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Health and Safety Research Division

FOLLOW-UP SURVEY OF BRIDGEPORT BRASS COMPANY SEYMOUR, CONNECTICUT

May 1985

Work performed as part of the
RADIOLOGICAL SURVEY ACTIVITIES PROGRAM

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

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Health and Safety Research Division

FOLLOW-UP SURVEY OF BRIDGEPORT BRASS COMPANY SEYMOUR, CONNECTICUT

W. D. Cottrell

Investigation Team

B. A. Berven - RASA Program Manager
W. D. Cottrell - Survey Field Supervisor

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Prepared by the
OAK RIDGE NATIONAL LABORATORY
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ACKNOWLEDGMENTS

Research for this project was sponsored by the Division of Remedial Action Projects, U.S. Department of Energy, under Contract No. DE-AC05-840R21400 with Martin Marietta Energy Systems, Inc. The authors wish to acknowledge the support of John E. Baublitz, Director, Division of Remedial Action Projects, Edward DeLaney, Project Manager, and members of their staff. The authors also recognize the contributions of S. V. Kaye, F. F. Haywood* and W. H. Shinpaugh for their data collection, analyses, reporting, and graphics.

*Eberline Instrument Company, Oak Ridge, Tennessee.

FOLLOW-UP SURVEY OF BRIDGEPORT BRASS COMPANY, SEYMOUR, CONNECTICUT*

INTRODUCTION

A preliminary radiological survey was conducted at the Bridgeport Brass Company, Seymour, Connecticut facility during January 1977 (report attached). Because of concerns for contamination levels observed during the preliminary survey, a follow-up survey was conducted at this site on August 26, 1980. This survey was conducted by members of the Health and Safety Research Division of Oak Ridge National Laboratory (ORNL). At the time of the survey, the area was being used as a printing plant with associated offices, warehousing, etc., and was owned by the National Distillers and Chemical Corporation. During the period 1962 through 1964, contract work for the Atomic Energy Commission (AEC) was conducted here by the Bridgeport Brass Company.

RESULTS OF THE FOLLOW-UP SURVEY

The survey was confined to areas where former contract work was carried out and consisted of the following measurements: a gamma scan at 5 cm from floor surfaces, gamma exposure rates at 1 m and at 1 cm, beta-gamma dose rates at 1 cm, direct alpha radiation and transferable alpha and beta-gamma contamination.

All gamma exposure rates were at or near background (5-10 μR/h) except those measurements taken near brick walls in the former Dynapak (extrusion) area. Measurements made on the surface of the brick walls ranged up to 15 μR/h. Beta-gamma dose rates measured at 1 cm from all surfaces surveyed were not significantly different from background (0.02 mrad/h) except for these locations: (1) an area on the floor at the south end of the former extrusion area, (2) the top surface of an open floor drain in the northwest corner of the extrusion area, and (3) dose rates at 1 cm from a crack in the floor of the former machine shop.

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* The survey was performed by members of the Radiological Survey Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-840R21400.

These dose rates were 0.04 mrad/h, 0.75 mrad/h, and 1.1 mrad/h, respectively (see Fig. 1 for locations). Direct alpha radiation measurements made at contact with the surface of floors in each area were all less than 260 dpm/100 cm^2. Direct alpha radiation levels up to 520 dpm/100 cm^2 were found at the surface of the open floor drain in the former Dynapak area (Drain No. 1, Fig. 1).

Smears taken from this drain gave transferable contamination levels of 70 dpm/100 cm^2 alpha and 150 dpm/100 cm^2 beta. Transferable contamination levels on floors were <10 dpm/100 cm^2 alpha, and <200 dpm/cm^2 beta. Samples of residue were taken from drains in the former Dynapak and grinding and cuttings areas and analyzed for uranium. The results were:

Sample number	Location[a]	Uranium concentration pCi/g
BBS1	Drain No. 1, former Dynapak Area	2,860
BBS2	Drain No. 2, former cutting and grinding area	1,280
BBS3	Drain No. 2, former cutting and grinding area	15,600

[a]See Fig. 1 for location of drains.

Drain No. 2 is an overflow type drain and sample BBS2 is a sample of the "crud" cake which had formed in this drain. This floor drain showing the portion of the "crud" cake left after sampling is shown in Fig. 3. Sample BBS3 is a sample of residue taken from the same drain.

The spot on the floor showing low level surface contamination and associated elevated beta-gamma dose rates (0.40 mrad/h max.) was located near the south end of the Dynapak area (Fig. 1) and was a few hundred square centimeters in area (approximately 900 cm^2). The elevated beta-gamma dose rate associated with the drain in the Dynapak area (Figs. 1 and 2) comes from contamination around the lip and inside surfaces of the drain and the area involved is approximately 200 cm^2. The maximum beta-gamma dose rate of 1.1 mrad/h was measured in a seam in the floor of the former machine shop area (Fig. 1). The lead-filled seam is

approximately one inch wide, traverses the full length of the room and apparently serves as an expansion joint for the concrete floor. The full length of the seam was not accessible for surveying (covered by equipment) but, of the length checked, only a few feet gave elevated beta-gamma dose rates. The areal extent of the contaminated sea was about 1000 cm^2 (Fig. 4).

