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TITLE: FINAL RADIOLOGICAL SURVEY REPORT FOR BUILDING T030

- APPROVALS -

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ABSTRACT

In 1988, a general radiological survey was conducted to clarify and identify areas at the Santa Susana Field Laboratories (SSFL) requiring further radiological inspection or remediation (Reference 1). Building T030 was included in this survey, and the results showed no detectable contamination in the facility. Background-corrected gamma measurements conducted outside of the facility were all less than the acceptance limit of 5 μR/hr.

In September 1995, the Oak Ridge Institute for Science and Education (ORISE) conducted a confirmatory survey of several facilities at the SSFL, including Building T030 (Reference 2). With the exception of a single finding for removable tritium contamination of 6,600 dpm/100 cm^2 (below the acceptance limit of 10,000 dpm/100cm^2) found on the north wall of the accelerator room, no unusual findings were noted. However, ORISE did question the completeness of the 1988 survey. Specifically, ORISE recommended complete measurements of total or removable surface activity, and additional sampling for tritium activity in the accelerator area. In view of ORISE's advice, a comprehensive final survey of Building T030 was conducted in 1996.

The results of the 1996 survey are presented in this report. The results demonstrate that Building T030 meets the requirements of DOE, NRC, and State of California for the release of facilities for use without radiological restrictions.

1. INTRODUCTION

Decontamination and decommissioning (D&D) of a number of formerly used nuclear facilities and sites is underway at Rocketdyne's Santa Susana Field Laboratory (SSFL). During D&D of these facilities, efforts are made to eliminate or reduce residual radioactive contamination to levels that are as low as reasonably achievable (ALARA). Upon completion of D&D, radiological surveys are performed under established protocols to demonstrate that any remaining radioactivity does not exceed applicable regulatory limits. Findings from these surveys are also used to perform additional D&D or radiological investigations, as needed. The scope of these surveys includes both known and suspected areas of contamination.

This report describes the final release survey performed for Building T030, and is organized as follows: Section 2 gives a summary of the results of the survey and the conclusions and recommendations; Section 3 gives background information concerning past radiological status, D&D efforts, and current radiological status; Section 4 presents the survey results and the technical approach used in the data collection, analysis, and limit criteria; Section 5 gives the relevant references; and Appendices A through C provide the supporting documentation and calculations for historical records and report completeness.

2. SUMMARY AND CONCLUSIONS

Survey measurements were made for alpha, beta-gamma, and tritium surface contamination on the interior walls, floors, and ceilings in Building T030, and for ambient gamma exposure rate at 1 meter above the interior floors.

For the radiological survey, interior rooms in Building T030 were divided into two areas, Affected Areas and Unaffected Areas. Affected Areas were defined as those areas which have known or suspected contamination based on either past measurements or site history. Unaffected Areas included all areas of a facility not classified as Affected, and were those areas which were not expected to contain any contamination based on previous measurements or site history. Statistical interpretation of the survey data was separated between Affected (Lot 1) and Unaffected areas (Lot 2): Lot 1 included Rooms 100, 101, 102 and adjacent restrooms; Lot 2 included all other areas in the eastern section of the facility, including the walkway, Rooms 103 through 108, and the connecting aisles.

All measurements were tested statistically for compliance with acceptable contamination limits for activation products and mixed fission products and for ambient exposure rate. The results of these tests showed that the facility is suitable for release without radiological restrictions.

3. BACKGROUND INFORMATION

3.1 Location

Building T030 is located within Rocketdyne's SSFL in the Simi Hills of southeastern Ventura County, California, adjacent to the Los Angeles County line and approximately 29 miles northwest of downtown Los Angeles, directly south of the City of Simi Valley. Location of the SSFL relative to Los Angeles and vicinity is shown in Figure 1. An enlarged map of neighboring SSFL communities is shown in Figure 2. Figure 3 is a plot plan of the western portion of SSFL known as Area IV, where Building T030 is located. A plan view of Building T030 and its adjoining areas is shown in Figure 4. Building T030 is located on government-optioned land.

3.2 Topography and Building Characteristics

Building T030 is situated on 10th Street, off the west side of G Street, among several adjacent buildings on paved ground. The building was constructed in 1958 for research with a small accelerator neutron source. The building has a total enclosed area of 2,311 ft^2. The facility consists of two connected sections, both with steel framing, siding and roofs. The rear section (west) was constructed at a right angle to the front office (east) section. The rear section was configured to house a Van de Graaff accelerator used as a proton on tritium neutron source. An outside concrete wall was constructed on the north and east sides of the west section to provide shielding for the proton beam. Men's and women's restrooms were built into the west section of the building. Rock outcroppings extend from near the building to the west, northwest, and northeast.

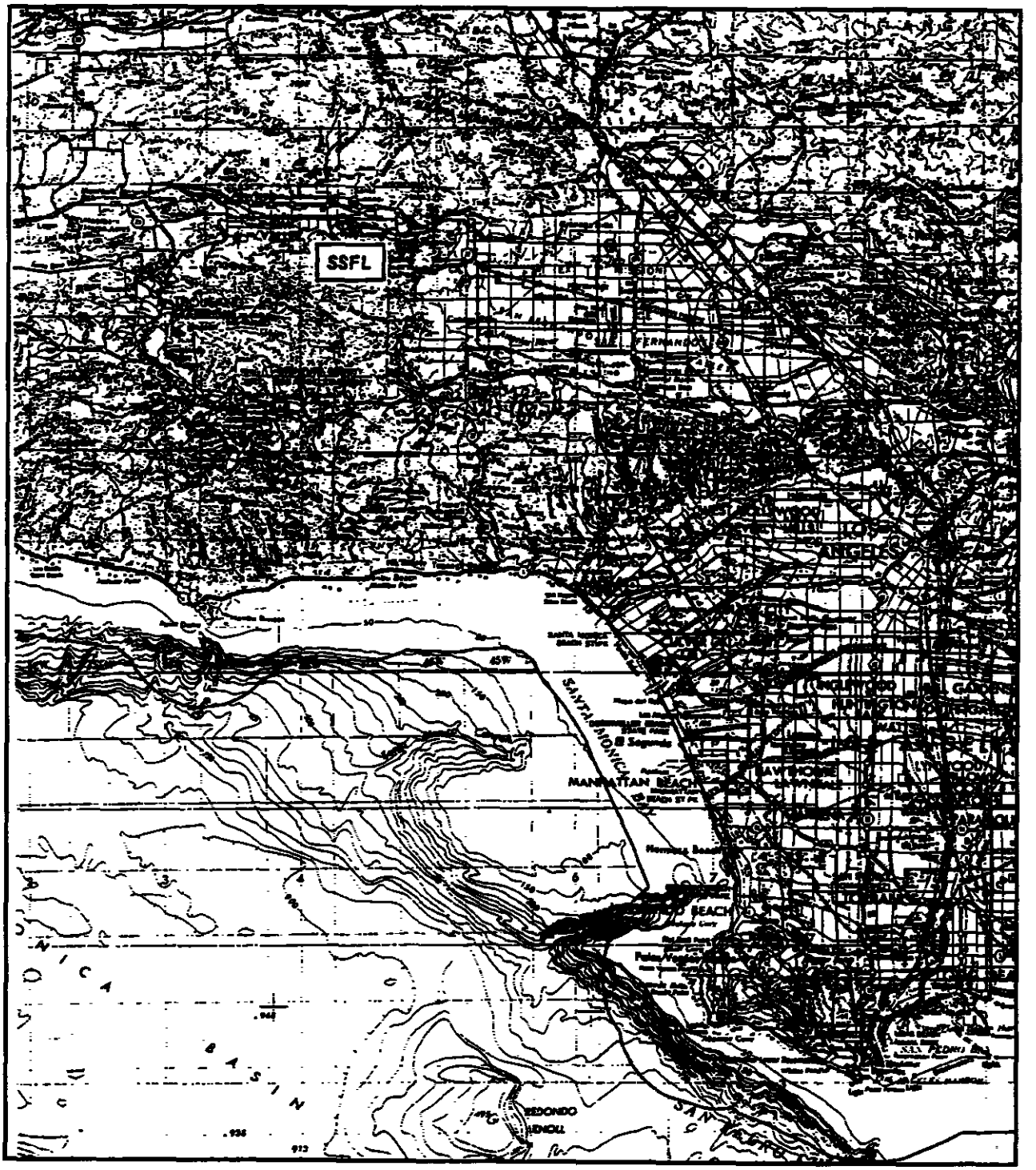

Figure 1. Location of SSFL Relative to Los Angeles and Vicinities

Figure 2. Neighboring SSFL Communities

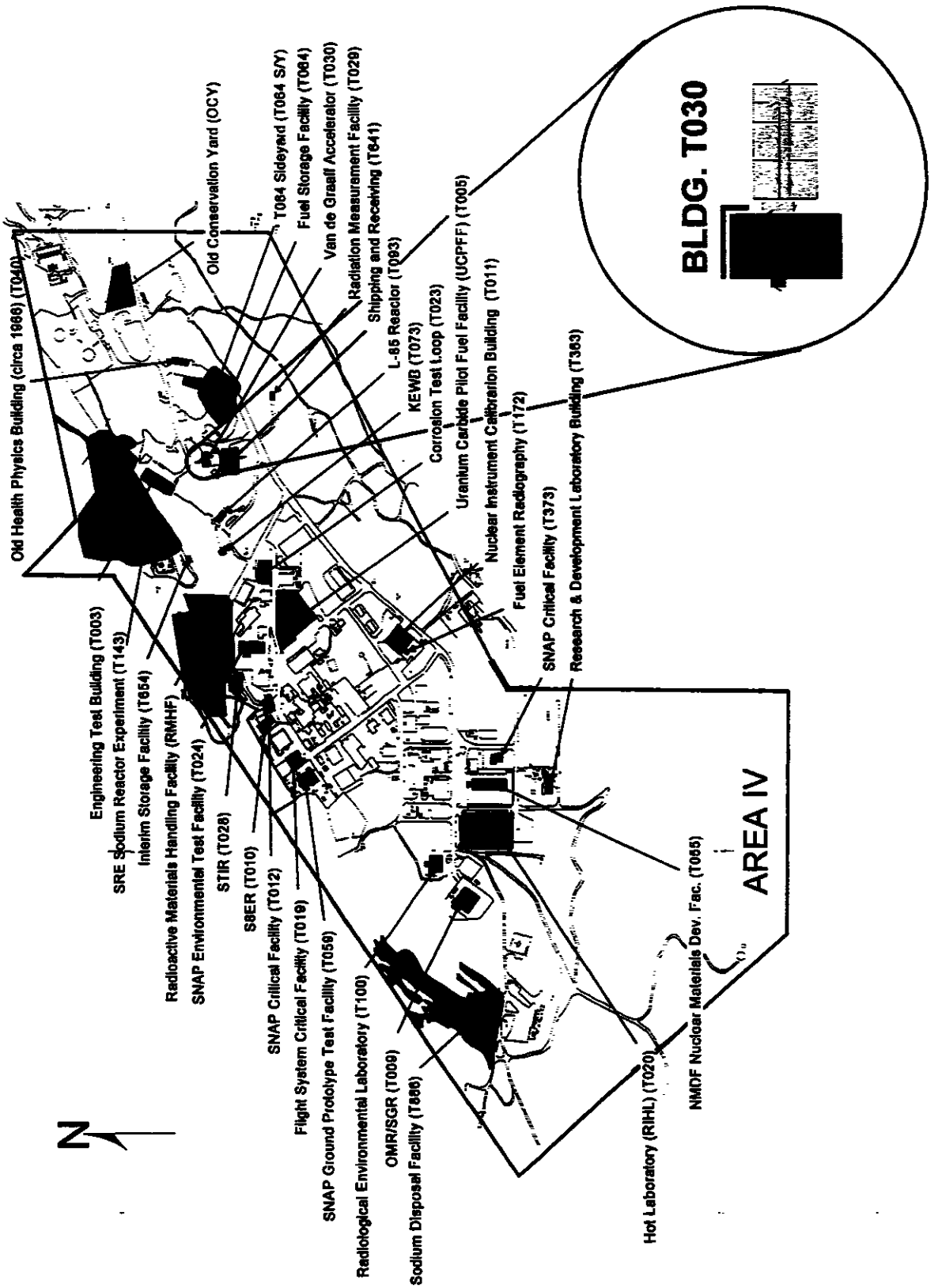

Figure 3. Santa Susana Field Laboratory (SSFL) Area IV

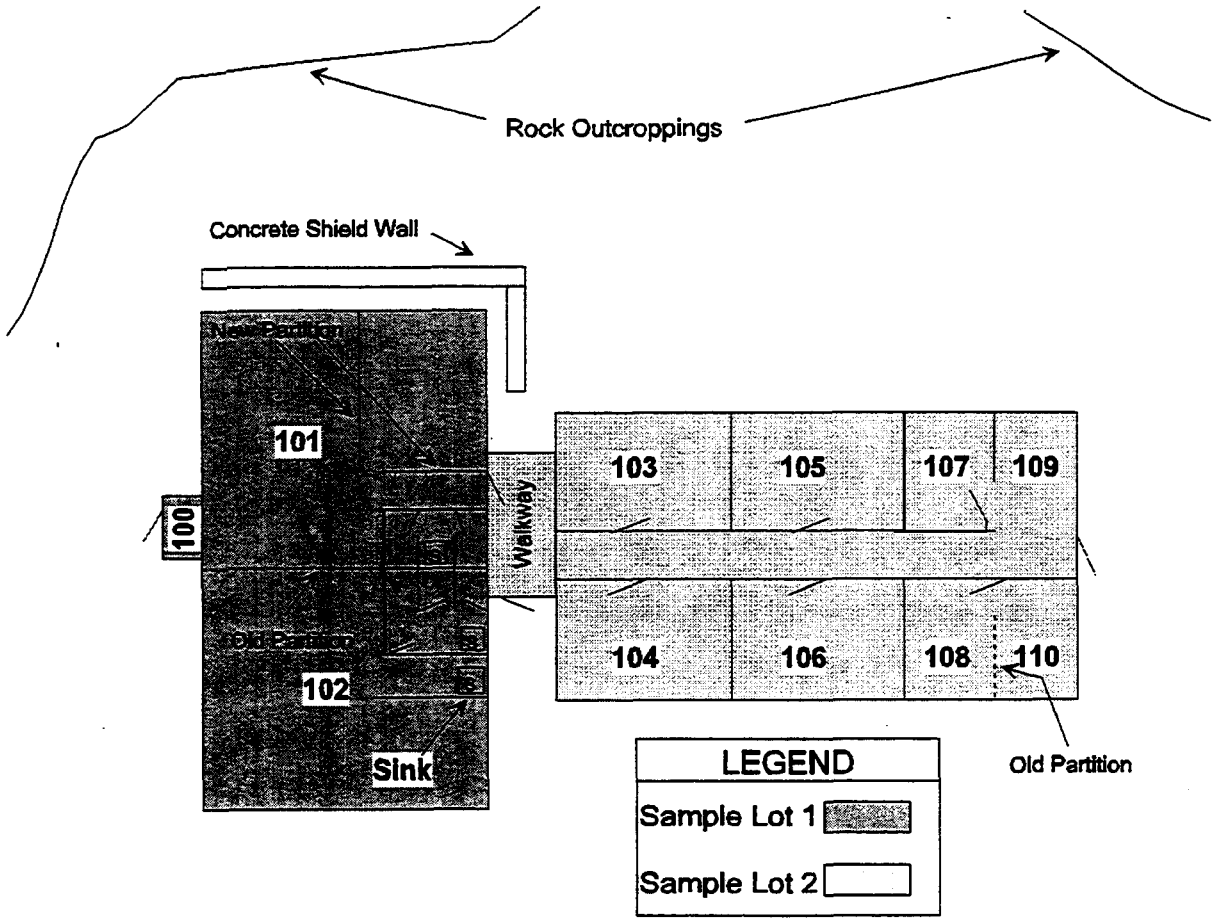

Figure 4. Layout of Building T030, with Identification of Sample Lots

3.3 Operating History

After construction in 1958, a Van de Graaff accelerator was moved into the facility in 1960. The accelerator could provide a proton beam of up to tens of microamperes in current, with continuously adjustable energies from a few hundred keV up to a maximum of about 1 MeV. The particle beam was well focused, with a diameter of a few millimeters. Neutrons were generated using a tritium target via the $^{3}H(p,n)^{3}He$ reaction. Five-gallon cans of borated water were used for neutron shielding around the machine. The accelerator was operated from 1960 through 1964, at which time the facility was decommissioned.

3.4 Decommissioning Efforts

Even though it was not in use, the accelerator remained in the facility after 1964. In March 1966, a smear survey of the accelerator (Reference 4) showed significant tritium contamination

on the accelerator. It was believed that the tritium contamination had not spread to surrounding areas. Following removal of the accelerator around 1966, the building was surveyed and no residual contamination was found.

In 1988, a general radiological survey was conducted to clarify and identify areas at the Santa Susana Field Laboratories (SSFL) requiring further radiological inspection or remediation (Reference 1). Building T030 was included in this survey. The scope of the Building T030 survey included ambient gamma exposure rate measurements, "indication" beta surveys of the accelerator room and outside paved area used for storing palletized containers, and exterior soil samples for tritium content. The results of that survey showed no detectable contamination in the facility. Tritium analyses on ten soil samples, and the beta survey, showed no detectable activity. Background-corrected gamma measurements were all less than the acceptance limit of 5 μR/hr.

In September 1995, the Oak Ridge Institute for Science and Education (ORISE) conducted a confirmatory survey of several facilities at the SSFL, including Building T030. The survey included a review of the Rocketdyne survey data and methodology for Building T030, and a confirmatory survey for alpha, beta and gamma contamination. With the exception of a single finding for removable tritium contamination of 6,600 dpm/100 cm^2 found on the north wall of the accelerator room, no indications of contamination were noted. The 6,600 dpm/100 cm^2 value is below the release criteria of 10,000 dpm/100cm^2.

Notwithstanding the above findings, ORISE did question the suitability of the 1988 survey as a final status release survey. Specifically, ORISE recommended complete measurements of total or removable surface activity, and additional sampling for tritium activity in the accelerator area. In view of ORISE's advice, a complete final survey for T030 was conducted, and that is the subject of the present report.

4. SURVEY RESULTS

4.1 Overview

Releasing a facility or area for unrestricted use requires a formal radiation survey to demonstrate that the applicable regulatory limits for such a release are met. The survey is performed under an established plan, and a statistical interpretation of the resulting data is made to determine if the regulatory release criteria have been met. This document provides the necessary framework to demonstrate that Building T030 meets DOE, NRC, and State of California criteria for release of the facility for unrestricted use. All original survey and user authorization documentation is maintained in the Building T030 final survey file in SSFL, Building 4100.

4.2 Scope of the Survey

For the final radiological survey of Building T030, the interior rooms were separated into two sample lots as shown in Figure 4. The sample lots were treated separately for the purposes of statistical data analyses. The distinguishable property for selecting the sample lots was the potential tritium contamination in areas formerly used to house the proton accelerator in the 1960's. The two sample lots are shown in Table 1, with the corresponding type of surveys performed on each.

Table 1. Sample Lots Surveyed

Sample Lot No.	Room or Area	Type of Survey Performed					
		Total		Removable			
		Alpha	Beta	Alpha	Beta	Tritium	Ambient Gamma[a]
1	Rooms 100, 101, 102, and adjacent restrooms	x	x	x	x	x	x
2	Rooms 103 through 110, hallway and walkway	x	x	x	x	x	x

[a]Ambient gamma readings were performed on all floors at a distance of 1 meter from the surface.

4.3 Survey Methods

4.3.1 Sampling Methods

The method and type of survey measurement depended on the type of surfaces involved. For both Sample Lots, a uniform 1-m by 1-m grid was superimposed on the floors, walls, and ceilings of the entire sample lot area. For grid surfaces less than 1-m x 1-m, an area of 1-m^2 was surveyed by combining them with other adjacent remnant areas. Survey methods meet or exceed NRC (NUREG/CR-5489, Reference 6) and State of California guidelines (DECON-1, Reference 7) for final release surveys.

4.3.1.1 Sample Lot 1 (Affected Area)

A 100% direct qualitative frisk of the floor, walls, and ceiling was performed using an alpha scintillation probe and a G-M pancake probe. Based on any identification of higher activity areas (or otherwise in the surveyor's judgment) in the qualitative scan, one 1-m x 1-m area within each 3-m x 3-m grid was selected for quantitative surveying, including removable tritium activity. A total of 68 data points were surveyed. For grid surfaces less than 1-m x 1-m, an area of 1m^2 was surveyed by combining them with other adjacent remnant areas.

Walls, floors, and ceilings were surveyed for total and removable alpha and beta activity, and for maximum alpha and beta activity, if a "hot spot" was detected when the total alpha and beta measurements were made. Additionally, the floors were surveyed for ambient gamma readings in μR/h at 1 meter. Sink traps were removed and qualitatively analyzed on a multichannel analyzer with a thin window, high purity germanium detector. Twenty percent of all other structural surfaces (pipes, conduit, light fixtures, etc.) were surveyed for total and removable alpha and beta activity. A survey method of 6 inches per 2.5 feet was utilized for the frisks.

4.3.1.2 Sample Lot 2 (Unaffected Area)

A 10% direct qualitative frisk of each surface (walls, floor, ceiling) was performed using an alpha scintillation probe and a G-M pancake probe. The surfaces were frisked in one direction. The probe was then shifted a distance of 10 times the probe diameter and a frisk was performed in the opposite direction. This procedure was continued until the entire 10% was covered. Additional readings were taken where contamination was more likely to have accumulated, such as floor baseboards, window sills, and door thresholds, etc. Within each two 3-m x 3-m grids, one 1-m x 1-m was selected for quantitative sampling, including removable tritium activity. For grid surfaces less than 1-m x 1-m, an area of 1m^2 was surveyed by combining them with other adjacent remnant areas.

Walls, floors, and ceilings were surveyed for total and removable alpha and beta activity, and for maximum alpha and beta activity, if a "hot spot" was detected when the total alpha and beta measurements were made. Additionally, the floors were surveyed for ambient gamma

readings in μR/h at 1 meter. Ten percent of all other structural surfaces (pipes, conduit, light fixtures, etc.) were surveyed for total and removable alpha and beta activity. A survey method of 6 inches per 5 feet was utilized for the frisks.

4.3.2 Instrument Calibrations and Checks

Measurements of total and maximum alpha surface activity were made using alpha scintillation detectors, sensitive only to alpha particles with energies exceeding about 1.5 MeV. The detectors were calibrated with a Th-230 alpha source standard traceable to the National Institute of Standards and Technology (NIST). Measurements of the total and maximum beta surface activities were made with a thin-window pancake Geiger-Mueller (G-M) tube. The G-M detectors were calibrated with a Tc-99 beta source standard, traceable to NIST. A 5-min integrated count time was used for both alpha and beta detectors.

All portable survey instruments were serviced and calibrated with NIST traceable standards on a quarterly basis. In addition, daily checks and calibrations were performed (when used) on all instrumentation to determine acceptable performance and establish a background value for the instrument on that day. Reference 8 provides further methods and procedures for environmental surveys. Measurements of removable surface activity (alpha and beta) were made by wiping approximately 100 cm^2 of surface area using standard smear disks. The activity on the disks were measured using a gas-flow proportional counter. The counters were calibrated using Th-230 and Tc-99 standard sources, traceable to NIST. A 1-min integrated count time was used. Calibration records for the survey instruments used are maintained in the SSFL, Building 4100 files.

The ambient exposure rates at 1 m from surfaces were measured using 1-in. NaI scintillation detectors. These instruments were calibrated against a Reuter-Stokes high-pressure ionization chamber, and daily checks were made using a Cs-137 source, placed 1-m from the detector. A 1-min integrated count time was used.

The multi-channel analyzer used for scanning the sink traps is calibrated annually with two NIST traceable, multi-isotopic sources. In addition, it is checked weekly against the sources to insure the deviation is within ± 5% of the original calibration.

4.4 Technical Approach

4.4.1 Criteria and Their Implementation

Acceptable contamination limits and gamma exposure rates for releasing a facility for unrestricted use are prescribed in NRC, State of California, and DOE guidelines (References 6,7, 9, and 13). For remediation of facilities at Rocketdyne's SSFL and DeSoto sites, DOE and the State have approved a set of release guidelines (Reference 10). In determining these guidelines, generally the lowest (most conservative) limits were chosen from the various agency guidelines.

