levels > 75% of release levels are detected).

(2) For the fixed measurements:

- * For β measurements; take a 1 minute count using the 100 cm² gas flow proportional detector (beta) with the Model 2221 ratemeter. Document all readings and mark on a drawing where the readings were taken.
- * For α measurements; take a ~ 10 second reading with the 50 cm² hand-held alpha detector. Document all readings and mark on a drawing where the readings were taken.
- * For removable measurements on floors; take a 100 cm² wipe at select locations; count using a low level α/β counter in the HP Laboratory. Mark on a drawing where the wipes were taken.

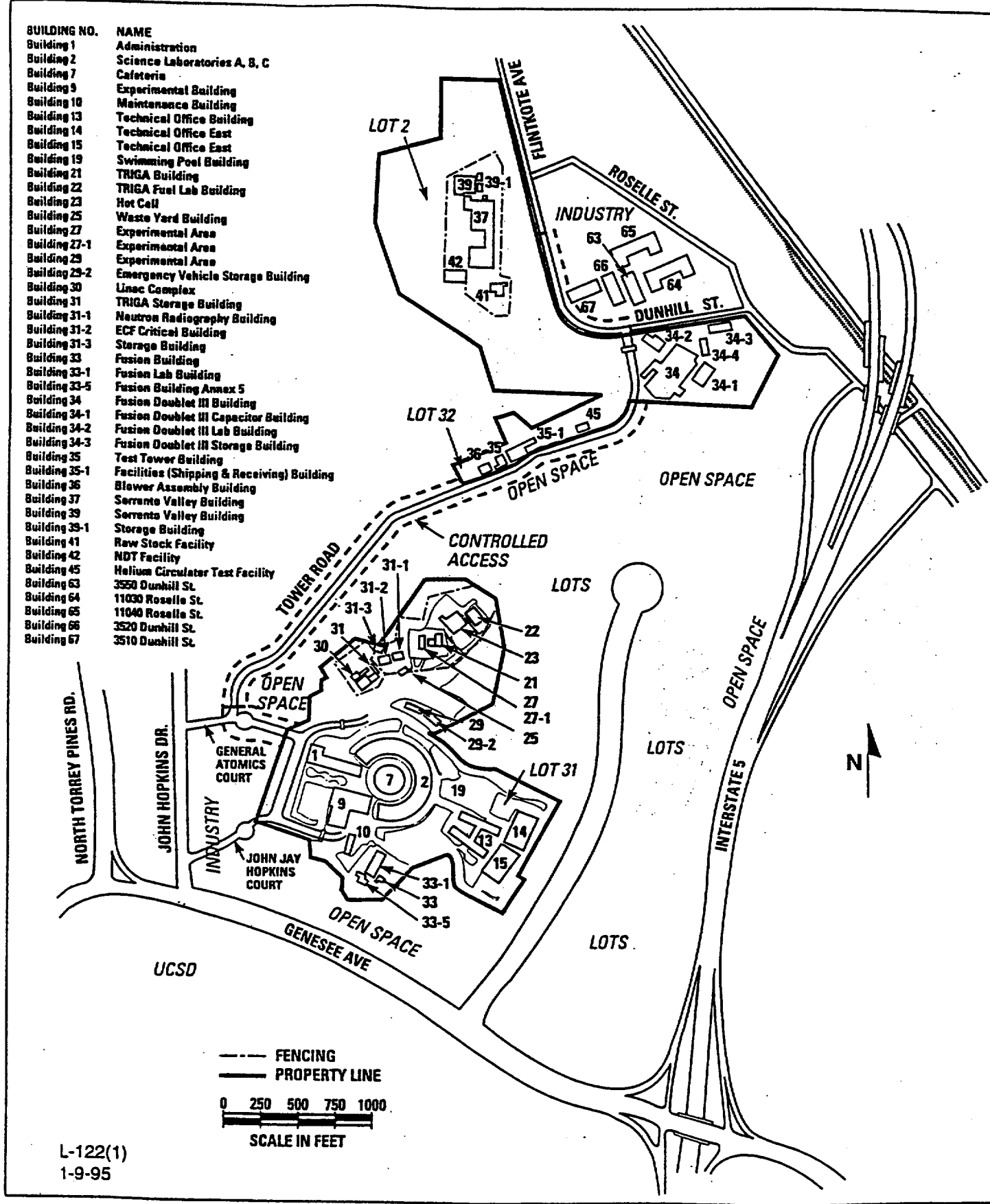


Figure 1: Plan View of General Atomics Site