Table 2 provides a summary of the contamination limit criteria. Table 3 summarizes the various "Statistically Significant Activity" (SSA) detection limits for the survey instruments used, and demonstrates that the detection limits and methods are well below the established limit criteria (from regulatory requirements) shown in Table 2.

As used in the tables, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation. Where surface contamination by both alpha- and beta-gamma-emitting radionuclides might exist, the limits established for alpha- and beta-gamma-emitting radionuclides would be applied independently. Beta-gamma emitters include mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched. No separated or enriched Sr-90 is present in T030.

Measurements of average contamination were averaged over an area of 1 m^2. For objects of less surface area, the average was derived for each such object. The maximum contamination level applies to an area of not more than 100 cm^2.

The amount of removable radioactivity per 100 cm^2 of surface area was determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 was determined, the activity per unit area was based on the actual area and the entire surface was wiped.

Measurements of removable tritium activity were made by wiping approximately 100 cm^2 of surface area using moistened polyfoam smear discs. After the smear was made, the smear disc was sealed in a liquid scintillator counter (LSC) vial. Loaded vials were sent to an outside laboratory for analysis by scintillation counting.

Table 2. Building T030 Contamination Limit Criteria

Radionuclides	Contamination in dpm/100cm^2		
	Average	Maximum	Removable
Sr-90 (separated or enriched), Th-natural, Th-232	<1,000	<3,000	<200
U-natural, U-235, U-238, and associated decay products	<5,000 α	<15,000 α	<1,000 α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission), including Sr-90 as mixed fission product	<5,000 β-γ	<15,000 β-γ	<1,000 β-γ
Tritium	-	-	<10,000 β
Surface gamma exposure rate	≤ 5 μR/h above background at 1 m		

Table 3. Observed Detection Limits versus Established Limit Criteria

	Alpha[a]		Beta[a]		Tritium[a]	Ambient
	Total	Removable	Total	Removable	Removable	Gamma[b]
Limit criteria	5,000	1,000	5,000	1,000	10,000	<5.0 above background
Average observed detection limit (SSA)[c]	9.8	6.3	293	11.3	5	0.32
Observed detection limit range	9.8	3.8 - 7.2	289 - 293	11.1 - 11.7	--5	0.31 - 0.32
Ratio of detection limit to criteria[d]	0.20%	0.63%	5.9%	1.1%	0.05%	6.4%

[a]Alpha, beta, and tritium activity in dpm/100 cm^2.

[b]Ambient gamma exposure rate in μR/hr at 1 meter from surface.

[c]SSA = 1.645 x √(2 x background counts) x area factor x efficiency factor/time, in units of dpm/100 cm^2. Tritium SSA was provided by the outside laboratory.

[d]Ratio of average observed detection limit to established limit criteria (in percent).

4.4.2 Data Analyses and Statistical Criteria

A statistical procedure was used to validate the applicability of the raw survey data for selected sample lots or areas. The statistical method known as "sampling inspection by

variables" (Reference 12) was used. This method has been widely applied in industry and the military and is essential where the lot size is impractically large.

In sampling inspection by variables, the number of data points on which measurements are obtained is first chosen to be large so that the parameters of the distribution are likely to have a normal distribution (i.e., Gaussian). The mean of the distribution, $\bar{x}$, and its standard deviation, s, are then related to a "test statistic," TS, as follows:

$$TS = \bar{x} + ks$$

where $\bar{x}$ = average (arithmetic mean of measured values)
s = observed sample standard deviation
k = tolerance factor calculated from the number of samples to achieve the desired sensitivity for the test

TS and $\bar{x}$ are then compared with an acceptance limit, U (such as those shown in Table 2), to determine acceptance or other plans of action, including rejection of the area as contaminated and requiring further remediation.

The sample mean and standard deviation are easily calculable quantities; the value of *k*, the tolerance factor, bears further discussion. Of the various criteria for selecting plans for acceptance sampling by variables, the most appropriate is the method of Lot Tolerance Percent Defective (LTPD), also referred to as the Rejectable Quality Level (RQL). The LTPD is defined as the poorest quality that should be accepted in an individual lot. Associated with the LTPD is a parameter referred to as consumer's risk (β), the risk of accepting a lot of quality equal to or poorer than the LTPD (or 10%). USNRC Regulatory Guide 6.6 ("Acceptance Sampling Procedures for Exempted and Generally Licensed Items Containing By-Product Material") states that the value for the consumer's risk should be 0.10. Conventionally, the value assigned to the LTPD has been 10%.

The State of California has stated that the consumer's risk of acceptance (β) at 10% defective (LTPD) must be 0.1. For those choices of β and LTPD, $K_\beta = K_2 = 1.282$ (Reference 12). Values of *k* for each sample size are calculated in accordance with the following equations:

$$k = \frac{K_2 + \sqrt{K_2^2 - ab}}{a};\quad a = 1 - \frac{K_\beta}{2(n-1)};\quad b = K_2^2 - \frac{K_\beta^2}{n}$$

where k = tolerance factor,
K_β = the normal deviate exceeded with probability of β, 0.10 (from tables, $K_\beta = 1.282$),
K_2 = the normal deviate exceeded with probability equal to the LTPD, 10% (from tables, $K_2 = 1.282$)[1], and
n = number of samples.

The statistical criteria for acceptance of the Building T030 interior final survey are presented below.

a) Acceptance: If the test statistic ($\bar{x} + ks$) is less than or equal to the limit (U), accept the region as clean. If any single measured value exceeds 80% of the limit, decontaminate that location to as near background as is possible, but do not change the value in the analysis. Figure 5 gives an example of the sample lot acceptance by the test.

b) Collect additional measurements: If the test statistic ($\bar{x} + ks$) is greater that the limit (U), but $\bar{x}$ itself is less than U, independently resample and combine all measured values to determine if $\bar{x} + ks \leq U$ for the combined set; if so, accept the region as clean. If not, the region is contaminated and must be remediated. Figure 6 gives an example of additional measurements that must be taken in the sample lot to accept or reject it.

c) Rejection: If the test statistic ($\bar{x} + ks$) is greater than the limit (U) and $\bar{x} \geq U$, the region is contaminated and must be remediated. Figure 7 gives an example of sample lot rejection by the test.

Thus, based on sampling inspection, it is a reasonable hypothesis that the probability of accepting a lot as not being contaminated, which is in fact 10% or more contaminated, is 0.10. Or in other words, the Building T030 final survey corresponds to assuring with 90% confidence that 90% of the area has residual contamination below 100% (a 90/90/100 test) of the applicable limits described in Table 2.

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[1] The values chosen for these coefficients for the survey correspond to assuring, with 90% confidence, that 90% of the area has residual contamination below 100% of the applicable limit (a 90/90/100 test). The choice of values for the two coefficients is consistent with industrial sampling practices and State of California guidelines (Reference 7).

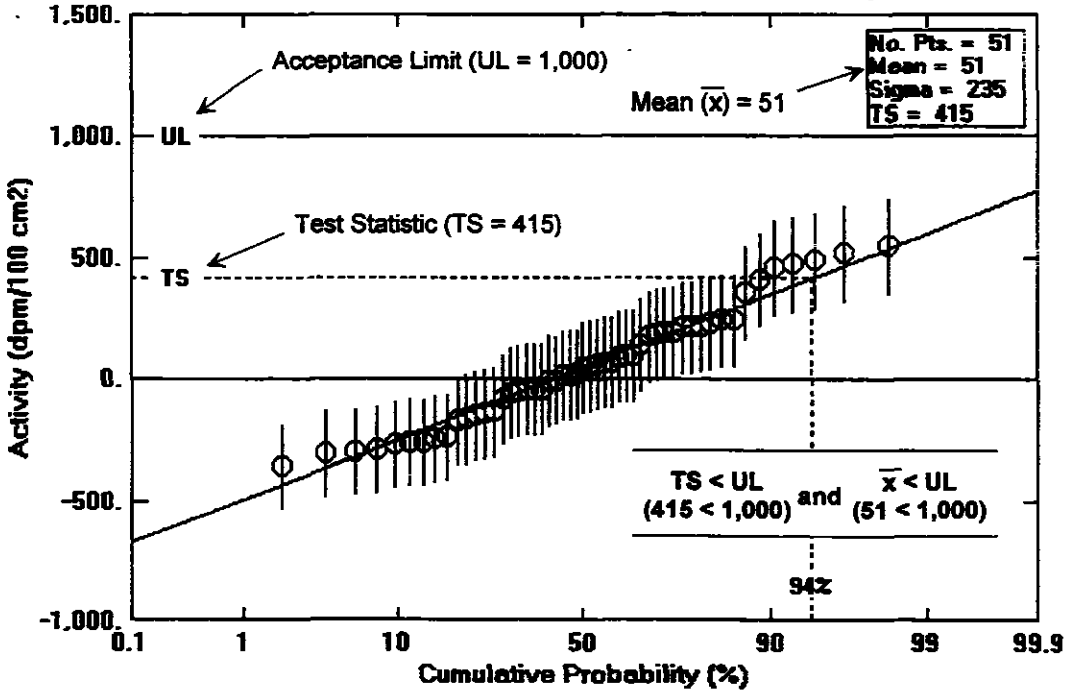


Figure 5. Example of Sample Lot Acceptance, where TS ($=\bar{x} + ks$) ≤ UL and $\bar{x}$ ≤ UL

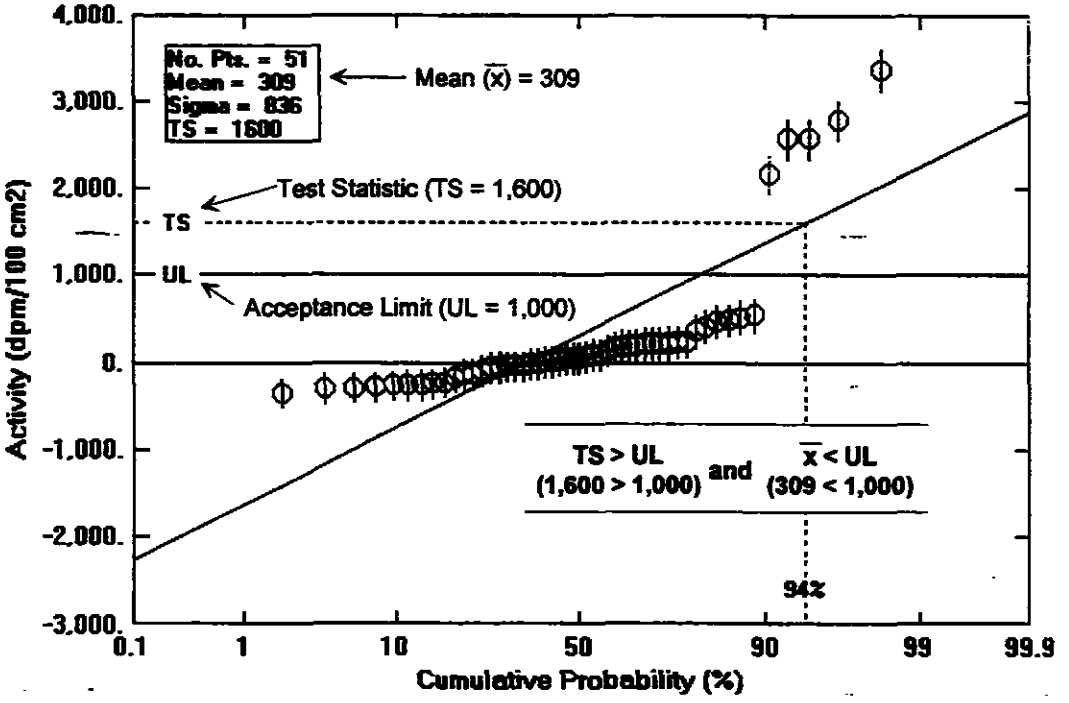


Figure 6. Example of Sample Lot Requiring Additional Measurements, where TS ($=\bar{x} + ks$) > UL and $\bar{x}$ < UL.

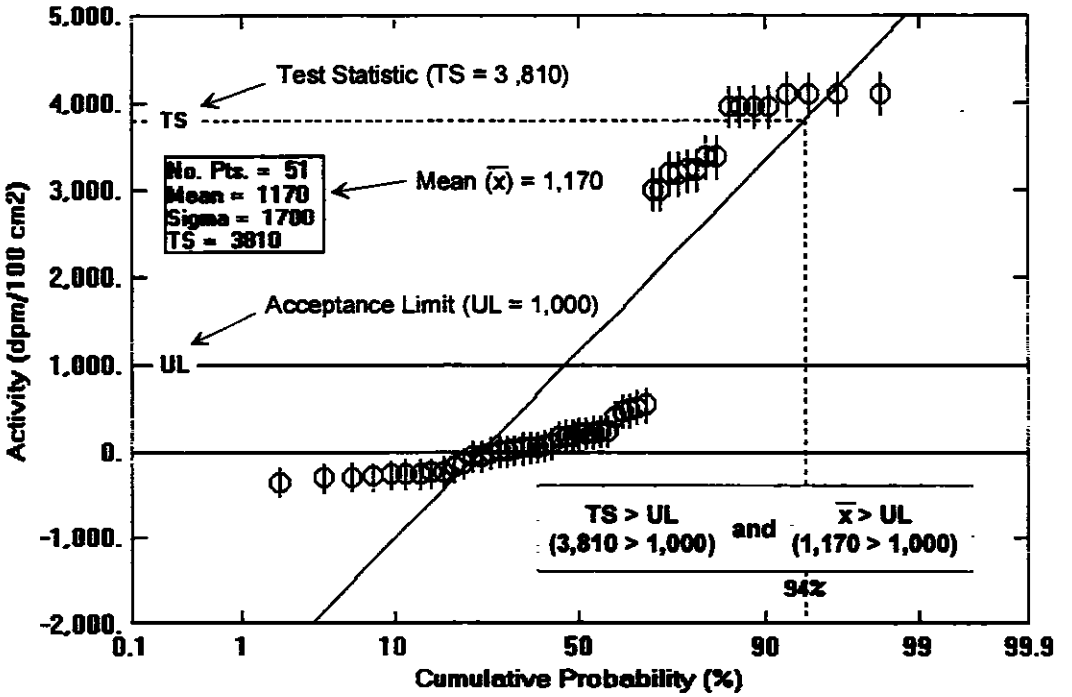


Figure 7. Example of Sample Lot Rejection, where TS ($=\bar{x} + ks$) > UL and $\bar{x}$ > UL

4.5 Building T030 Sample Lot Analyses and Results

4.5.1 Sample Lot 1

4.5.1.1 Description

Sample Lot 1 consists of all surface areas in Rooms 100, 101, 102 and adjacent bathrooms. Survey data for Lot 1 were taken in September 1996.

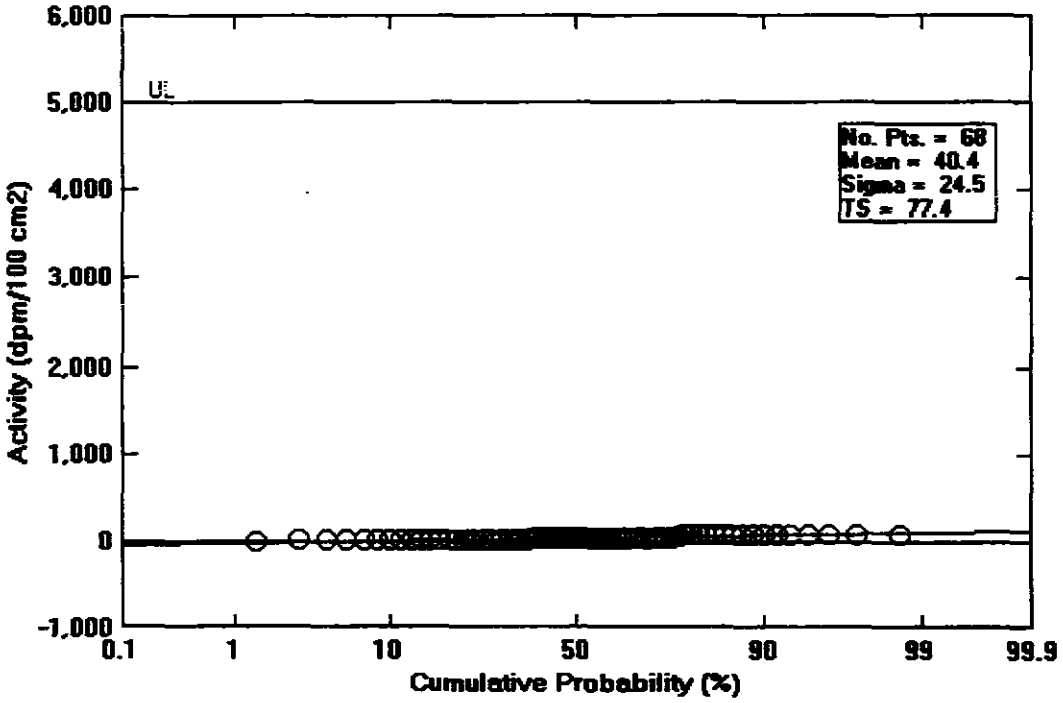
4.5.1.2 Analyses of Sample Lot 1 Data

Raw data measurements for Sample Lot 1 were taken, adjusted for daily instrument background (except for ambient gamma exposure rates) and plotted on cumulative probability graphs as discussed previously. For statistical comparisons (using the "sampling inspection by variables" method), alpha/beta survey data from all areas within Sample Lot 1 were combined together and then analyzed for the specific type of radiation measurement made.

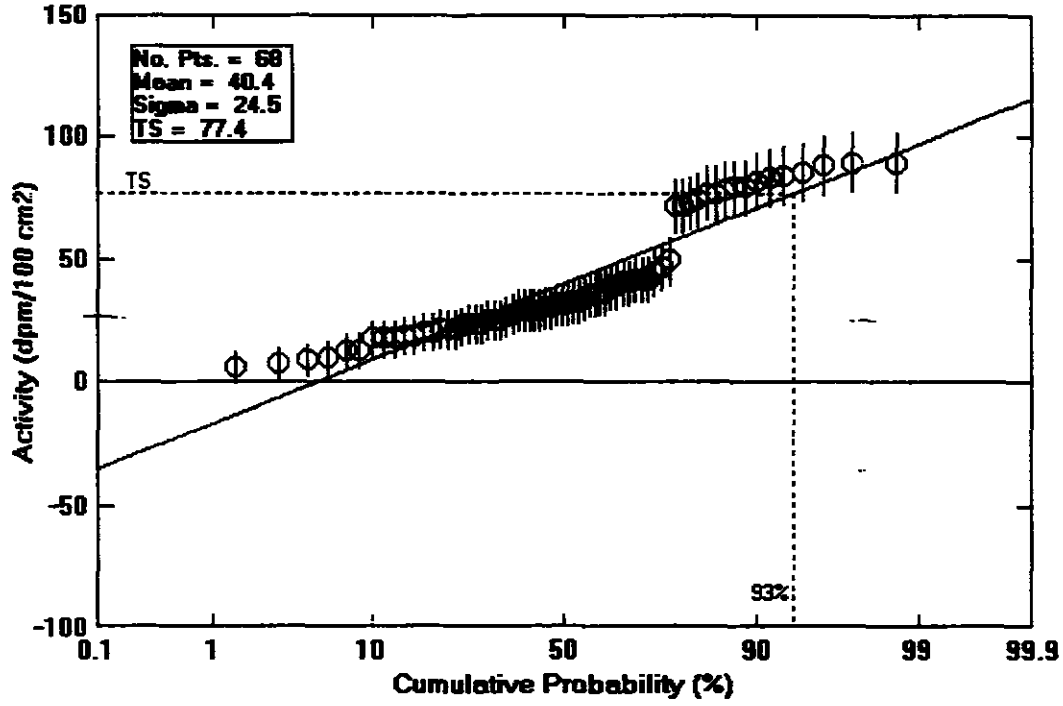
The cumulative plots for alpha, beta, and tritium survey data are shown in Figure 8 through Figure 11. These plots are shown on two scales; a normal scale to show all the data relative to the acceptance limit, and an expanded scale showing only the data and test statistic values. The purpose of the expanded scale presentation is to allow for more detailed examination of the data to determine if deviations from a normal distribution are evident, or if the data show evidence of more than one distribution.

The gamma survey data are shown in Figure 13. The gamma data are shown in two forms; 1) the raw data, and 2) the background subtracted data for comparison with the acceptance limit. For T030, a background value of 8.11 μR/h was used based on measurements conducted in a similarly constructed non-radiological building (T038) located at the SSFL. The gamma exposure rate data for Building T038 is shown in Figure 14.

Sample Lot 1 statistical results are tabulated in Table 4 for comparing the test statistics ($TS = \bar{x} + ks$) with the applicable contamination criteria or acceptance limits (U) from Table 2. The corresponding figure numbers for the graphs of each calculated cumulative probability plot are also indicated in parentheses. Individual raw measurement data and instrument backgrounds are provided in Appendix A. Individual calculated sample results used as graph data for Sample Lot 1 are provided in Appendix B. Grid location diagrams for the various survey areas in Building T030 are given in Appendix C.

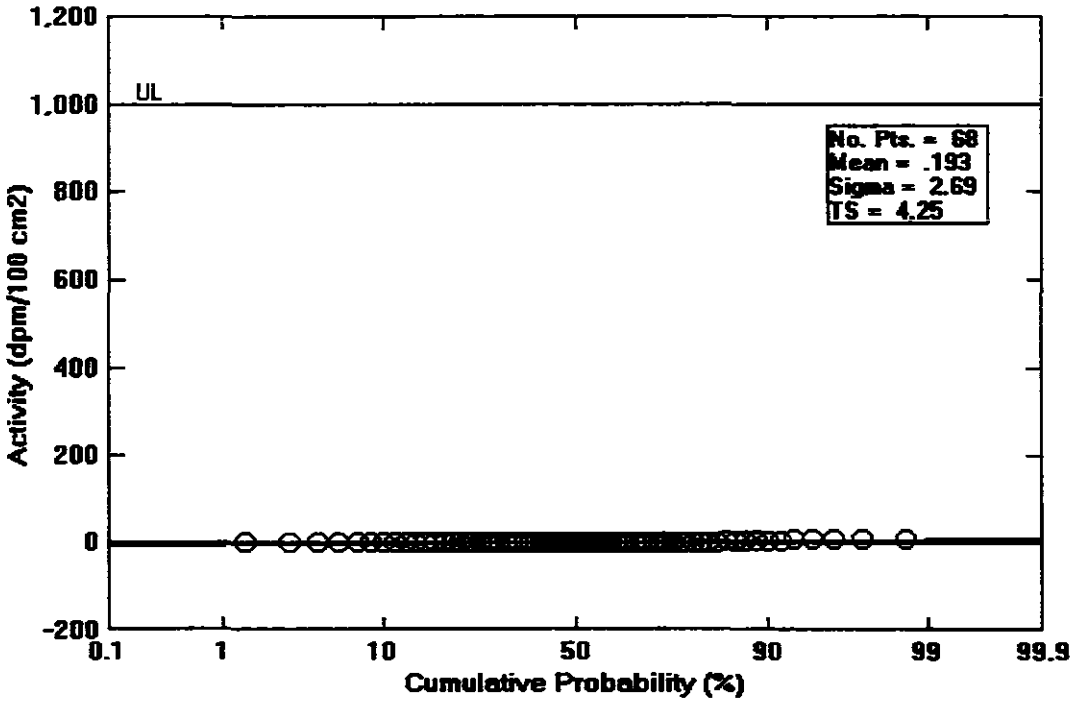


a) Normal Scale

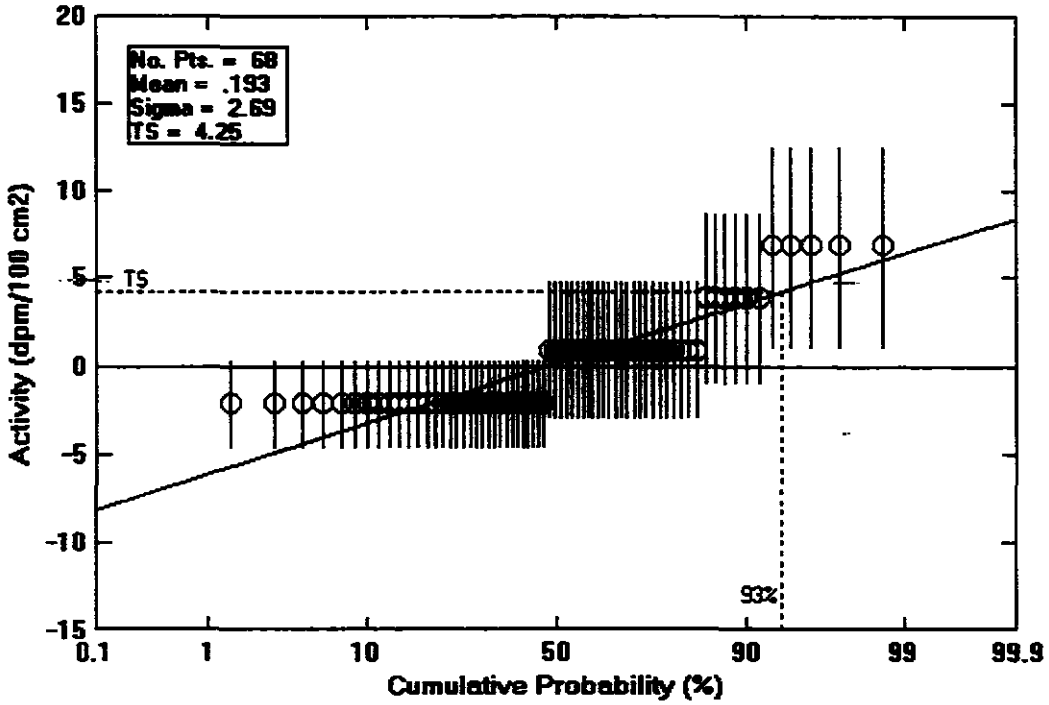


b) Expanded Scale

Figure 8. Building T030 - Lot 1 Total Alpha Activity

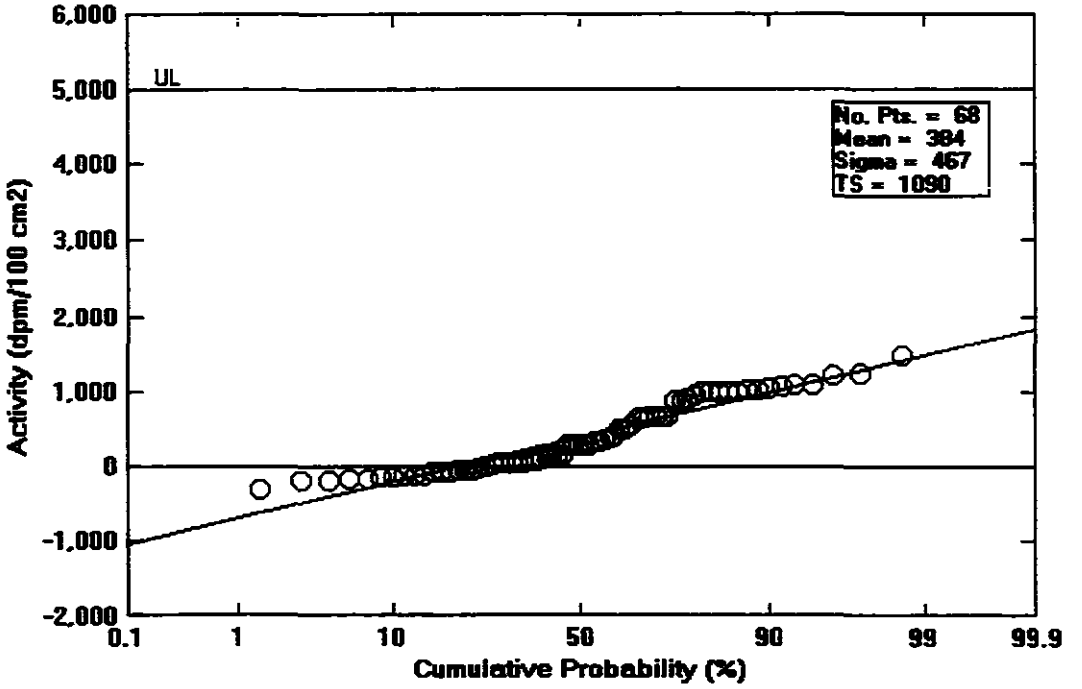


a) Normal Scale

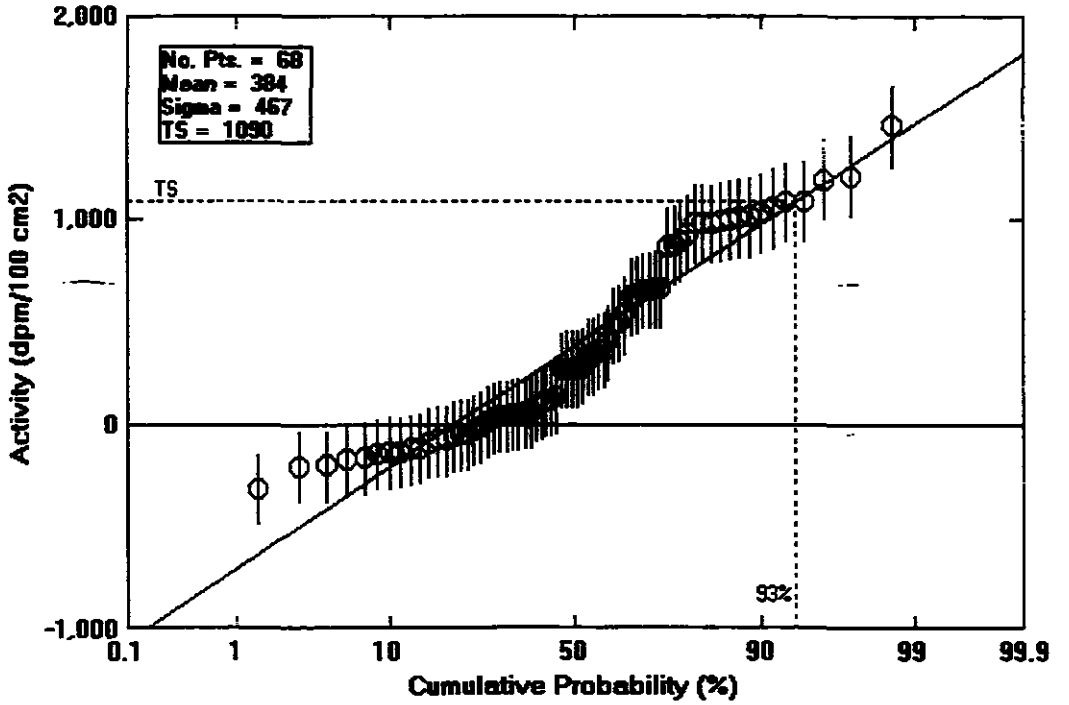


b) Expanded Scale

Figure 9. Building T030 - Lot 1 Removable Alpha Activity

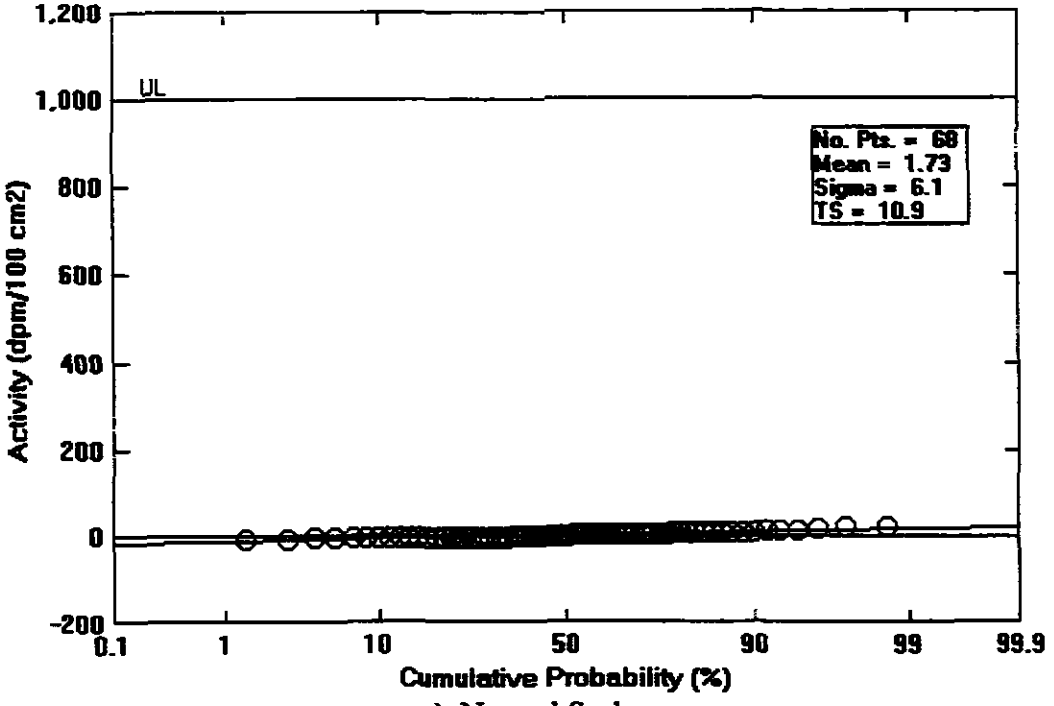


a) Normal Scale

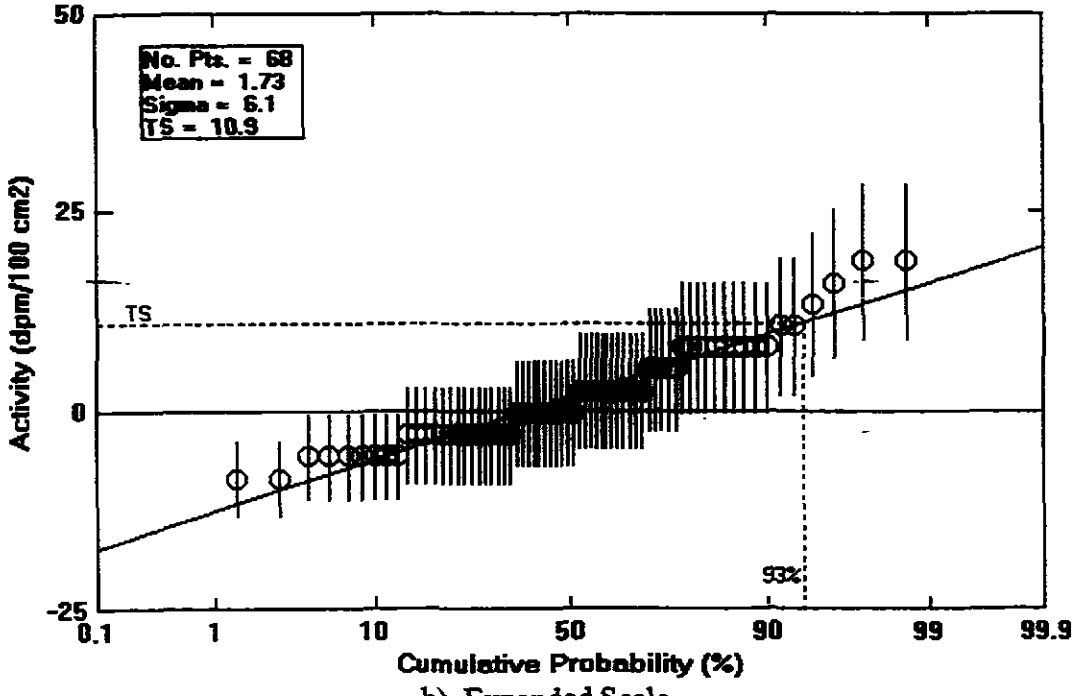


b) Expanded Scale

Figure 10. Building T030 - Lot 1 Total Beta Activity

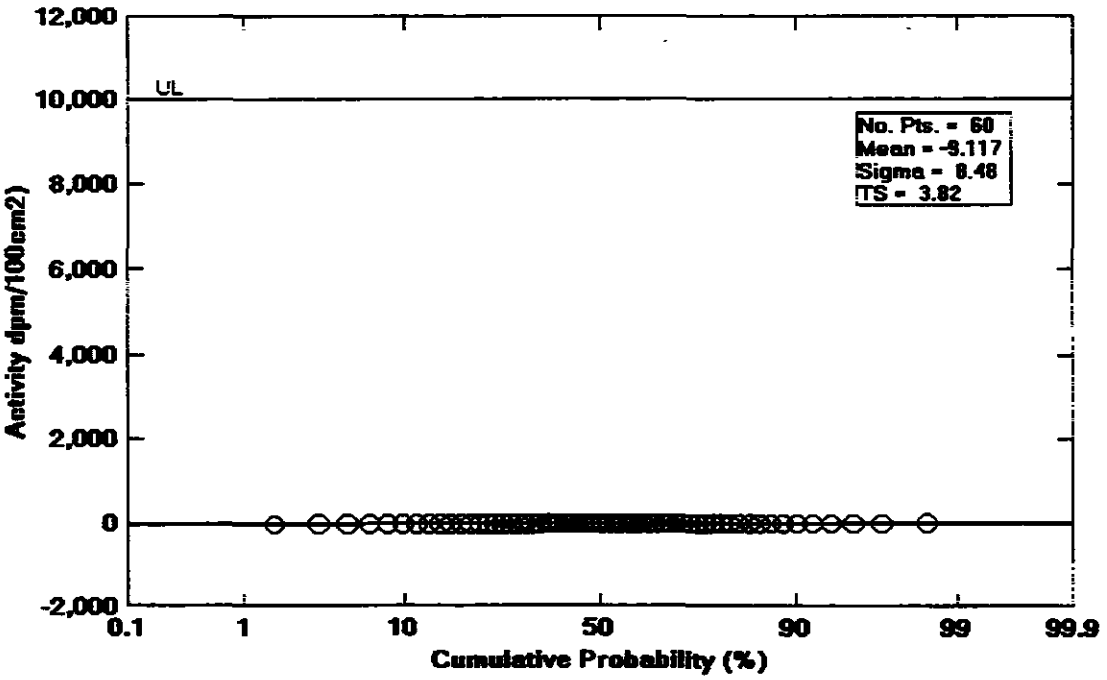


a) Normal Scale

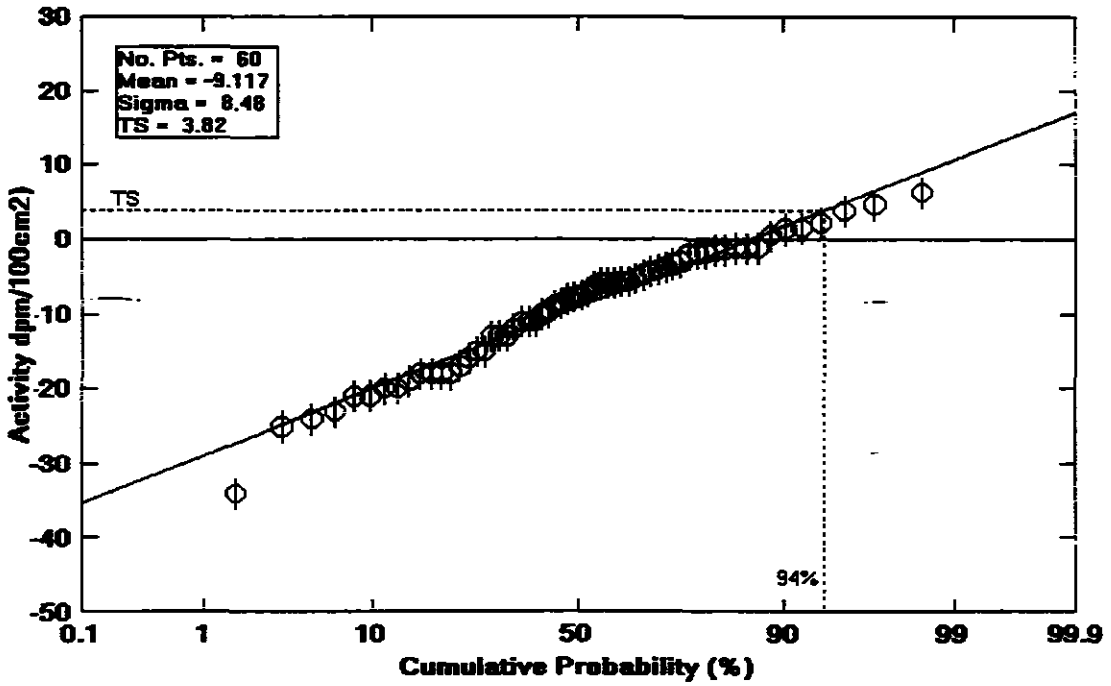


b) Expanded Scale

Figure 11. Building T030 - Lot 1 Removable Beta Activity

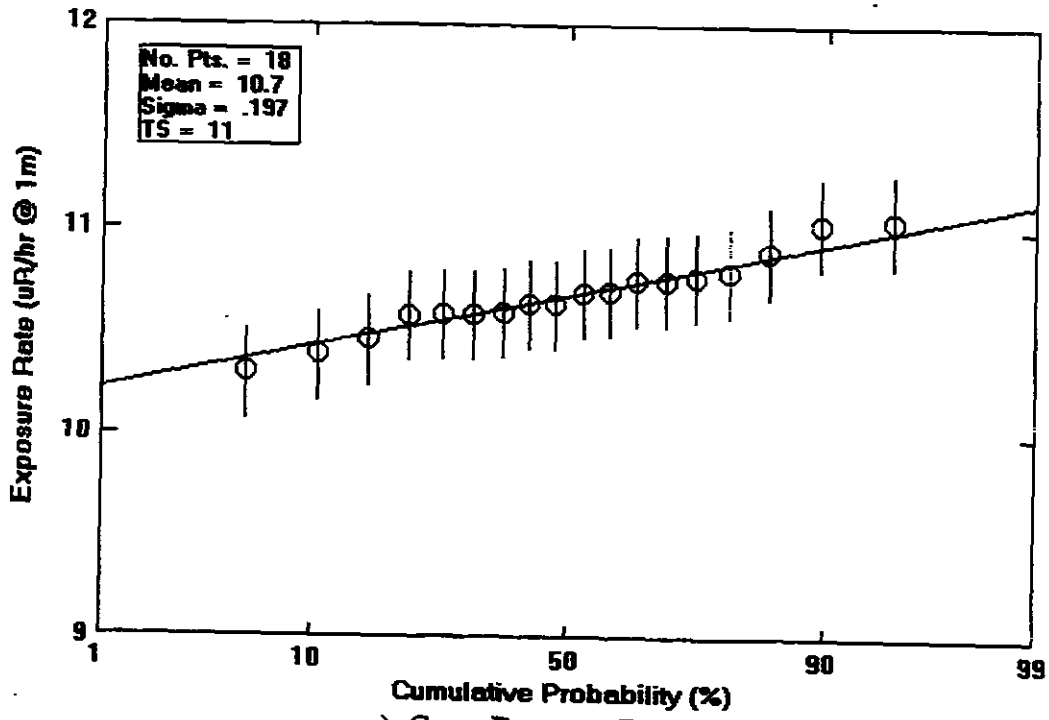


a) Normal Scale

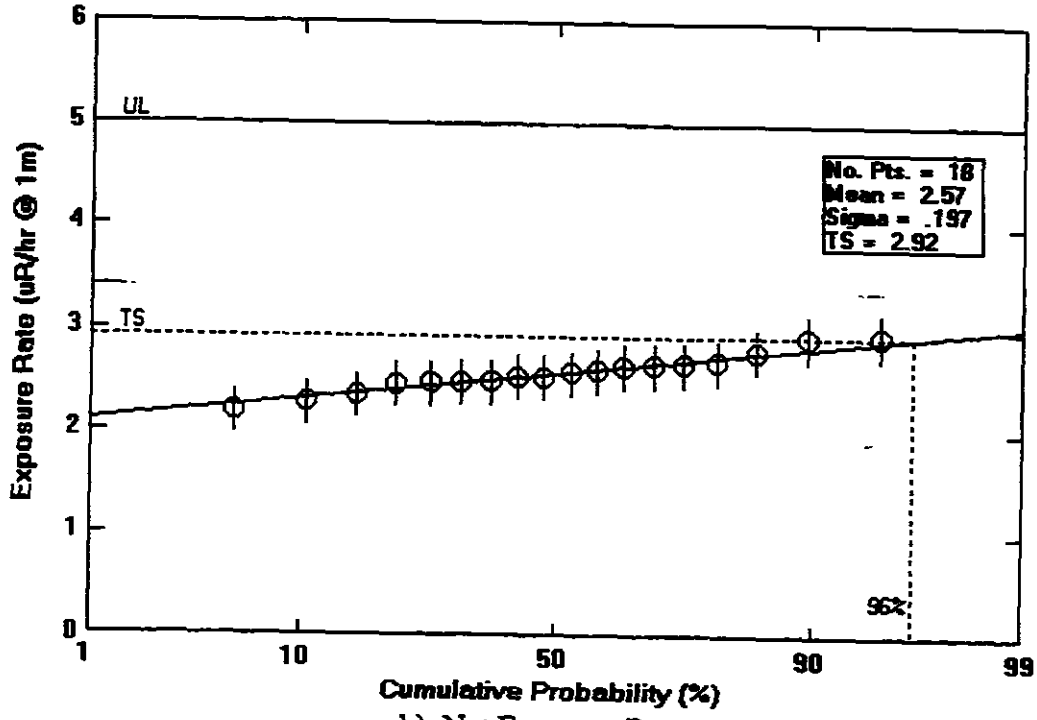


b) Expanded Scale

Figure 12. Building T030 - Lot 1 Removable Tritium Activity



a) Gross Exposure Rate



b) Net Exposure Rate

Figure 13. Building T030 - Lot 1 Gamma Exposure Rate

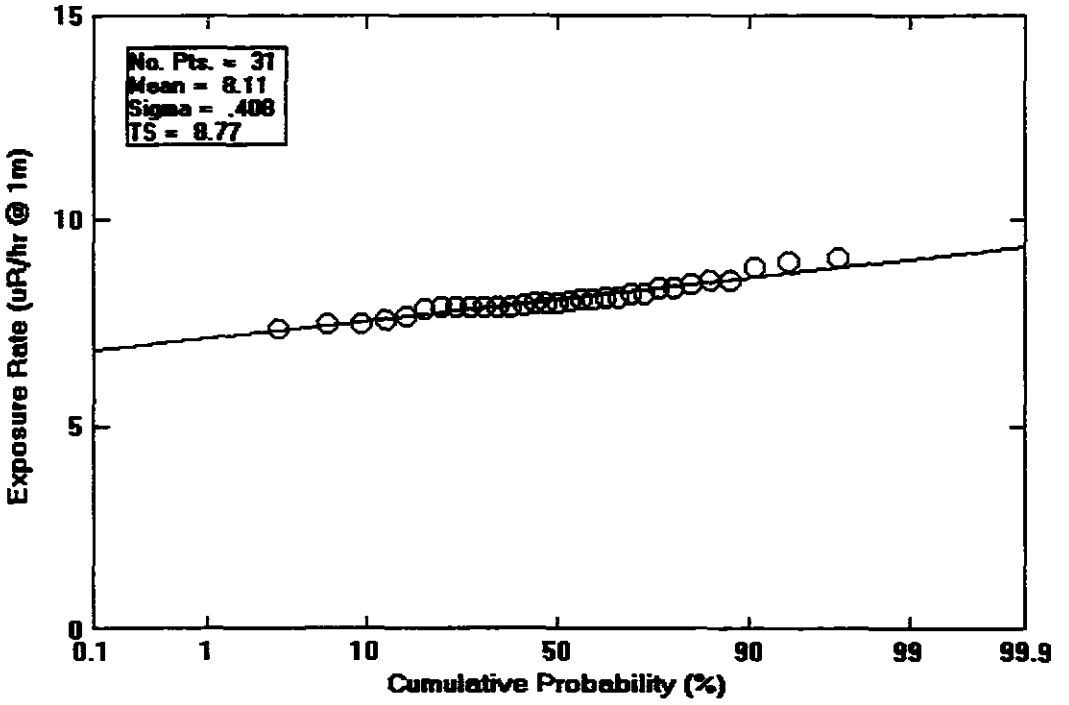


Figure 14. Background Gamma Exposure Rate Measured in Building T038

Table 4. Sample Lot 1 Statistical Results

	Total[a]		Removable[a]		Removable[a]	Ambient
	Alpha	**Beta**	**Alpha**	**Beta**	**Tritium**	**Gamma[b]**
Acceptance Limit (UL)	5,000	5,000	1,000	1,000	10,000	5
Calculated Test Statistic ($TS = x + ks$)						
Entire area - floors, walls, ceiling, & structure	77.4 (Fig. 8)	1,090 (Fig. 10)	4.25 (Fig. 9)	10.9 (Fig. 11)	3.82 (Fig. 12)	2.92 (Fig. 13)

[a]Alpha, beta, and tritium activity in dpm/100 cm^2.

[b]Ambient gamma exposure rate in µR/hr at 1 meter from the surface.

4.5.1.3 Interpretation of Results for Sample Lot 1

The survey data in Table 4, and Figure 8 through Figure 13, demonstrate that for each applicable acceptance limit (U) from Table 2, the corresponding test statistic (TS) value is less than the U, or TS <U. Therefore, the areas in Sample Lot 1 pass the "sampling inspection by variables" test and are "Accepted" as radiologically clean.

In other words, the Building T030 Sample Lot 1 survey corresponds to assuring with a 90% confidence that 90% of Sample Lot 1 has residual contamination below 100% (a 90/90/100 test) of the applicable NRC, DOE, and State of California limits given in Table 2.

The MCA scan results on all sink traps indicated no presence of detectable man-made radioactivity.

4.5.2 Sample Lot 2

4.5.2.1 Description

Sample Lot 2 consists of all surface areas in Rooms 103 through 108, interconnecting aisle, and walkway to the west end of the building. Survey data for Lot 2 were taken in September 1996.

4.5.2.2 Analyses of Sample Lot 2 Data

Raw data measurements for Sample Lot 2 were taken, adjusted for daily instrument background, and plotted on cumulative probability graphs as explained previously. For statistical comparisons (using the "sampling inspection by variables" method), all areas within Sample Lot 2 were combined together and then analyzed for the specific type of radiation measurement made.

Sample Lot 2 results are tabulated in Table 5 for comparing the test statistic ($TS = \bar{x} + ks$) with applicable, established contamination criteria or acceptance limits (U) from Table 2. The corresponding figure numbers for the graphs of each calculated cumulative probability plot are also indicated in parentheses.

Individual raw measurement data and instrument backgrounds are provided in Appendix A. Individual calculated sample results used as graph data for Sample Lot 2 are provided in Appendix B. Grid location diagrams for the various survey areas in T030 are given in Appendix C.

Table 5. Sample Lot 2 Statistical Results

	Total[a]		Removable[a]		Removable[a]	Ambient
	Alpha	**Beta**	**Alpha**	**Beta**	**Tritium**	**Gamma[b]**
Acceptance Limit (UL)	5,000	5,000	1,000	1,000	10,000	5
Calculated Test Statistic ($TS = x + ks$)						
Entire area - floors, walls, ceiling, & structure	70.9 (Fig. 15)	884 (Fig. 17)	4.36 (Fig. 16)	10.1 (Fig. 18)	3.73 (Fig. 19)	3.02 (Fig. 20)

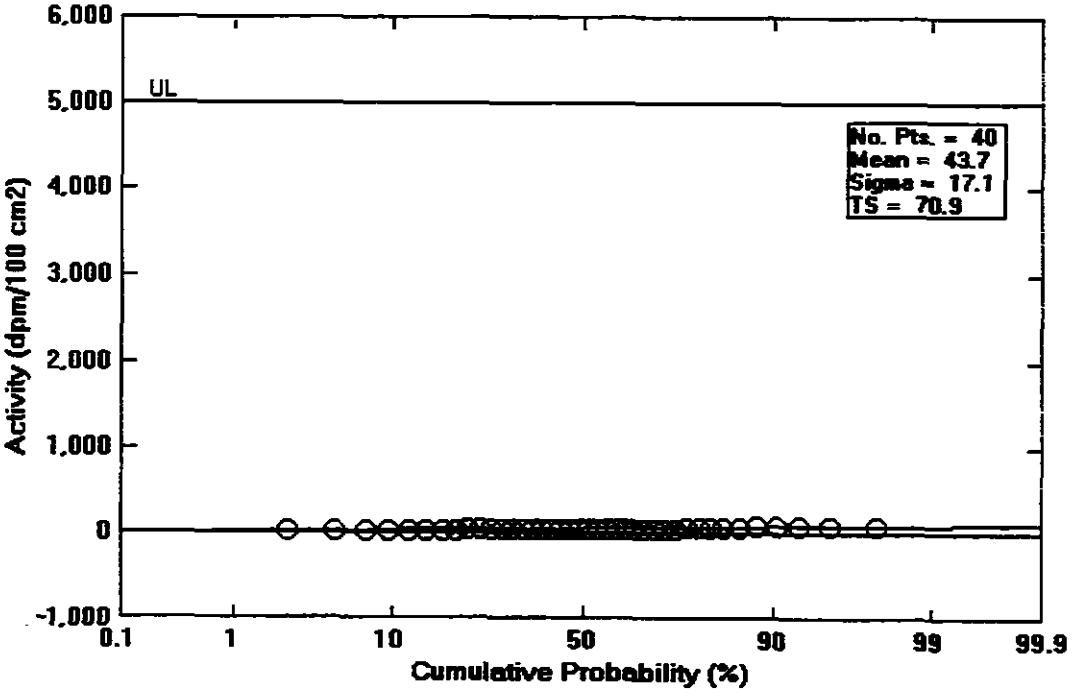
[a]Alpha, beta, and tritium activity in dpm/100 cm^2.

[b]Ambient gamma exposure rate in µR/hr at 1 meter from the surface.

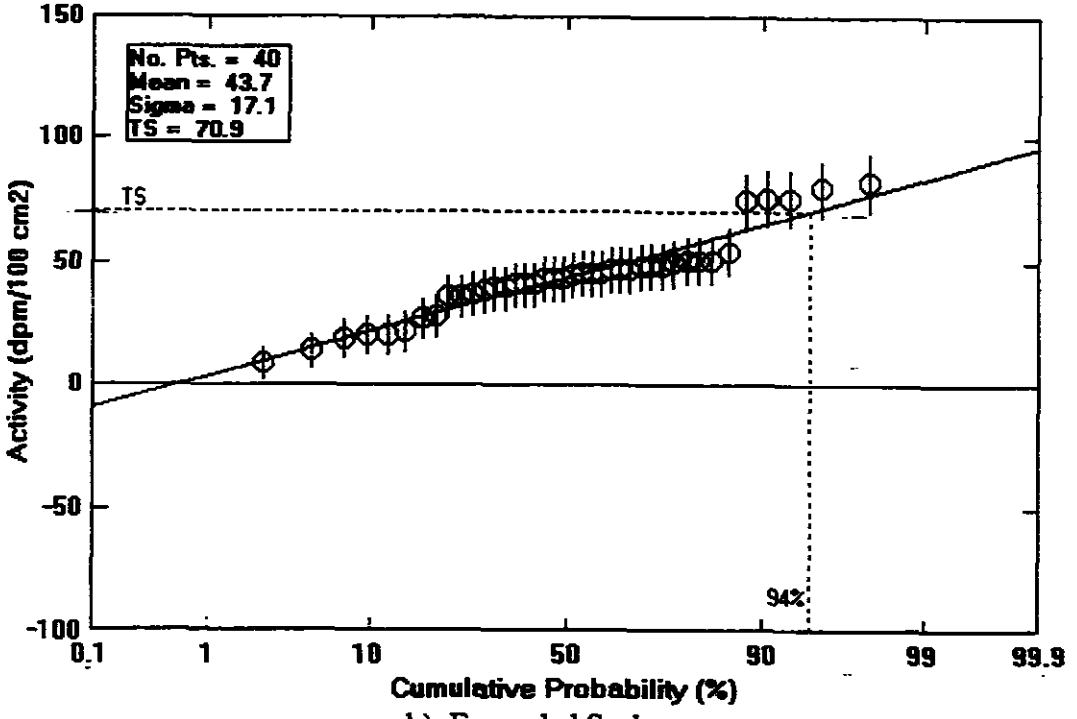
4.5.2.3 Interpretation of Results for Sample Lot 2

Table 5 and Figure 15 through Figure 20 demonstrate that for each applicable acceptance limit (U) from Table 2, the corresponding test statistic (TS) value is less than the U, or TS <U. Therefore, the survey areas in Sample Lot 2 pass the "sampling inspection by variables" test and are "Accepted" as radiologically clean.

In other words, the Building T030 Sample Lot 2 survey corresponds to assuring with a 90% confidence that 90% of Sample Lot 2 has residual contamination below 100% (a 90/90/100 test) of the applicable NRC, DOE, and State of California limits described in Table 2.

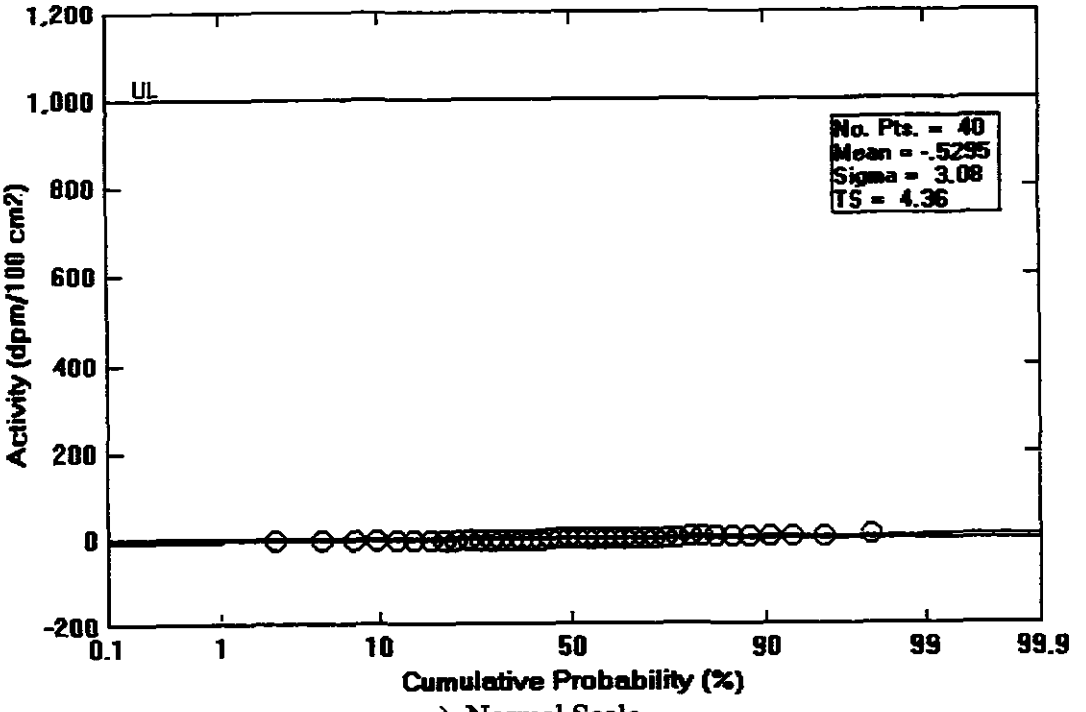


a) Normal Scale

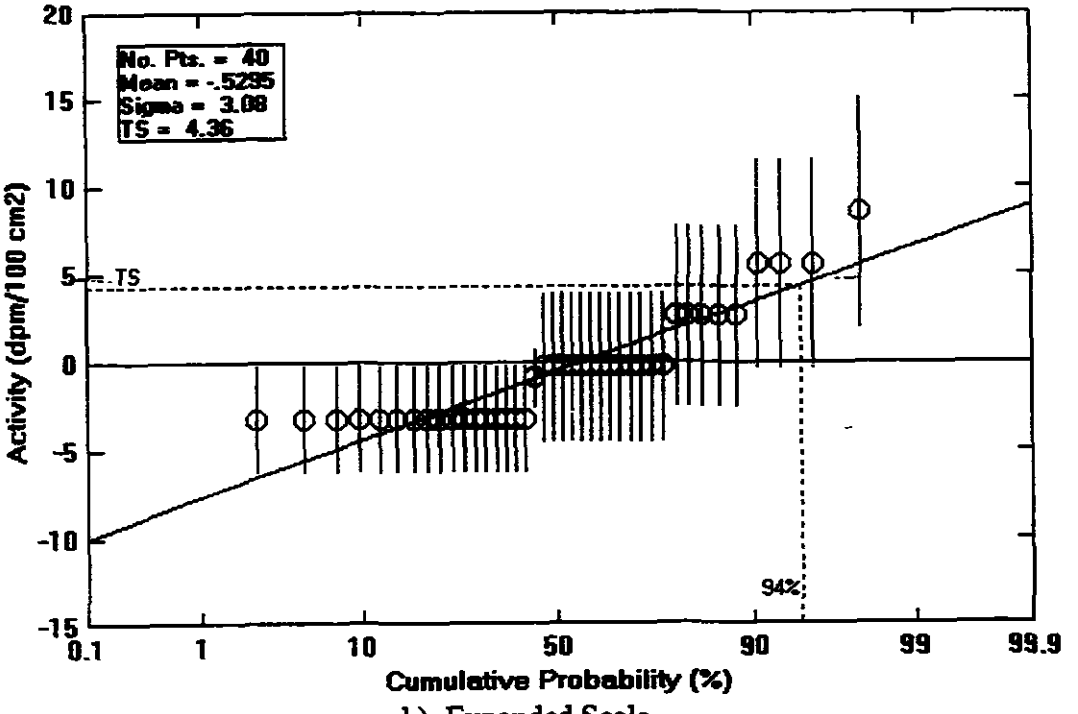


b) Expanded Scale

Figure 15. Building T030 - Lot 2 Total Alpha Activity

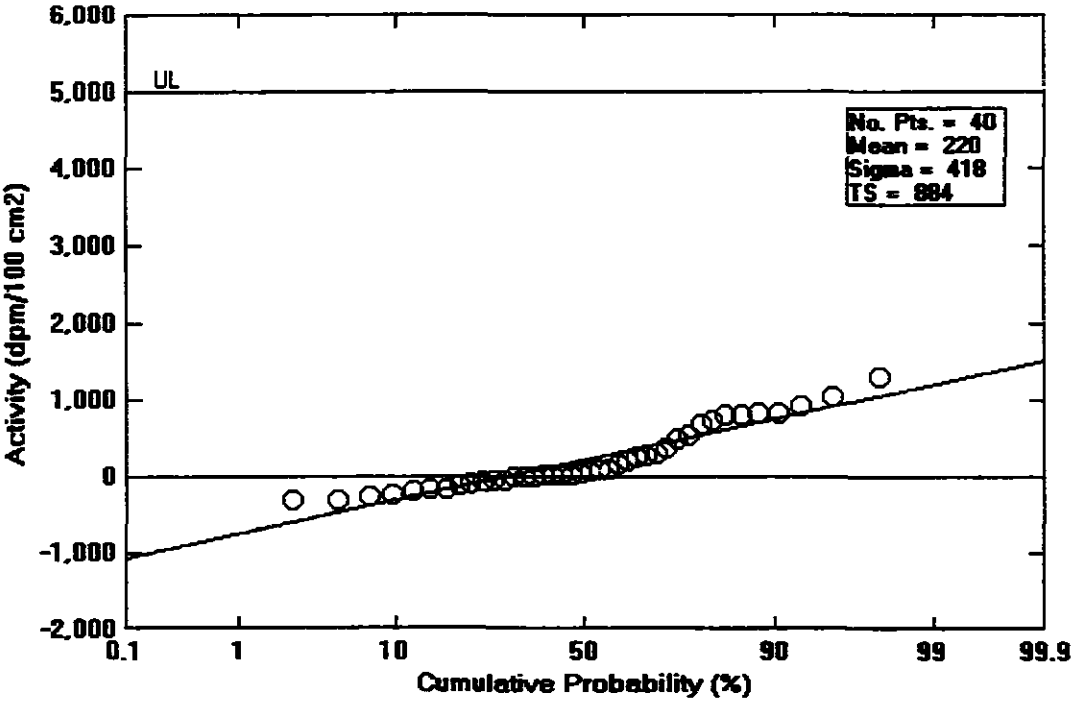


a) Normal Scale

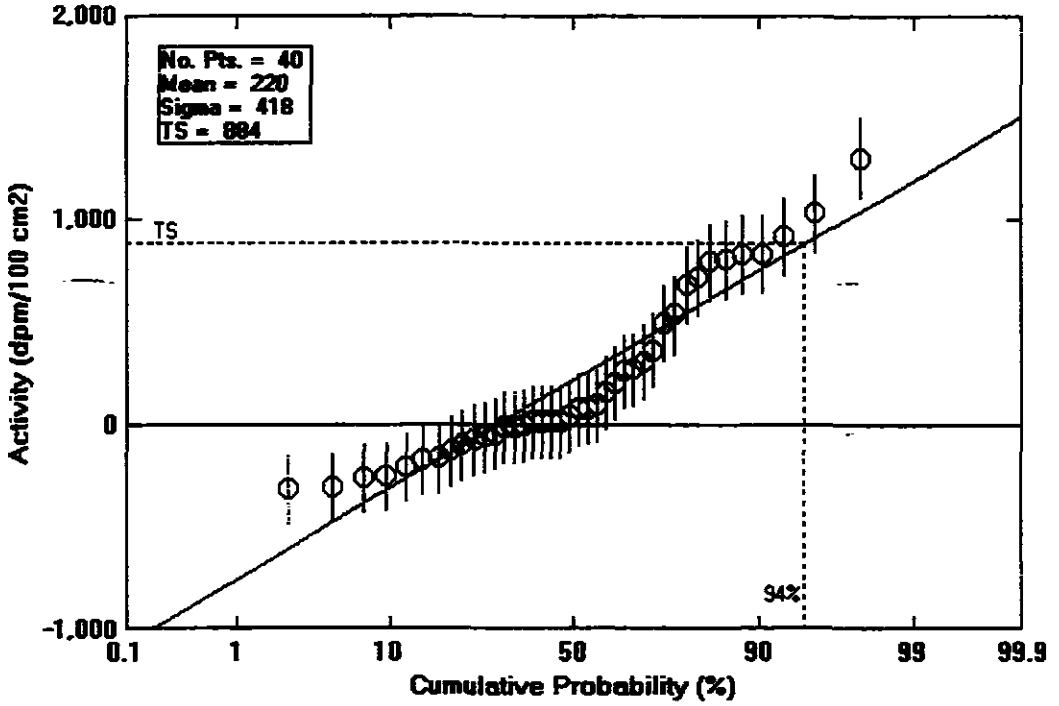


b) Expanded Scale

Figure 16. Building T030 Lot 2 Removable Alpha Activity

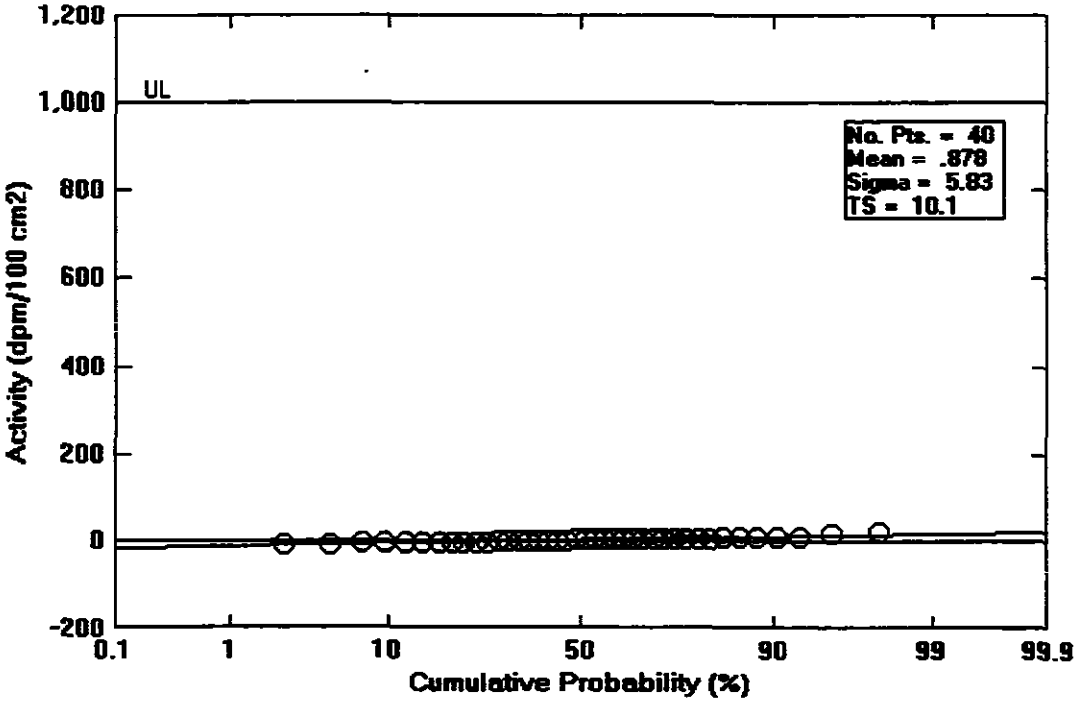


a) Normal Scale

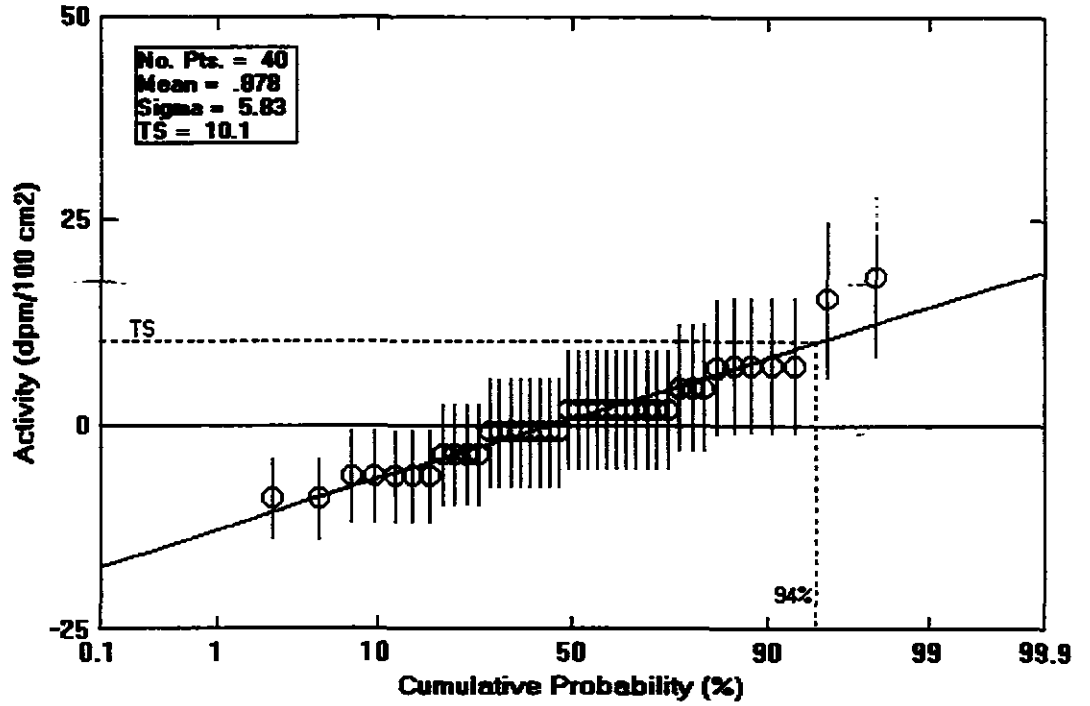


b) Expanded Scale

Figure 17. Building T030 - Lot 2 Total Beta Activity

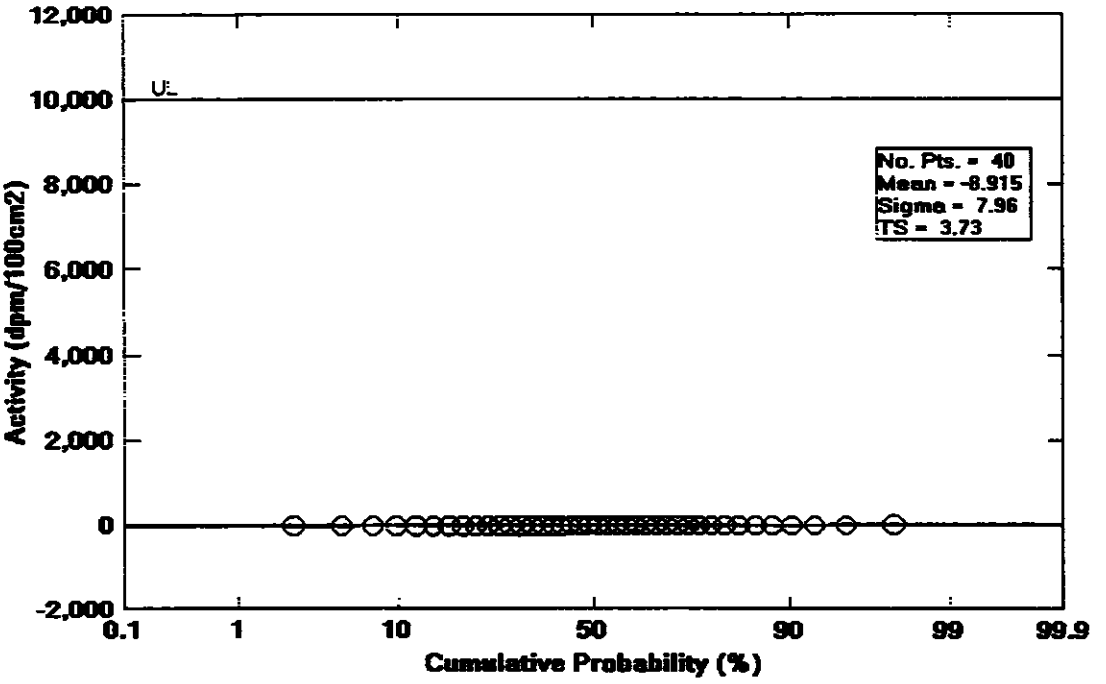


a) Normal Scale

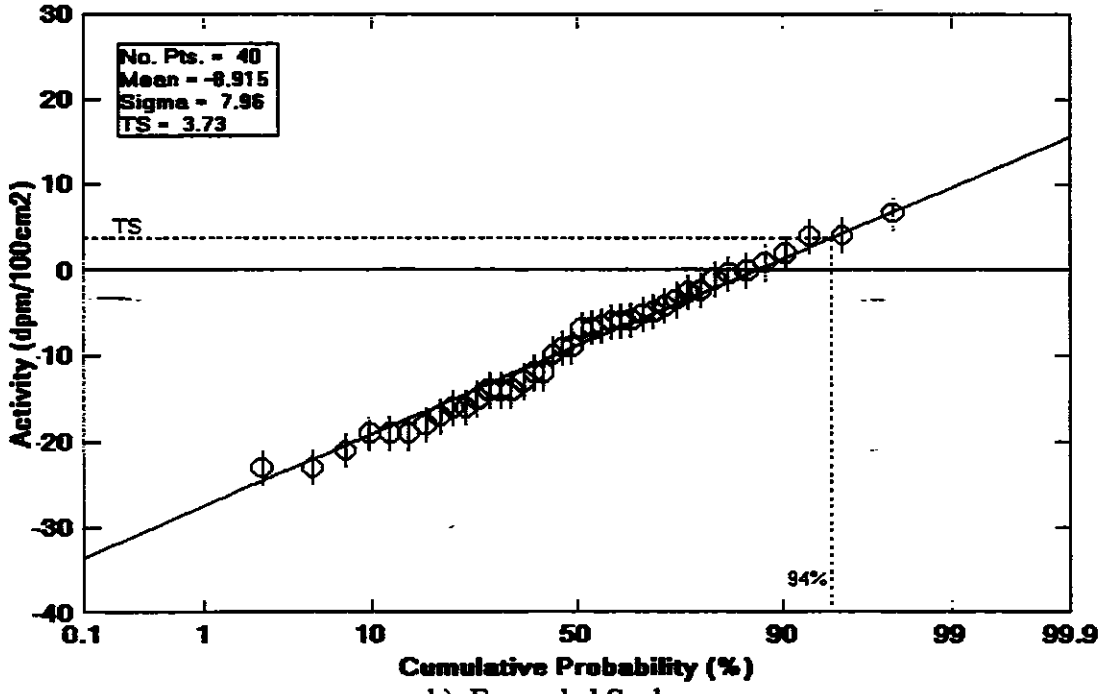


b) Expanded Scale

Figure 18. Building T030 - Lot 2 Removable Beta Activity

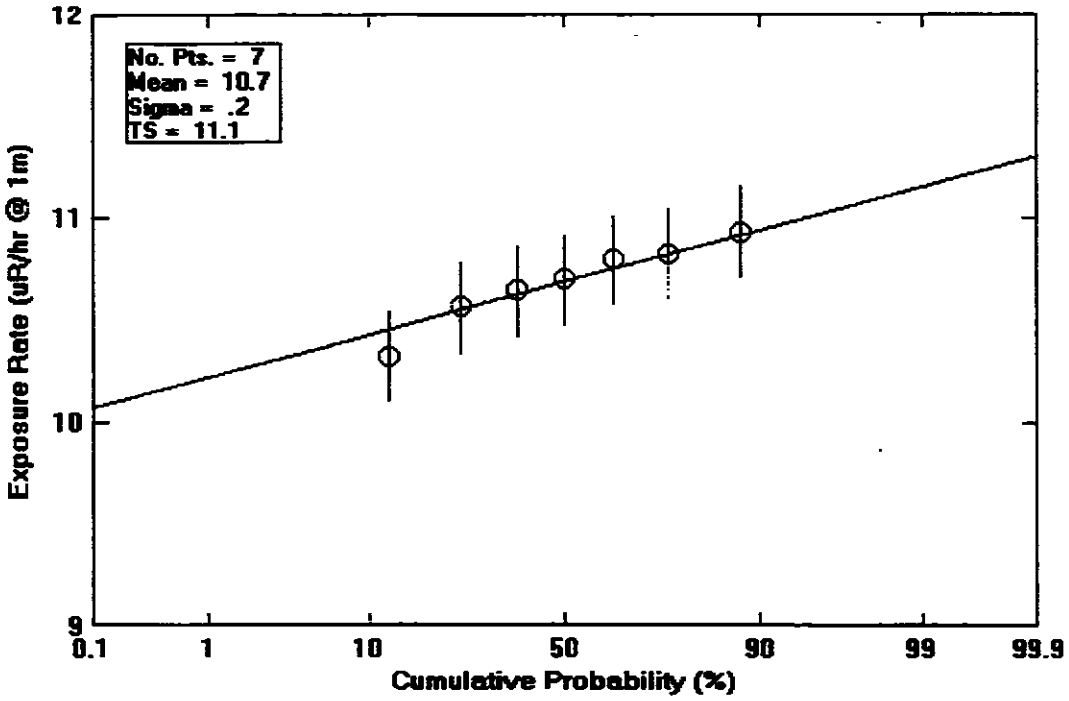


a) Normal Scale

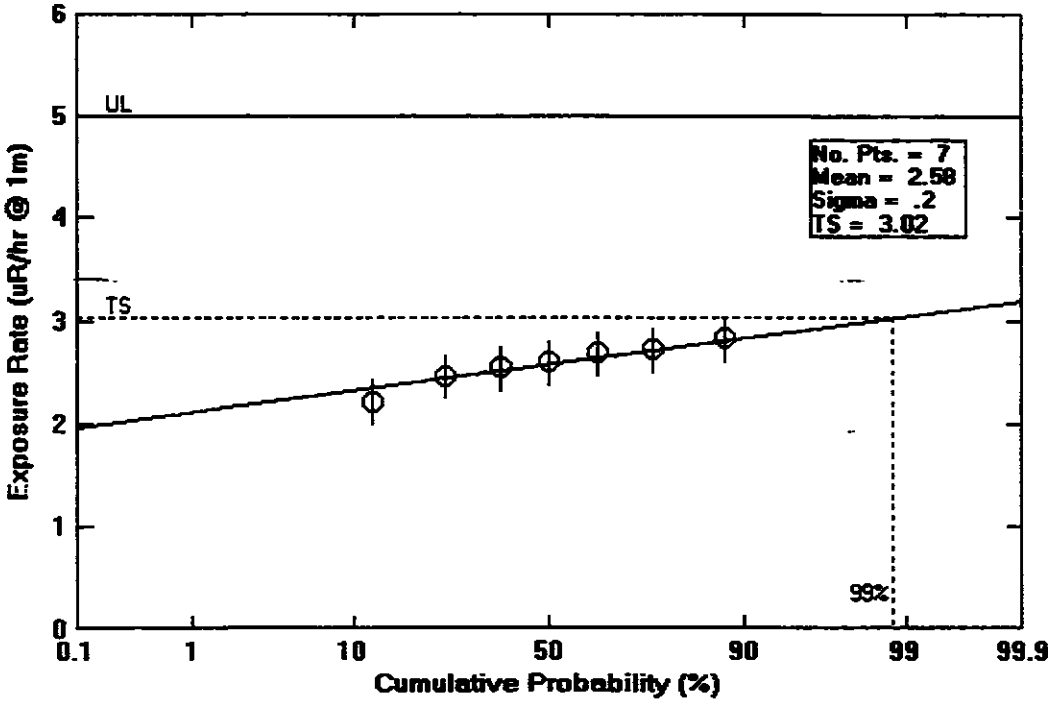


b) Expanded Scale

Figure 19. Building T030 - Lot 2 Removable Tritium Activity



a) Gross Exposure Rate



b) Net Exposure Rate

Figure 20. Building T030 - Lot 2 Gamma Exposure Rate

5. REFERENCES

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3. Rockwell Document SSWA-AR-0007, "Building T30 Final Radiological Survey Plan", June 25, 1996.

4. Rockwell Internal Letter "Tritium Smear Survey, Building 030 Van de Graaf Accelerator", A. R. Mooers to W. F. Heine, March 29, 1966.

5. Rockwell Document 012-SP-0004, "Building T30 Final Survey Procedure", June 16, 1995.

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7. DECON-1, State of California for Decontaminating Facilities and Equipment Prior to Release for Unrestricted Use, dated June 1977.

8. N001OP000033, Methods and Procedures for Radiological Monitoring.

9. NRC Dismantling Order for the L-85 Reactor Decommissioning, NRC to M. E. Remley, dated March 1, 1983.

10. Rockwell Document N001SRR140127, "Proposed Sitewide Release Criteria for Remediation of Facilities at the SSFL", August 22, 1996.

11. DOE/CH/8901, A Manual for Implementing Residual Radioactive Material Guidelines, T. L. Gilbert, et al., June 1989.

12. MIL-STD-414, Sampling Procedures and Tables for Inspection by Variables for Percent Defective, June 11, 1957.

13. DOE Order 5400.5, "Radiation Protection of the Public and the Environment", Februrary 8, 1990

Appendix A.

Building T030

Sample Lots 1 and 2

Final Survey Data

T030, Lot 1 Survey Data, Affected Area

SAMPLE NAME	GRID NAME	5 MIN ALPHA TOTAL	5 MIN ALPHA MAX	1 MIN ALPHA REM	5 MIN BETA TOTAL	5 MIN BETA MAX	1 MIN BETA REM	1 MIN GAM TOTAL	ALPHA (1 MIN) INSTRUMENT BACKG	ALPHA (1 MIN) INSTRUMENT EFACT	ALPHA (1 MIN) INSTRUMENT AFACT	ALPHA (1 MIN) SMEAR BACKG	ALPHA (1 MIN) SMEAR EFACT	BETA (1 MIN) INSTRUMENT BACKG	BETA (1 MIN) INSTRUMENT EFACT	BETA (1 MIN) INSTRUMENT AFACT	BETA (1 MIN) SMEAR BACKG	BETA (1 MIN) SMEAR EFACT	GAMMA (1 MIN) BACKG	GAMMA (1 MIN) EFACT
Walkway																				
North Wall	3	37		0	272		5		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
East Wall	13	28		1	296		6		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
South Wall	22	44		1	327		3		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
West Wall	33	34		1	288		4		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
Floor	41	25		1	455		4	2214	2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		0.0047
Ceiling	49	74		0	335		6		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
N. Walkway Pad																				
Pad	1	25		0	407		0	2372	2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		0.0047
Womens RR Foyer																				
North Wall	5	46		0	276		3		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
South Wall	15	40		0	298		9		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
Womens RR																				
North Wall	2	43		1	327		1		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
East Wall	10	50		0	307		6		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
West Wall	19	42		0	282		6		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
Floor	24	17		2	423		4	2298	2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		0.0047
Ceiling	27	68		1	357		5		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
Mens RR																				
East Wall	8	36		1	263		2		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
South Wall	15	44		1	284		10		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
West Wall	21	34		0	327		4		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
Floor	30	19		1	438		1	2316	2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		0.0047
Ceiling	35	69		0	335		7		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
Room 100																				
North Wall	3	39		1	297		3		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
South Wall	12	29		0	268		5		2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		
Floor	19	28		1	423		2	2268	2.2	4.5	1.41	0.7	2.99	58	7.4	5	3.1	2.72		0.0047
Room 101																				
North Wall	13	40		1	276		1		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
North Wall	16	43		2	263		7		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
North Wall	18	31		1	294		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
North Wall	28	34		3	305		5		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
NE Wall	37	25		2	289		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
NE Wall	43	34		1	293		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		

T030, Lot 1 Survey Data, Affected Area

SAMPLE NAME	GRID NAME	5 MIN ALPHA TOTAL	5 MIN ALPHA MAX	1 MIN ALPHA REM	5 MIN BETA TOTAL	5 MIN BETA MAX	1 MIN BETA REM	1 MIN GAM TOTAL	ALPHA (1 MIN) INSTRUMENT BACKG	ALPHA (1 MIN) INSTRUMENT EFACT	ALPHA (1 MIN) INSTRUMENT AFACT	ALPHA (1 MIN) SMEAR BACKG	ALPHA (1 MIN) SMEAR EFACT	BETA (1 MIN) INSTRUMENT BACKG	BETA (1 MIN) INSTRUMENT EFACT	BETA (1 MIN) INSTRUMENT AFACT	BETA (1 MIN) SMEAR BACKG	BETA (1 MIN) SMEAR EFACT	GAMMA (1 MIN) BACKG	GAMMA (1 MIN) EFACT
SE Wall	51	32		0	270		3		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
South Wall	60	36		0	283		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
West Wall	78	44		0	268		5		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
West Wall	85	35		1	259		3		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Floor	101	31		0	430		3	2275	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	105	26		1	423		2	2278	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	107	30		1	434		1	2276	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	122	26		0	413		3	2313	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	124	18		1	449		2	2321	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	126	37		0	405		8	2342	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	141	27		0	427		2	2249	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Ceiling	156	82		1	371		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	160	77		0	376		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	162	81		0	323		0		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	177	68		0	325		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	179	78		0	341		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	181	72		0	372		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	196	74		1	375		1		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Room 102																				
NE Wall	7	48		0	303		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
North Wall	13	38		3	287		10		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
North Wall	19	34		1	291		6		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
SE Wall	27	30		1	271		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
South Wall	47	33		0	244		6		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
South Wall	52	31		1	280		6		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
South Wall	58	35		3	299		6		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
West Wall	74	36		0	276		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
West Wall	78	39		0	292		3		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
West Wall	87	42		3	301		4		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Floor	102	27		0	420		6	2312	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	104	21		0	407		3	2288	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	119	16		0	421		1	2273	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	121	28		0	424		2	2233	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	124	21		2	422		3	2376	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Floor	138	30		1	465		3	2301	2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		0.0047
Ceiling	157	70		3	359		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	159	82		1	375		1		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	174	73		0	335		6		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	176	79		2	352		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		

T030, Lot 1 Survey Data, Affected Area

SAMPLE NAME	GRID NAME	5 MIN ALPHA TOTAL	5 MIN ALPHA MAX	1 MIN ALPHA REM	5 MIN BETA TOTAL	5 MIN BETA MAX	1 MIN BETA REM	1 MIN GAM TOTAL	ALPHA (1 MIN) INSTRUMENT BACKG	ALPHA (1 MIN) INSTRUMENT EFACT	ALPHA (1 MIN) INSTRUMENT AFACT	ALPHA (1 MIN) SMEAR BACKG	ALPHA (1 MIN) SMEAR EFACT	BETA (1 MIN) INSTRUMENT BACKG	BETA (1 MIN) INSTRUMENT EFACT	BETA (1 MIN) INSTRUMENT AFACT	BETA (1 MIN) SMEAR BACKG	BETA (1 MIN) SMEAR EFACT	GAMMA (1 MIN) BACKG	GAMMA (1 MIN) EFACT
Ceiling	179	76		0	376		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		
Ceiling	195	72		2	336		2		2.2	4.5	1.41	0.7	2.99	57.3	7.4	5	3.1	2.72		

T030, Lot 2 Survey Data, Unaffected Area

SAMPLE NAME	GRID NAME	5 MIN ALPHA		1 MIN	5 MIN BETA		1 MIN	1 MIN GAM	ALPHA (1 MIN)					BETA (1 MIN)					GAMMA (1 MIN)	
									INSTRUMENT			SMEAR		INSTRUMENT			SMEAR			
		TOTAL	MAX	REM	TOTAL	MAX	REM	TOTAL	BACKG	EFACT	AFACT	BACKG	EFACT	BACKG	EFACT	AFACT	BACKG	EFACT	BACKG	EFACT
Office Hallway																				
North Wall	13	46		0	290		3		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
North Wall	22	47		3	310		4		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
East Wall	32	42		0	325		4		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
South Wall	38	43		1	361		1		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
South Wall	58	45		1	316		10		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Floor	74	18		0	401		4	2328	2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		0.0047
Ceiling	95	70		1	381		0		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Room 103																				
North Wall	8	39		2	247		5		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
East Wall	25	51		2	271		6		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
South Wall	39	49		1	292		3		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
Floor	57	22		0	458		3	2301	2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		0.0047
Room 104																				
North Wall	9	47		1	291		6		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
East Wall	21	48		0	288		9		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
South Wall	39	50		0	301		3		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
West Wall	47	49		0	287		0		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Floor	53	28		0	401		2	2321	2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		0.0047
Ceiling	75	74		0	324		6		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Room 105																				
North Wall	6	51		1	275		5		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
East Wall	20	48		0	291		2		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
South Wall	38	47		4	283		4		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
West Wall	43	45		1	267		4		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
Floor	55	32		0	406		6	2351	2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		0.0047
Ceiling	72	71		3	330		4		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
Room 106																				
North Wall	6	40		3	294		2		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
East Wall	19	41		0	287		3		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
South Wall	30	45		1	266		1		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
West Wall	45	43		2	291		1		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Floor	61	27		1	396		1	2290	2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		0.0047
Room 107																				
East Wall	13	51		0	273		4		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
West Wall	33	43		0	246		3		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
Room 108/110																				

T030, Lot 2 Survey Data, Unaffected Area

SAMPLE NAME	GRID NAME	5 MIN ALPHA TOTAL	5 MIN ALPHA MAX	1 MIN ALPHA REM	5 MIN BETA TOTAL	5 MIN BETA MAX	1 MIN BETA REM	1 MIN GAM TOTAL	ALPHA (1 MIN) INSTRUMENT BACKG	ALPHA (1 MIN) INSTRUMENT EFACT	ALPHA (1 MIN) INSTRUMENT AFACT	ALPHA (1 MIN) SMEAR BACKG	ALPHA (1 MIN) SMEAR EFACT	BETA (1 MIN) INSTRUMENT BACKG	BETA (1 MIN) INSTRUMENT EFACT	BETA (1 MIN) INSTRUMENT AFACT	BETA (1 MIN) SMEAR BACKG	BETA (1 MIN) SMEAR EFACT	GAMMA (1 MIN) BACKG	GAMMA (1 MIN) EFACT
North Wall	9	39		1	246		4		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
South Wall	33	42		2	247		3		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
West Wall	50	49		1	271		1		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Floor	57	33		1	386		2		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Ceiling	68	71		0	330		3		2.2	4.5	1.41	1.1	2.94	57.7	7.4	5	3.3	2.72		
Room 109																				
East Wall	14	54		0	253		4		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
West Wall	21	48		2	256		4		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
Floor	35	26		0	421		4	2220	2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		0.0047
Ceiling	38	76		1	348		5		2.2	4.5	1.41	1.1	2.94	56.2	7.4	5	3.3	2.72		
East Entrance																				
Pad	1	27		0	399		6	2272	2.2	4.50	1.41	0.3	2.98	58	7.4	5	3.4	2.73		0.0047

Appendix B.

Building T030

Sample Lots 1 and 2

Final Survey Results

T030, Lot 1 Survey Data, Affected Area

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Walkway															
North Wall	3	32.99	8.79			-2.09	2.50	-133.20	175.43			5.17	7.74		
East Wall	13	21.57	7.92			0.90	3.90	44.40	179.14			7.89	8.21		
South Wall	22	41.88	9.41			0.90	3.90	273.80	183.81			-0.27	6.72		
West Wall	33	29.19	8.51			0.90	3.90	-14.80	177.91			2.45	7.25		
Floor	41	17.77	7.61			0.90	3.90	1221.00	201.98			2.45	7.25	10.30	
Ceiling	49	79.95	11.70			-2.09	2.50	333.00	185.00			7.89	8.21		
N. Walkway Pad															
Pad	1	17.77	7.61			-2.09	2.50	865.80	195.37			-8.43	4.79	11.03	0.23
Womens RR Foyer															
North Wall	5	44.42	9.58			-2.09	2.50	-88.80	176.36			-0.27	6.72		
South Wall	15	36.80	9.06			-2.09	2.50	59.20	179.44			16.05	9.46		
Womens RR															
North Wall	2	40.61	9.33			0.90	3.90	273.80	183.81			-5.71	5.51		
East Wall	10	49.49	9.91			-2.09	2.50	125.80	180.81			7.89	8.21		
West Wall	19	39.34	9.24			-2.09	2.50	-59.20	176.98			7.89	8.21		
Floor	24	7.61	6.71			3.89	4.91	984.20	197.60			2.45	7.25	10.69	0.22
Ceiling	27	72.33	11.28			0.90	3.90	495.80	188.23			5.17	7.74		
Mens RR															
East Wall	8	31.73	8.70			0.90	3.90	-199.80	174.02			-2.99	6.14		
South Wall	15	41.88	9.41			0.90	3.90	-44.40	177.29			18.77	9.84		
West Wall	21	29.19	8.51			-2.09	2.50	273.80	183.81			2.45	7.25		
Floor	30	10.15	6.95			0.90	3.90	1095.20	199.68			-5.71	5.51	10.77	0.22
Ceiling	35	73.60	11.35			-2.09	2.50	333.00	185.00			10.61	8.64		
Room 100															
North Wall	3	35.53	8.97			0.90	3.90	51.80	179.29			-0.27	6.72		
South Wall	12	22.84	6.03			-2.09	2.50	-162.80	174.80			5.17	7.74		
Floor	19	21.57	7.92			0.90	3.90	984.20	197.60			-2.99	6.14	10.64	0.22
Room 101															
North Wall	13	36.80	9.06			0.90	3.90	-77.70	175.51			-5.71	5.51		
North Wall	16	40.61	9.33			3.89	4.91	-173.90	173.47			10.61	8.64		
North Wall	18	25.38	8.22			0.90	3.90	55.50	178.29			2.45	7.25		
North Wall	28	29.19	8.51			6.88	5.75	136.90	179.97			5.17	7.74		
NE Wall	37	17.77	7.61			3.89	4.91	18.50	177.52			-2.99	6.14		
NE Wall	43	29.19	8.51			0.90	3.90	46.10	178.14			2.45	7.25		

T030, Lot 1 Survey Data, Affected Area

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
SE Wall	51	26.65	8.32			-2.09	2.50	-122.10	174.57			-0.27	6.72		
South Wall	60	31.73	8.70			-2.09	2.50	-25.90	176.60			-2.99	6.14		
West Wall	76	41.88	9.41			-2.09	2.50	-136.90	174.25			5.17	7.74		
West Wall	85	30.46	8.61			0.90	3.90	-203.50	172.83			-0.27	6.72		
Floor	101	25.38	8.22			-2.09	2.50	1061.90	198.08			-0.27	6.72	10.56	0.22
Floor	105	19.04	7.72			0.90	3.90	1010.10	197.11			-2.99	6.14	10.60	0.22
Floor	107	24.11	8.13			0.90	3.90	1091.50	198.63			-5.71	5.51	10.59	0.22
Floor	122	19.04	7.72			-2.09	2.50	936.10	195.72			-0.27	6.72	10.76	0.22
Floor	124	8.88	6.83			0.90	3.90	1202.50	200.69			-2.99	6.14	10.80	0.22
Floor	126	32.99	8.79			-2.09	2.50	876.90	194.59			13.33	9.06	10.89	0.23
Floor	141	20.30	7.82			-2.09	2.50	1039.70	197.66			-2.99	6.14	10.46	0.22
Ceiling	158	90.10	12.24			0.90	3.90	625.30	189.76			2.45	7.25		
Ceiling	160	83.75	11.90			-2.09	2.50	662.30	190.47			-2.99	6.14		
Ceiling	162	88.83	12.17			-2.09	2.50	270.10	182.69			-8.43	4.79		
Ceiling	177	72.33	11.28			-2.09	2.50	264.90	182.99			-2.99	6.14		
Ceiling	179	85.02	11.97			-2.09	2.50	403.30	185.37			2.45	7.25		
Ceiling	181	77.41	11.56			-2.09	2.50	632.70	189.89			-2.99	6.14		
Ceiling	196	79.95	11.70			0.90	3.90	654.90	190.33			-5.71	5.51		
Room 102															
NE Wall	7	46.95	9.75			-2.09	2.50	122.10	179.67			2.45	7.25		
North Wall	13	34.26	8.66			6.88	5.75	-144.30	174.10			18.77	9.84		
North Wall	19	29.19	8.51			0.90	3.90	33.30	177.63			7.69	8.21		
SE Wall	27	24.11	8.13			0.90	3.90	-114.70	174.72			2.45	7.25		
South Wall	47	27.92	8.42			-2.09	2.50	-314.50	170.44			7.69	8.21		
South Wall	52	25.38	8.22			0.90	3.90	-48.10	176.13			7.69	8.21		
South Wall	58	30.46	8.61			6.88	5.75	92.50	179.06			7.69	8.21		
West Wall	74	31.73	8.70			-2.09	2.50	-77.70	175.51			2.45	7.25		
West Wall	78	35.53	8.97			-2.09	2.50	40.70	177.98			-0.27	6.72		
West Wall	87	39.34	9.24			6.88	5.75	107.30	179.36			2.45	7.25		
Floor	102	20.30	7.82			-2.09	2.50	987.90	196.69			7.69	8.21	10.75	0.22
Floor	104	12.69	7.18			-2.09	2.50	891.70	194.87			-0.27	6.72	10.64	0.22
Floor	119	6.35	6.59			-2.09	2.50	995.30	196.83			-5.71	5.51	10.57	0.22
Floor	121	21.57	7.92			-2.09	2.50	1017.50	197.25			-2.99	6.14	10.39	0.22
Floor	124	12.69	7.18			3.89	4.91	1002.70	196.97			-0.27	6.72	11.05	0.23
Floor	136	24.11	8.13			0.90	3.90	1468.90	205.54			-0.27	6.72	10.70	0.22
Ceiling	157	74.87	11.42			6.88	5.75	536.50	188.01			-2.99	6.14		
Ceiling	159	90.10	12.24			0.90	3.90	654.90	190.33			-5.71	5.51		
Ceiling	174	78.68	11.63			-2.09	2.50	358.90	184.48			7.69	8.21		
Ceiling	176	86.29	12.04			3.89	4.91	484.70	186.99			-2.99	6.14		

T030, Lot 1 Survey Data, Affected Area

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Ceiling	179	82.49	11.84			-2.09	2.50	662.30	190.47			-2.99	6.14		
Ceiling	195	77.41	11.56			3.89	4.91	366.30	184.63			-2.99	6.14		

T030, Lot 2 Survey Data, Unaffected Area

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
Office Hallway															
North Wall	13	44.42	9.58			-3.23	3.08	11.10	177.98			-0.82	6.83		
North Wall	22	45.68	9.66			5.59	5.95	159.10	181.04			1.90	7.35		
East Wall	32	39.34	9.24			-3.23	3.08	270.10	183.29			1.90	7.35		
South Wall	38	40.61	9.33			-0.29	4.26	536.50	186.59			-6.26	5.64		
South Wall	58	43.15	9.50			-0.29	4.26	203.50	181.94			16.22	9.92		
Floor	74	8.88	6.83			-3.23	3.08	832.50	194.31			1.90	7.35	10.83	0.22
Ceiling	95	74.87	11.42			-0.29	4.26	684.50	191.47			-6.98	4.94		
Room 103															
North Wall	8	35.53	8.97			2.65	5.18	-251.60	170.04			4.62	7.84		
East Wall	25	50.76	9.99			2.65	5.18	-74.00	173.86			7.34	8.29		
South Wall	39	48.22	9.83			-0.29	4.26	81.40	177.14			-0.82	6.83		
Floor	57	13.96	7.29			-3.23	3.08	1309.80	201.17			-0.82	6.83	10.70	0.22
Room 104															
North Wall	9	45.68	9.66			-0.29	4.26	16.50	178.14			7.34	8.29		
East Wall	21	46.95	9.75			-3.23	3.08	-3.70	177.68			16.50	9.64		
South Wall	39	49.49	9.91			-3.23	3.08	92.50	179.67			-0.82	6.83		
West Wall	47	48.22	9.83			-3.23	3.08	-11.10	177.52			-6.98	4.94		
Floor	53	21.57	7.92			-3.23	3.08	832.50	194.31			-3.54	6.26	10.80	0.22
Ceiling	75	79.95	11.70			-3.23	3.08	262.70	183.14			7.34	8.29		
Room 105															
North Wall	6	50.76	9.99			-0.29	4.26	-44.40	174.49			4.62	7.84		
East Wall	20	46.95	9.75			-3.23	3.08	74.00	176.98			-3.54	6.26		
South Wall	38	45.68	9.66			8.53	6.64	14.80	175.74			1.90	7.35		
West Wall	43	43.15	9.50			-0.29	4.26	-103.60	173.23			1.90	7.35		
Floor	55	26.65	8.32			-3.23	3.08	925.00	193.96			7.34	8.29	10.93	0.23
Ceiling	72	76.14	11.49			5.59	5.95	362.60	182.92			1.90	7.35		
Room 106															
North Wall	6	36.80	9.06			5.59	5.95	40.70	178.60			-3.54	6.26		
East Wall	19	38.07	9.15			-3.23	3.08	-11.10	177.52			-0.82	6.83		
South Wall	30	43.15	9.50			-0.29	4.26	-166.50	174.25			-6.26	5.64		
West Wall	45	40.61	9.33			2.65	5.18	16.50	178.14			-6.26	5.64		
Floor	61	20.30	7.82			-0.29	4.26	795.50	193.61			-6.26	5.64	10.65	0.22
Room 107															
East Wall	13	50.76	9.99			-3.23	3.08	-59.20	174.16			1.90	7.35		
West Wall	33	40.61	9.33			-3.23	3.08	-259.00	169.88			-0.82	6.83		
Room 108/110															

T030, Lot 2 Survey Data, Unaffected Area

SAMPLE NAME	GRID NAME	ALPHA (DPM/100CM2)						BETA (DPM/100CM2)						GAMMA (uR/hr)	
		TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV	MAX	STD DEV	REM	STD DEV	TOTAL	STD DEV
North Wall	9	35.53	8.97			-0.29	4.26	-314.50	171.08			1.90	7.35		
South Wall	33	39.34	9.24			2.65	5.18	-307.10	171.24			-0.82	6.83		
West Wall	50	48.22	9.83			-0.29	4.26	-129.50	175.04			-6.26	5.64		
Floor	57	27.92	8.42			-0.29	4.26	721.50	192.19			-3.54	6.26		
Ceiling	68	76.14	11.49			-3.23	3.08	307.10	184.04			-0.82	6.83		
Room 109															
East Wall	14	54.57	10.23			-3.23	3.08	-207.20	171.00			1.90	7.35		
West Wall	21	46.95	9.75			2.65	5.18	-170.20	171.80			1.90	7.35		
Floor	35	19.04	7.72			-3.23	3.08	1036.00	196.07			1.90	7.35	10.33	0.22
Ceiling	38	82.49	11.84			-0.29	4.26	495.80	185.59			4.62	7.84		
East Entrance															
Pad	1	20.30	7.82			-0.89	1.63	806.60	194.24			7.10	8.37	10.57	0.22

Final Survey Tritium Data - T030 Lot 1 - Affected Area No. of Samples: 60			
SAMPLE NAME	GRID NAME	TRITIUM (dpm/100cm2) TOTAL	STD DEV
Walkway			
North Wall	3	-7.9	2.1
South Wall	22	-20.0	2.1
West Wall	33	-1.4	2.1
Floor	41	-4.2	2.1
N. Walkway Pad			
Womens RR Foyer			
South Wall	15	-25.0	2.1
Womens RR			
East Wall	10	-12.0	2.1
Floor	24	-24.0	2.1
Mens RR			
East Wall	8	-20.0	2.1
South Wall	15	-10.0	2.1
West Wall	21	-15.0	2.1
Floor	30	-18.0	2.1

Final Survey Tritium Data - T030 Lot 2 - Unaffected Area No. of Samples: 40			
SAMPLE NAME	GRID NAME	TRITIUM (dpm/100cm2) TOTAL	STD DEV
Office Hallway			
North Wall	13	-6.5	2.1
North Wall	22	-2.3	2.1
East Wall	32	-5.9	2.1
South Wall	38	-5.8	2.1
South Wall	58	0.9	2.1
Floor	74	2.0	2.1
Ceiling	95	0.0	2.1
Room 103			
North Wall	8	-6.7	2.1
East Wall	25	-4.8	2.1
South Wall	39	-6.0	2.1
Floor	57	4.0	2.1
Room 104			
North Wall	9	6.7	2.1
East Wall	21	-2.5	2.1
South Wall	39	-1.0	2.1
West Wall	47	-3.4	2.1
Floor	53	4.1	2.1
Ceiling	75	-5.1	2.1
Room 105			
North Wall	6	-4.2	2.1
East Wall	20	-9.0	2.1
South Wall	38	-9.1	2.1
West Wall	43	-19.0	2.1
Floor	55	-23.0	2.1

Final Survey Tritium Data - T030 Lot 1 - Affected Area No. of Samples: 60			
SAMPLE NAME	GRID NAME	TRITIUM (dpm/100cm2) TOTAL	STD DEV
Room 100			
North Wall	3	-15.0	2.1
South Wall	12	-11.0	2.1
Floor	19	-13.0	2.1
Room 101			
North Wall	13	-8.6	2.1
North Wall	16	-6.2	2.1
North Wall	18	-1.3	2.1
North Wall	28	-5.5	2.1
NE Wall	37	-5.8	2.1
NE Wall	43	-3.0	2.1
SE Wall	51	-18.0	2.1
South Wall	60	-3.6	2.1
West Wall	76	-7.6	2.1
West Wall	85	4.6	2.1
Floor	101	-5.8	2.1
Floor	105	-5.6	2.1
Floor	107	-5.1	2.1
Floor	122	6.3	2.1
Floor	124	2.2	2.1
Floor	126	-3.3	2.1
Floor	141	-7.0	2.1
Ceiling	156	-13.0	2.1
Ceiling	160	-4.7	2.1
Ceiling	162	-1.9	2.1
Ceiling	177	-5.7	2.1
Ceiling	179	-9.9	2.1
Ceiling	181	-11.0	2.1
Ceiling	196	1.4	2.1
Room 102			
NE Wall	7	1.5	2.1
North Wall	13	3.8	2.1
North Wall	19	-1.7	2.1

Final Survey Tritium Data - T030 Lot 2 - Unaffected Area No. of Samples: 40			
SAMPLE NAME	GRID NAME	TRITIUM (dpm/100cm2) TOTAL	STD DEV
Ceiling	72	-12.0	2.1
Room 106			
North Wall	8	-6.8	2.1
East Wall	19	-17.0	2.1
South Wall	30	-12.0	2.1
West Wall	45	-16.0	2.1
Floor	61	-18.0	2.1
Room 107			
East Wall	13	-21.0	2.1
West Wall	33	-16.0	2.1
Room 108/110			
North Wall	9	-23.0	2.1
South Wall	33	-9.9	2.1
West Wall	50	-14.0	2.1
Floor	57	-13.0	2.1
Ceiling	68	-14.0	2.1
Room 109			
East Wall	14	-19.0	2.1
West Wall	21	-14.0	2.1
Floor	35	-15.0	2.1
Ceiling	38	-19.0	2.1
East Entrance			
Pad	1	-0.3	2.1

Lots 1 2 Tritium Data

Final Survey Tritium Data - T030 Lot 1 - Affected Area No. of Samples:	60		
SAMPLE NAME	GRID NAME	TRITIUM (dpm/100cm2) TOTAL	STD DEV
SE Wall	27	-19.0	2.1
South Wall	47	-8.8	2.1
South Wall	52	-7.5	2.1
South Wall	58	-11.0	2.1
West Wall	74	-4.0	2.1
West Wall	78	-1.2	2.1
West Wall	87	-1.1	2.1
Floor	102	-1.2	2.1
Floor	104	-1.8	2.1
Floor	119	0.6	2.1
Floor	121	-23.0	2.1
Floor	124	-34.0	2.1
Floor	138	-13.0	2.1
Ceiling	157	-21.0	2.1
Ceiling	159	-16.0	2.1
Ceiling	174	-16.0	2.1
Ceiling	176	-21.0	2.1
Ceiling	179	-17.0	2.1
Ceiling	195	-18.0	2.1

Final Survey Tritium Data - T030 Lot 2 - Unaffected Area No. of Samples:	40		
SAMPLE NAME	GRID NAME	TRITIUM (dpm/100cm2) TOTAL	STD DEV

T030 FINAL SURVEY SSA's

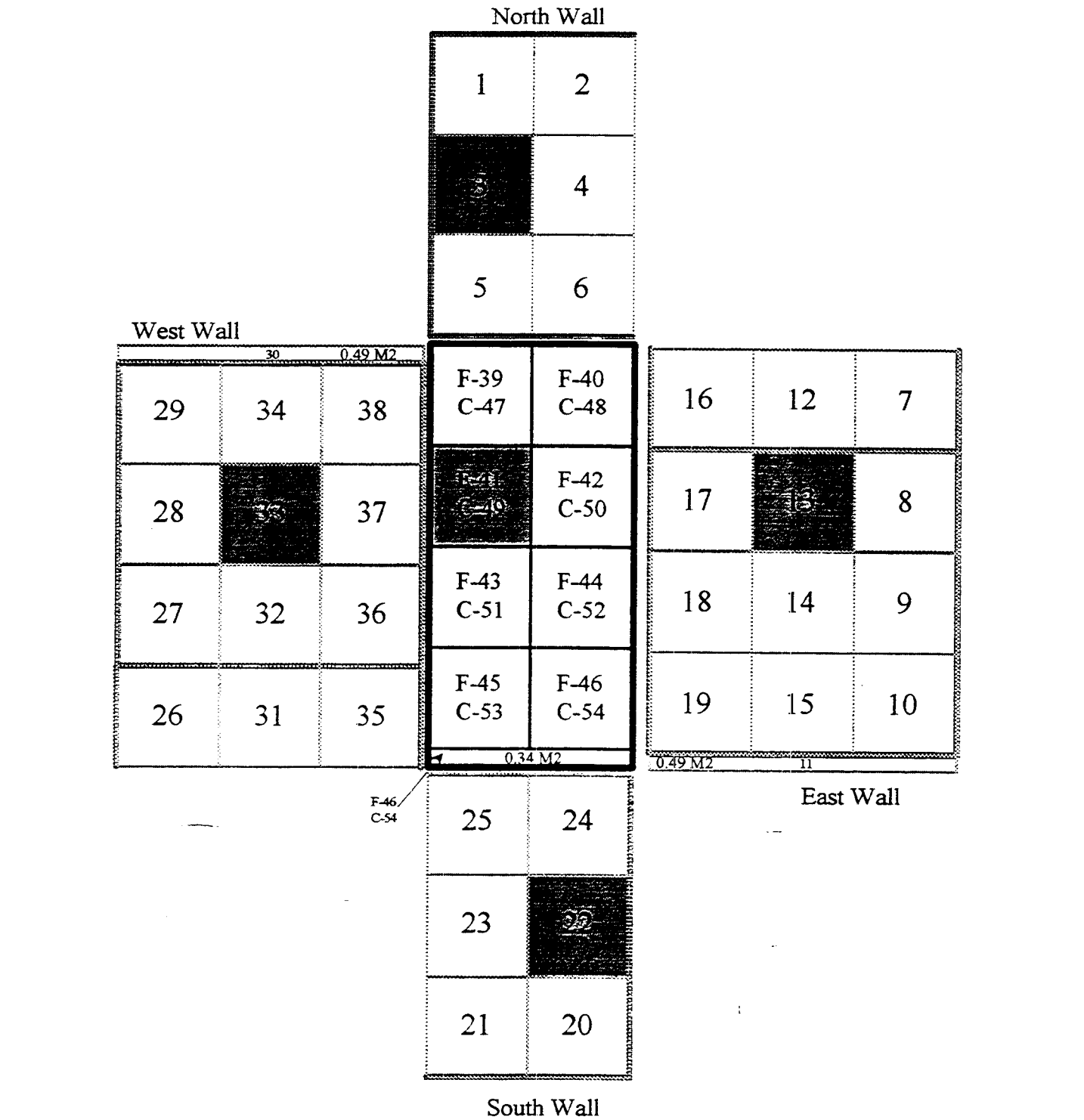
Lot No.	No. Samples*	Average SSA Values: Total Alpha	Total Beta	Rem. Alpha	Rem. Beta	Gamma	Tritium*
1	68	9.79	293	5.82	11.1	0.32	5.00
2	40	9.79	291	7.09	11.5	0.32	5.00
Maximum		9.79	293	7.17	11.7	0.32	5.00
Minimum		9.79	289	3.80	11.1	0.31	5.00
Wt. Mean		9.79	293	6.29	11.3	0.32	5.00

*Note: There were 60 tritium samples for the affected area.

Appendix C.

Grid Locations for Building T030 Survey

T030 WALKWAY GRID LOCATION DIAGRAM



= (black and gray) 9 M2 locations

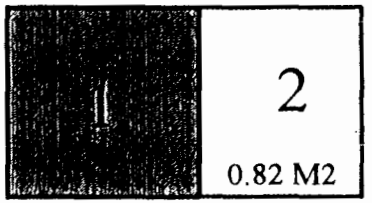
= Surveyed Grids

= Wall Grids

= Floor (F) and Ceiling (C) Grids

NORTH

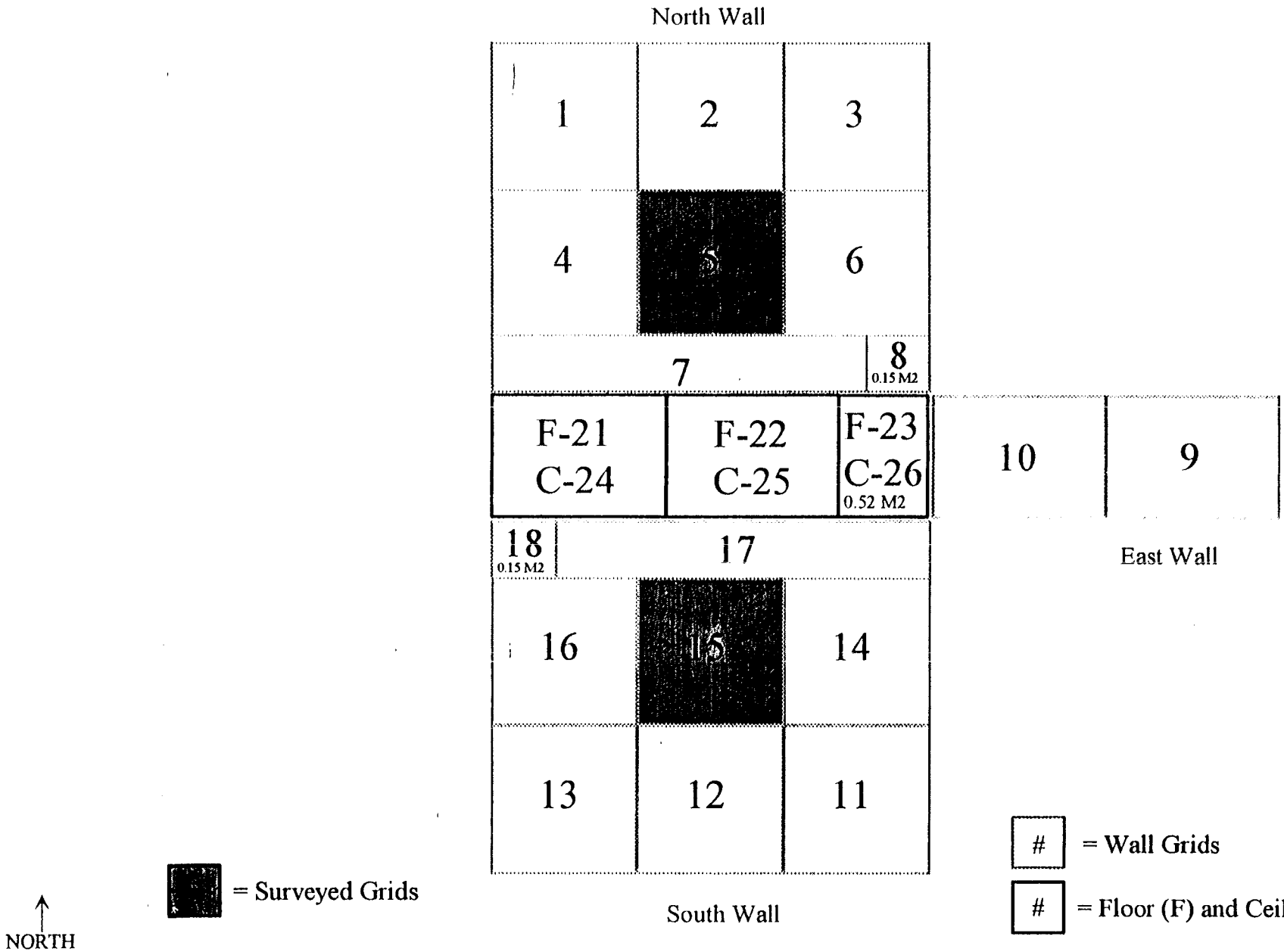
T030 NORTH WALKWAY CONCRETE PAD GRID LOCATOR DIAGRAM



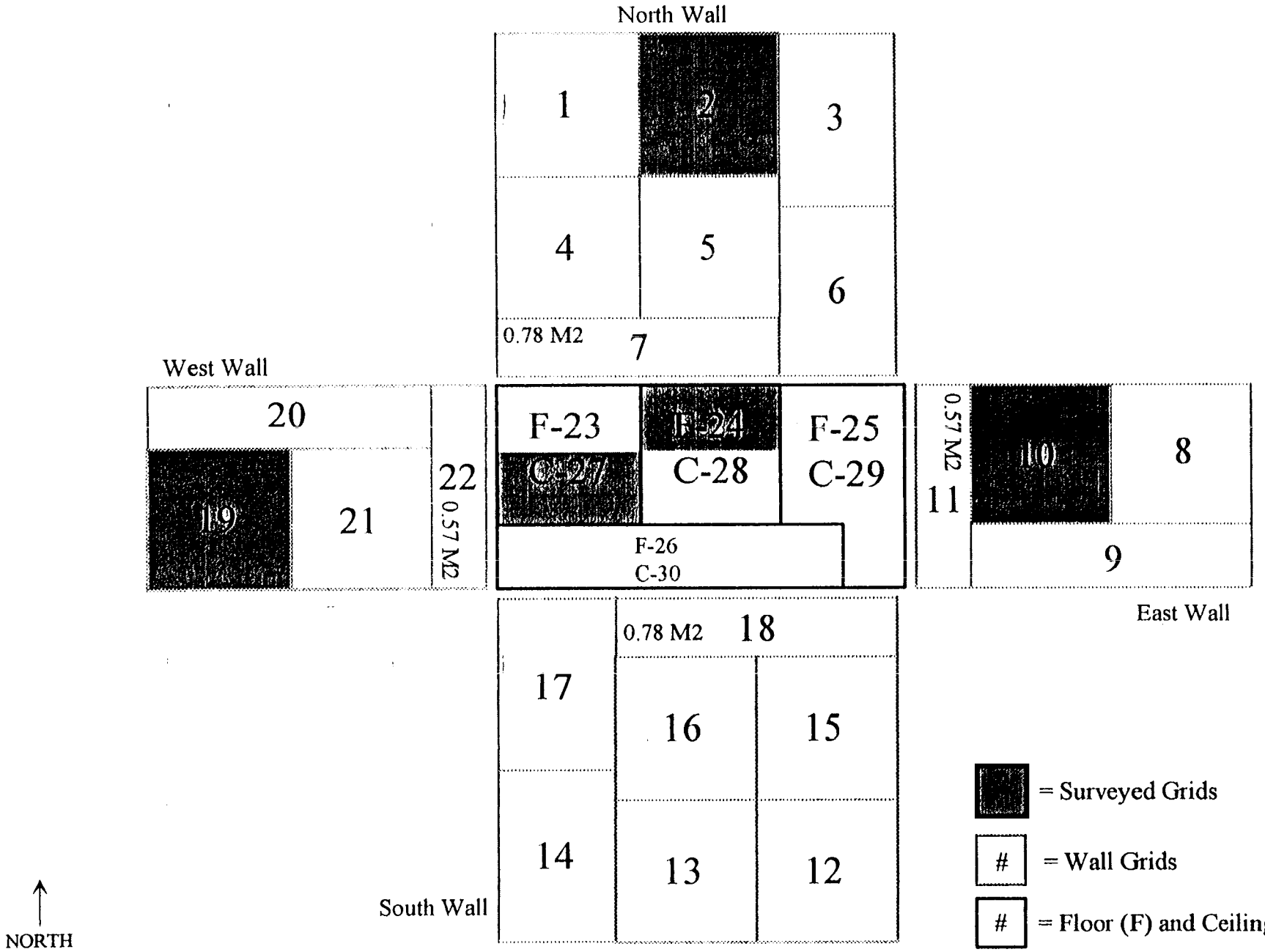
North

= Surveyed Grid

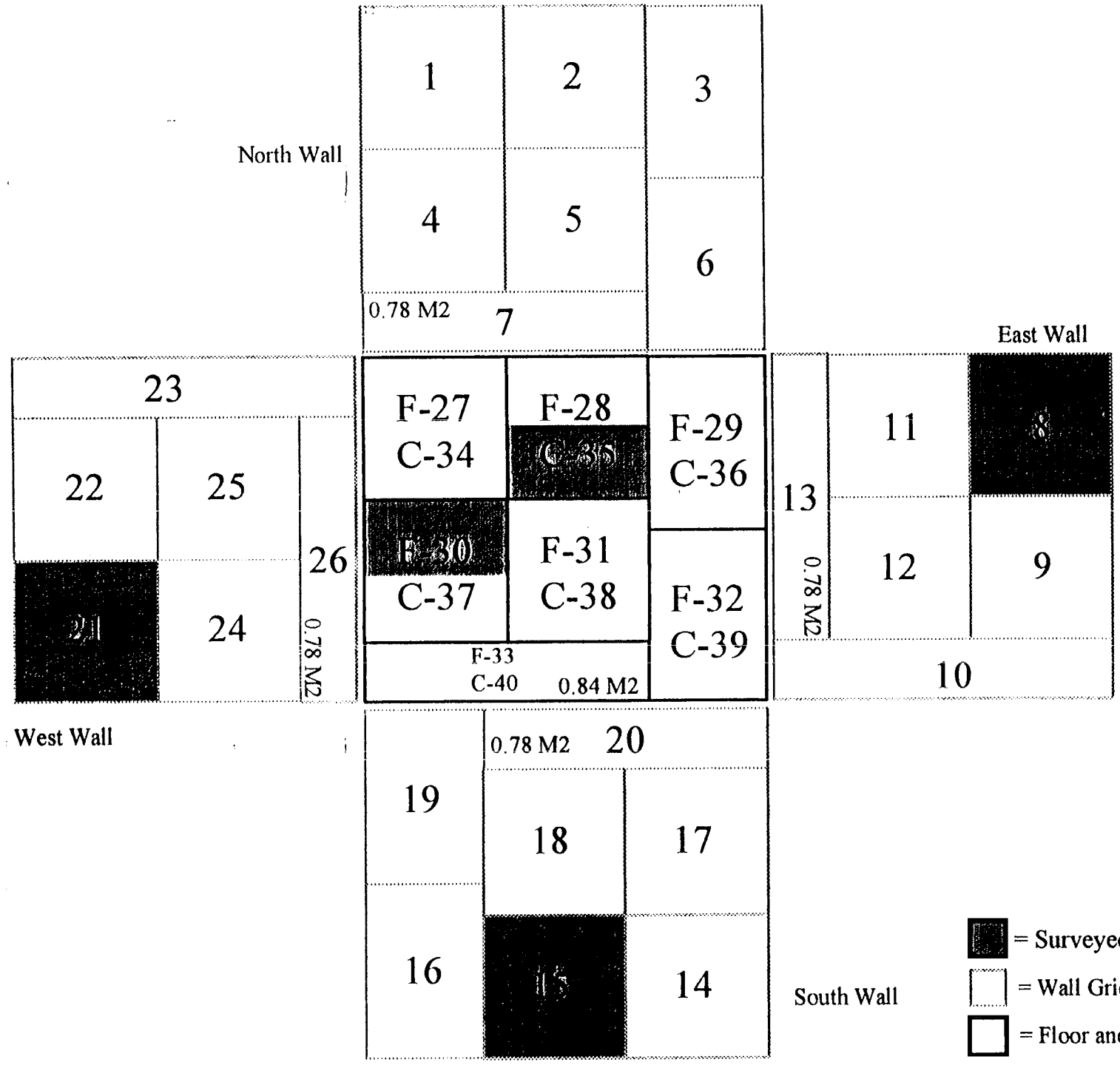
T030 WOMEN'S ROOM FOYER GRID LOCATION DIAGRAM



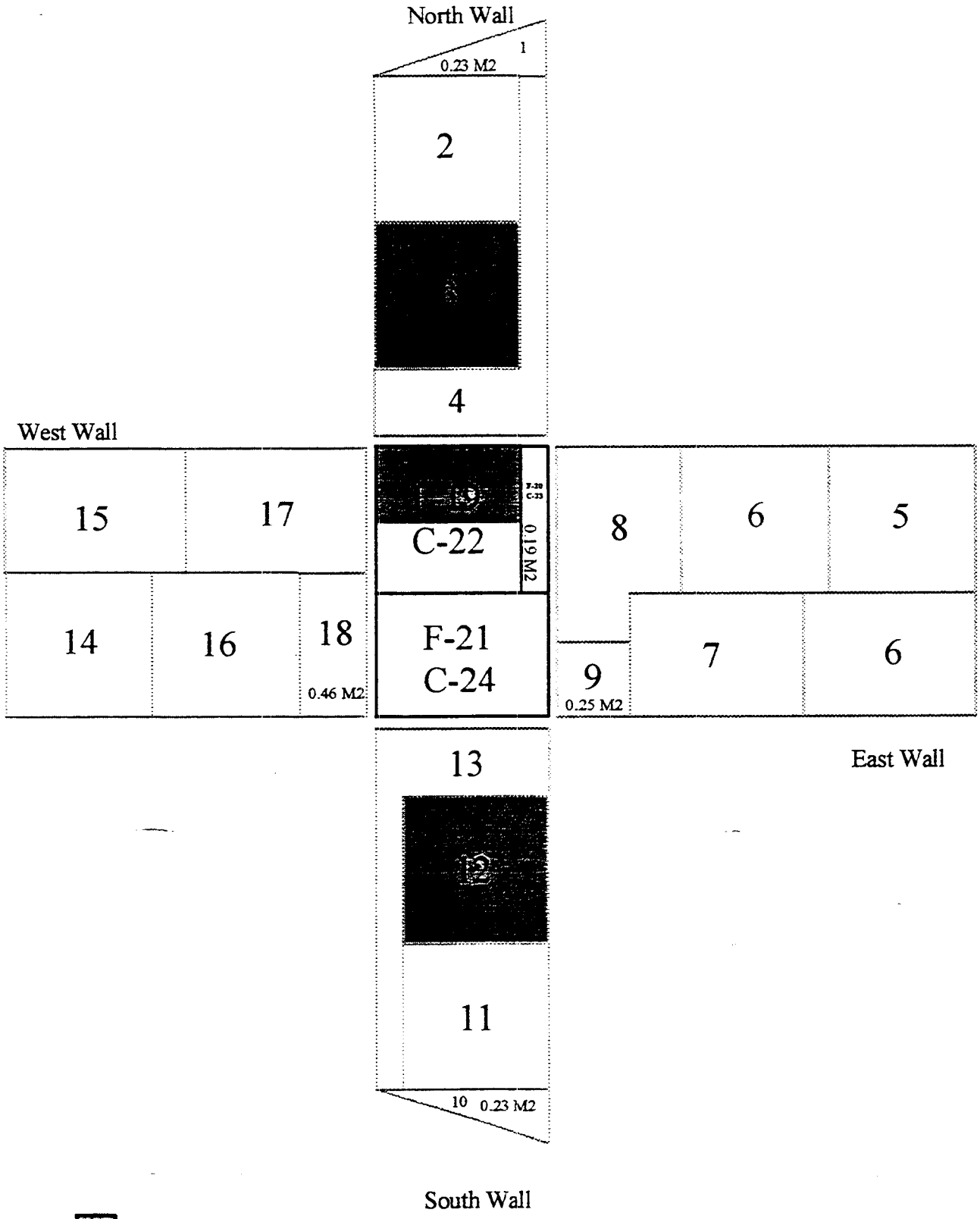
T030 WOMEN'S ROOMGRID LOCATION DIAGRAM



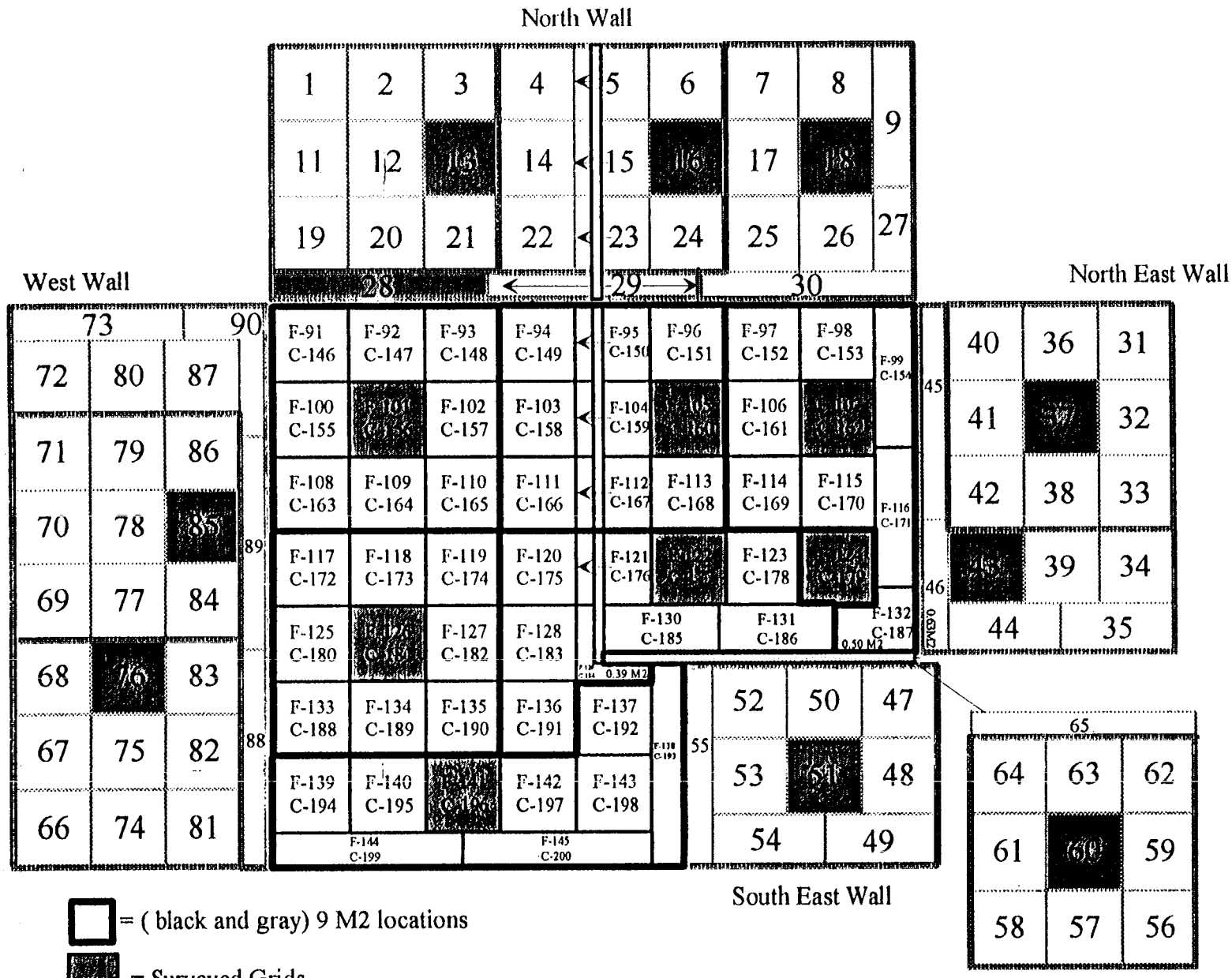
T030 MEN'S ROOM GRID LOCATOR DIAGRAM



T030 ROOM 100 GRID LOCATOR DIAGRAM



T030 ROOM 101 GRID LOCATOR DIAGRAM



= (black and gray) 9 M2 locations

= Surveyed Grids

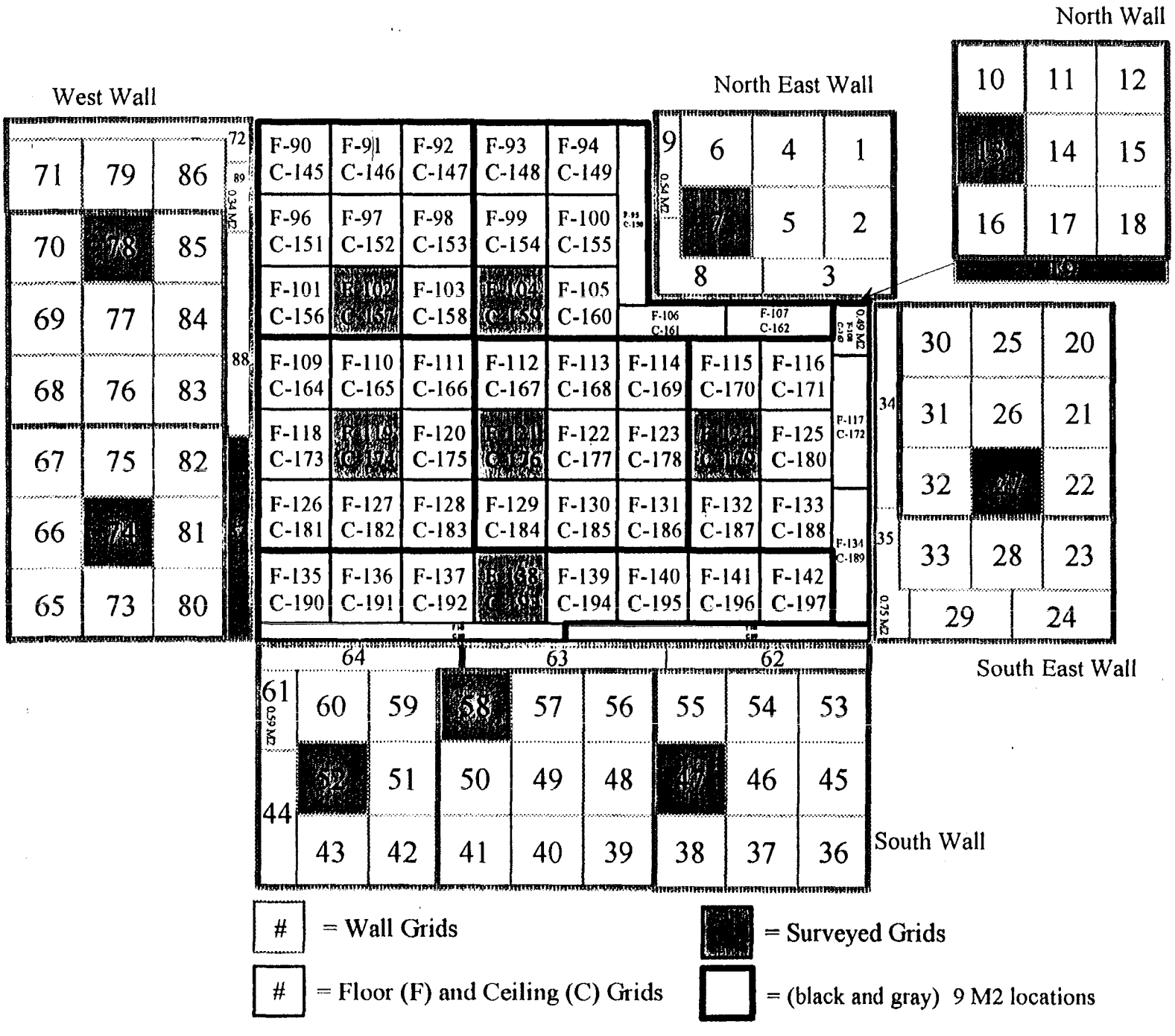
= Wall Grids

= Floor and Ceiling Grids

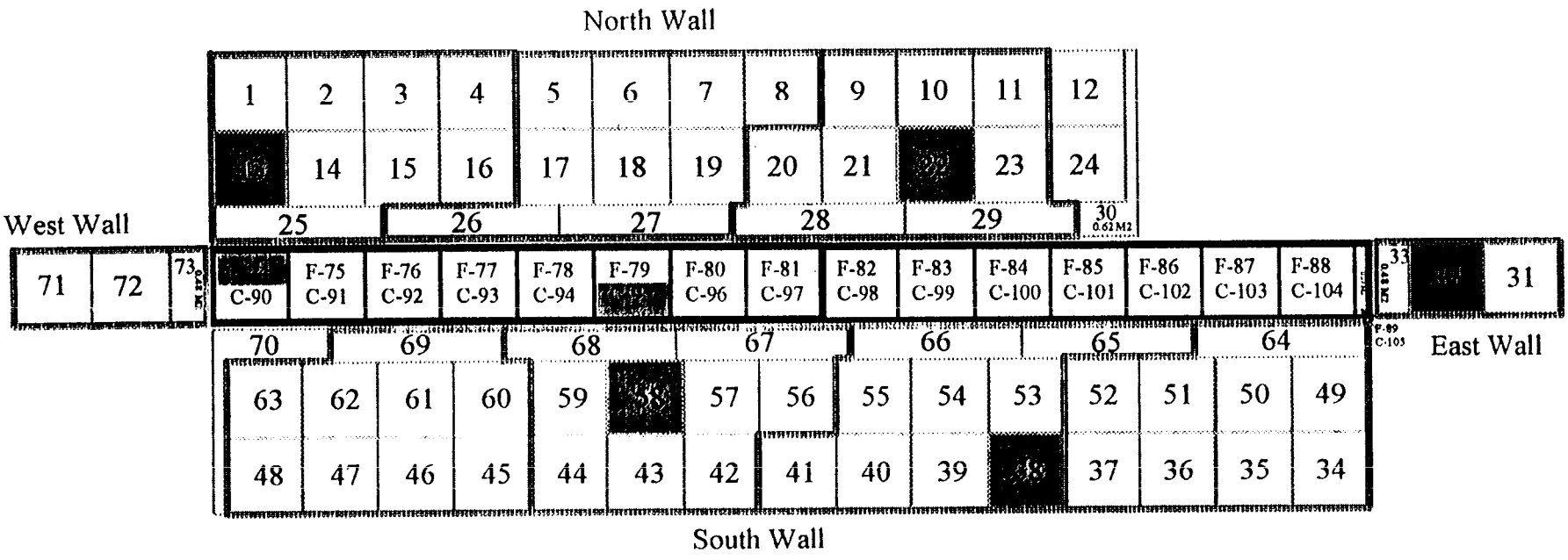
= Partition Wall

North

T030 ROOM 102 GRID LOCATION DIAGRAM



T030 OFFICE HALLWAY GRID LOCATION DIAGRAM



= Wall Grids

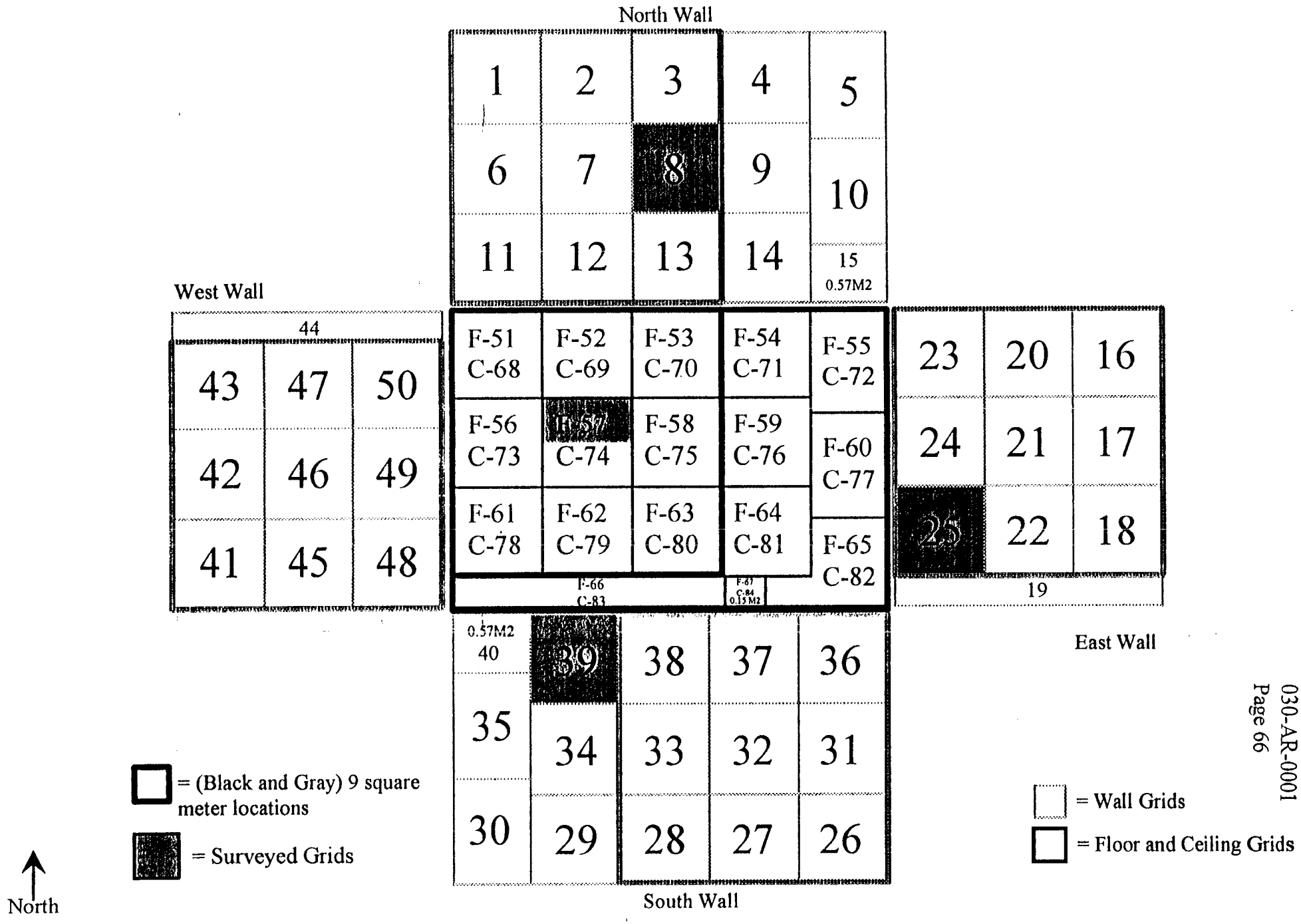
= Floor (F) and Ceiling (C) Grids

= (black and gray) 9 M2 locations

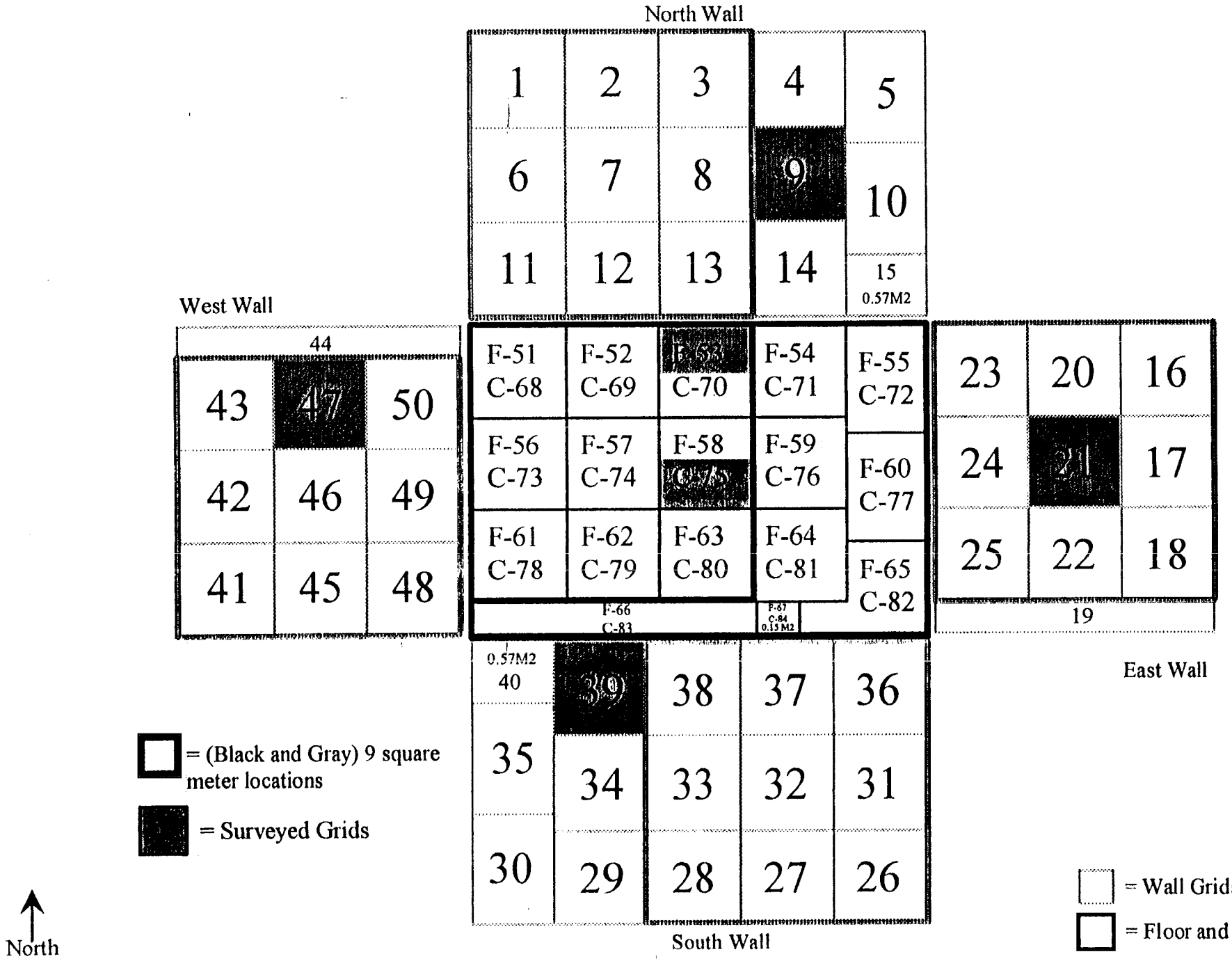
= Surveyed Grids

NORTH

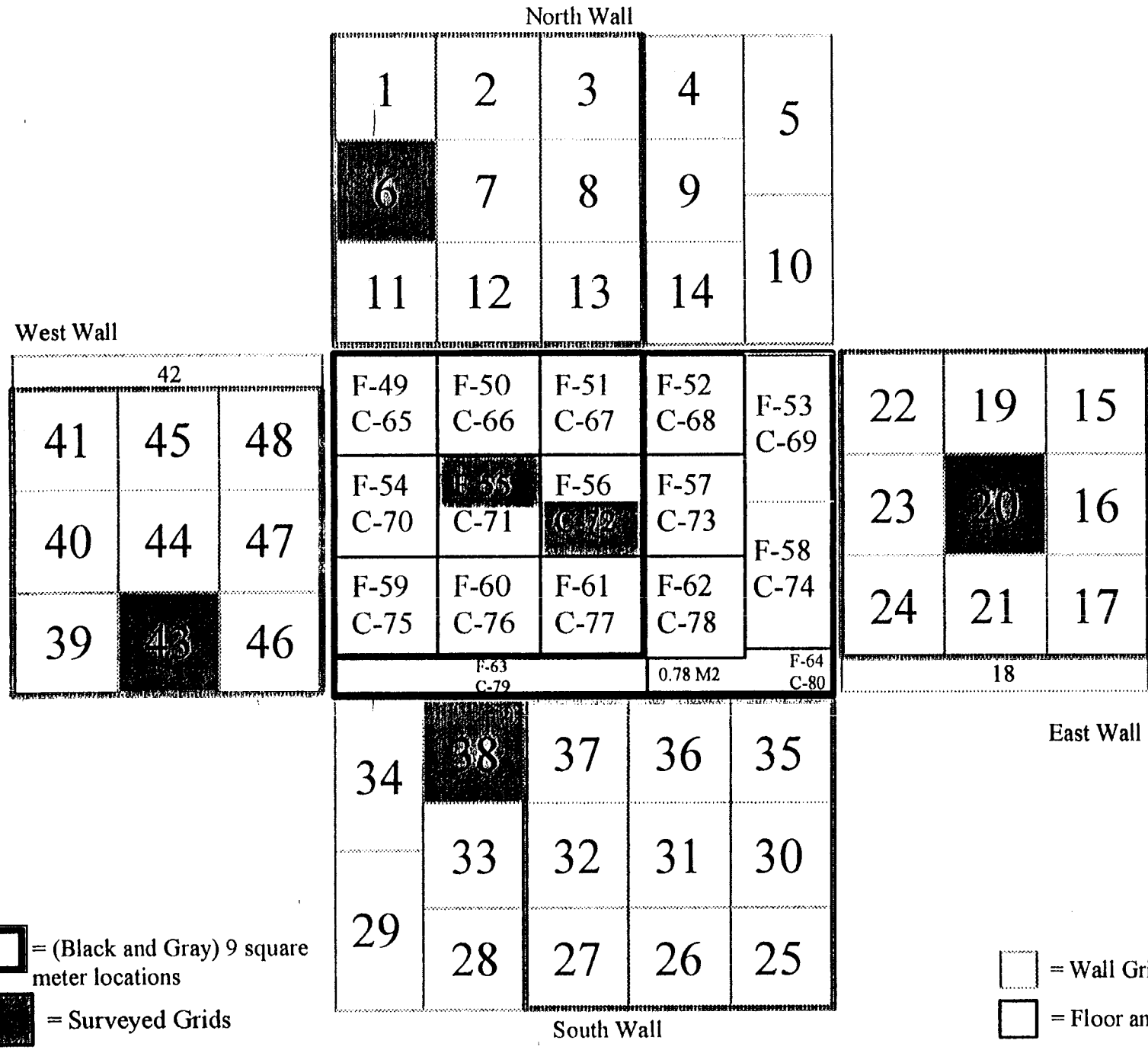
T030 ROOM 103 GRID LOCATOR DIAGRAM



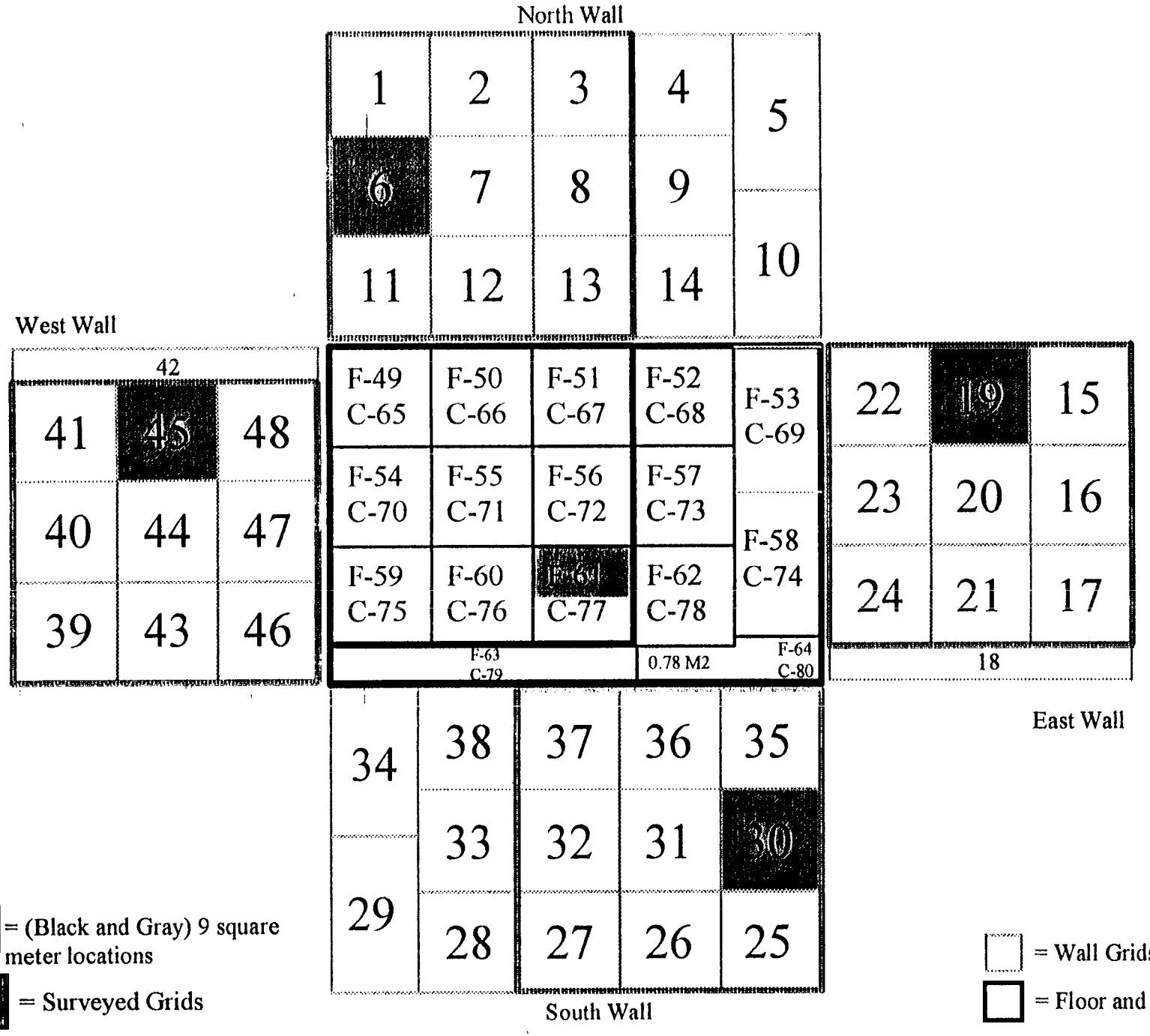
T030 ROOM 104 GRID LOCATOR DIAGRAM



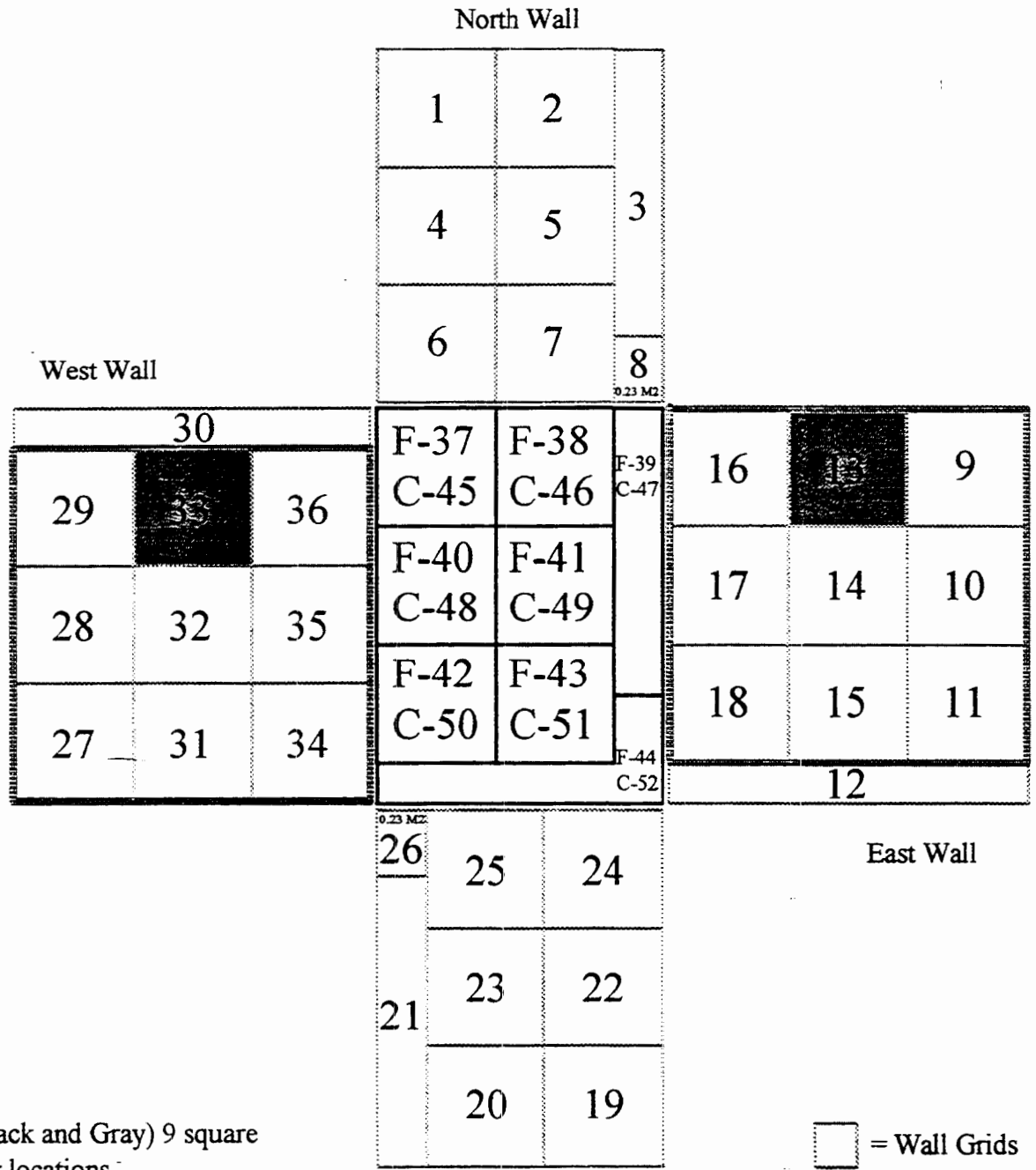
T030 ROOM 105 GRID LOCATOR DIAGRAM



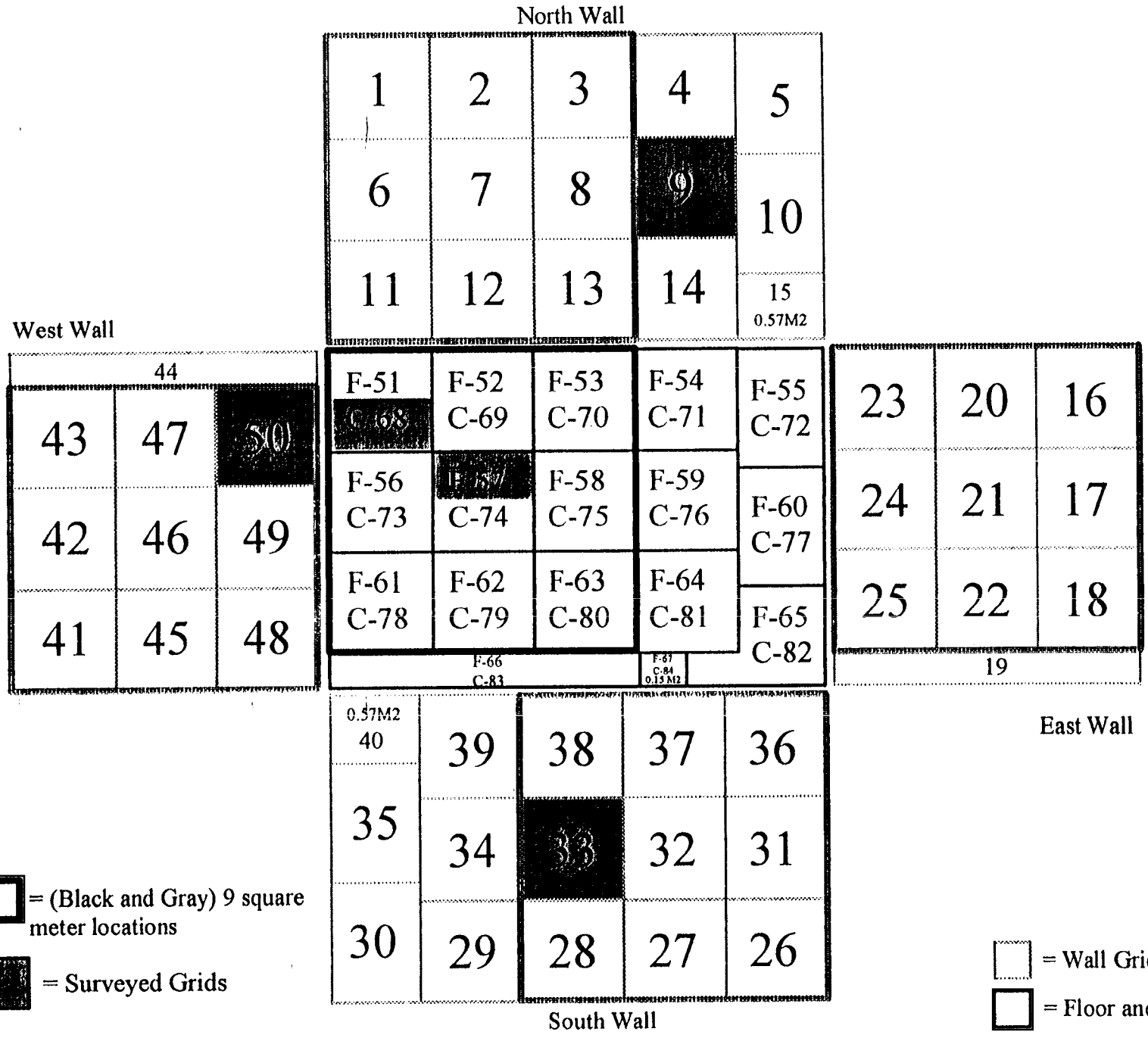
T030 ROOM 106 GRID LOCATOR DIAGRAM



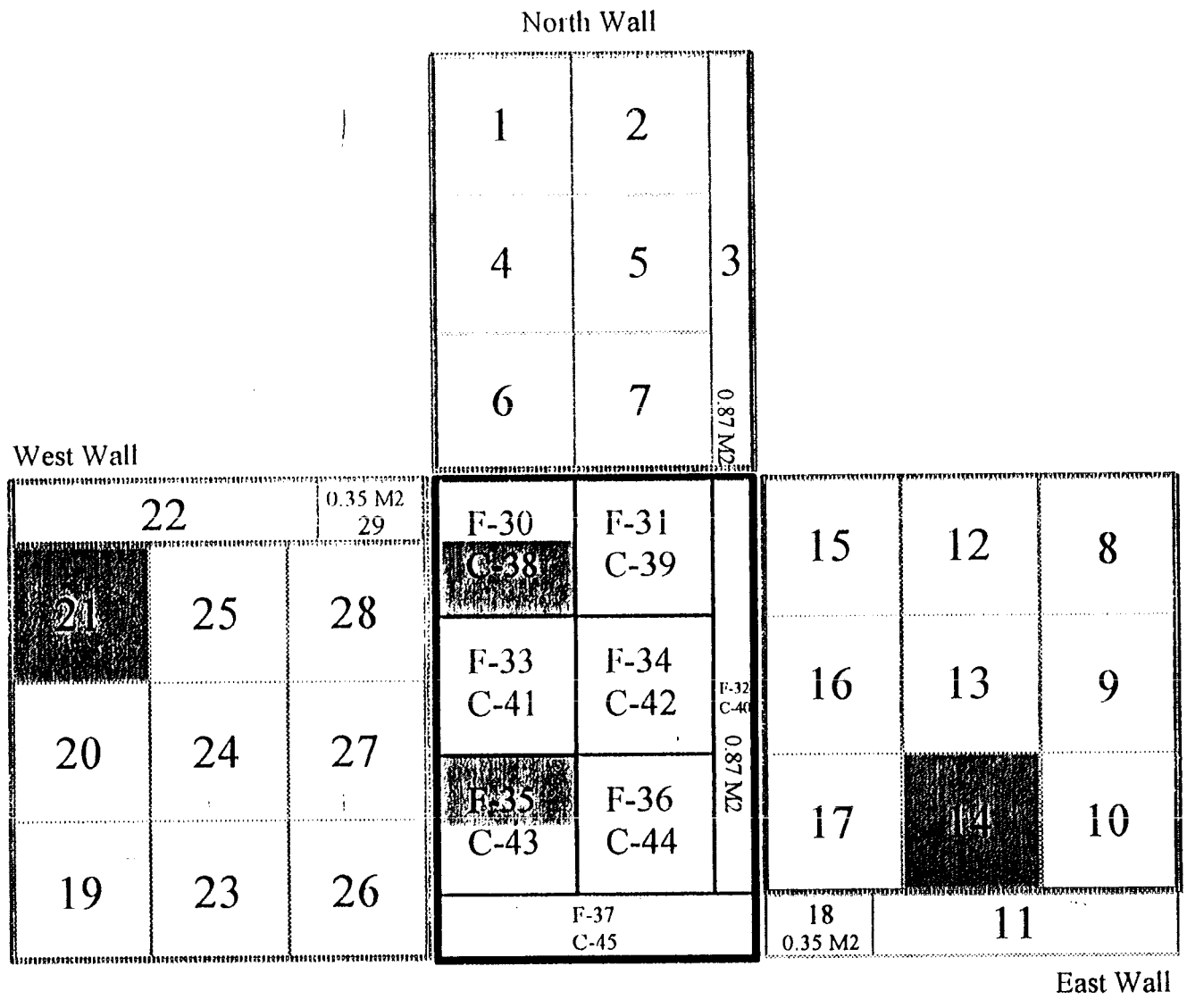
T030 ROOM 107 GRID LOCATOR DIAGRAM



T030 ROOM 108/110 GRID LOCATOR DIAGRAM



T030 ROOM 109 GRID LOCATION DIAGRAM



= Wall Grids

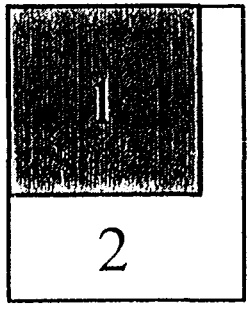
= Floor (F) and Ceiling (C) Grids

= (black and gray) 9 M2 locations

= Surveyed Grids

NORTH

T030 EAST ENTRANCE CONCRETE PAD GRID LOCATOR DIAGRAM



North

= Surveyed Grid