SIGNIFICANCE OF FINDINGS

The measurements made during the current survey are in general agreement with those made during the 1977 survey of this site. Most of the current measurements are within existing U. S. Department of Energy guidelines for the release of property for unrestricted use.[1] These guidelines for uranium contamination are given in Table 1. However, the beta-gamma dose rates measured along a seam in the concrete floor of the former machine shop area exceed these guidelines. The floor drains in the former Dynapak and cutting and grinding areas show very low levels of contamination, but do indicate that at some time uranium, probably from the cleanup of spills, was flushed down these drains. The drains empty directly into the nearby Naugatuck River and any uranium contamination that may have been discharged into the river would have been diluted by river water, and widely dispersed downstream by the flow in the river. Thus, it is highly unlikely that any significant radioactive contamination could be detected at or beyond the outfall of the drains.

[1] "U. S. Department of Energy Guidelines for Residual Radioactivity at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites" (January 1985).

ORNL-DWG. 82-10520

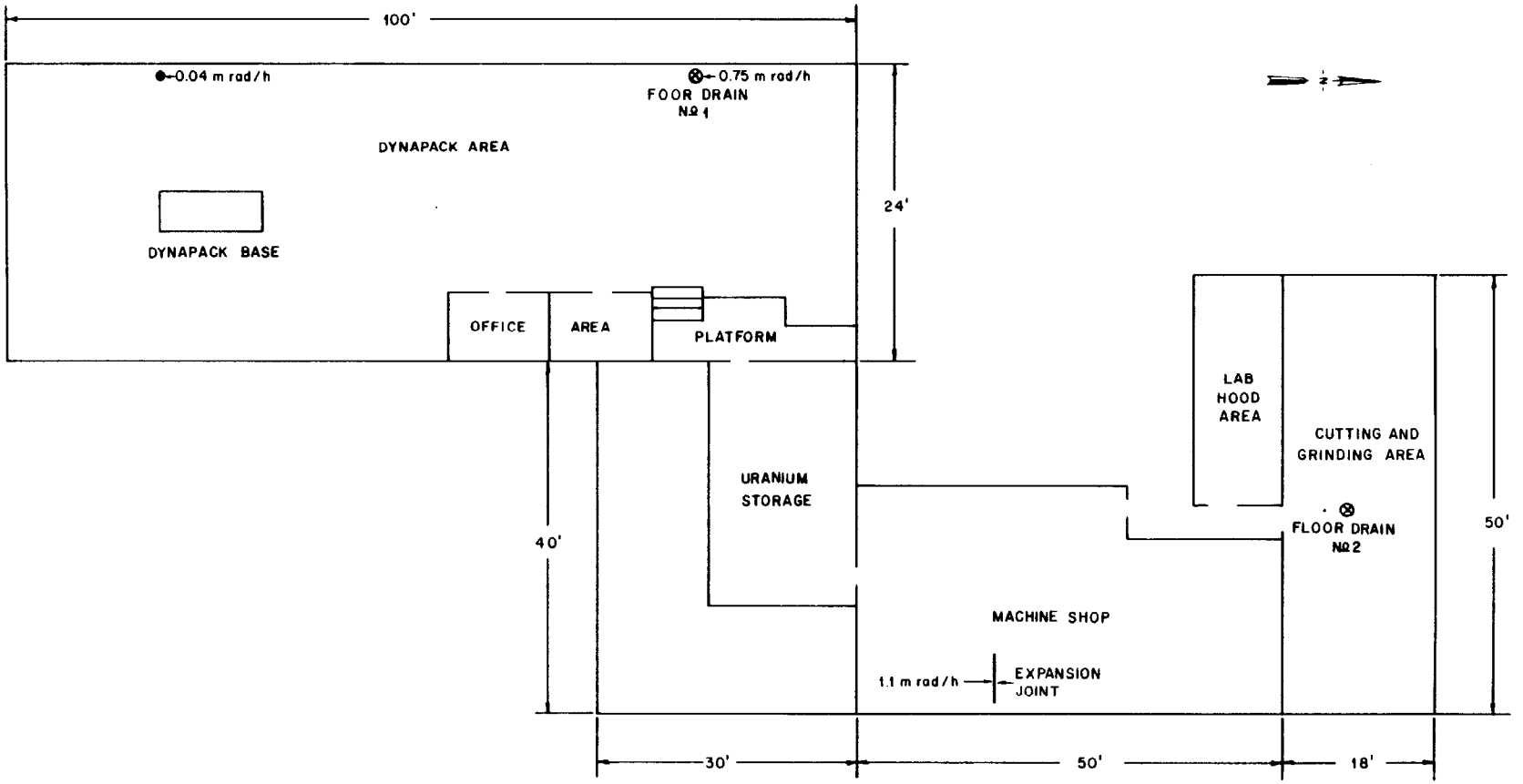


Fig. 1. Plan view of the Bridgeport Brass Company, Seymour, Connecticut facility. Area designations are those in use during the contract period (1962-1964).

ORNL Photo. No. 5133-80

Fig. 2. Drain no. 1 located in the former Dynapak area (Fig. 1).

ORNL Photo. No. 5134-80

Fig. 3. Drain no. 2 located in the former cutting and grinding area (Fig. 1).

ORNL Photo. No. 5141-80

Fig. 4. Seam in floor of the former machine shop area (Fig. 1).

Table 1. Acceptable surface contamination levels

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

[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 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 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, the 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 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

APPENDIX I

PRELIMINARY SURVEY OF

BRIDGEPORT BRASS COMPANY

SEYMOUR, CONNECTICUT

PRELIMINARY SURVEY OF BRIDGEPORT BRASS COMPANY SEYMOUR, CONNECTICUT

Work performed
by the
Health and Safety Research Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37830

March 1980

OAK RIDGE NATIONAL LABORATORY
operated by
UNION CARBIDE CORPORATION
for the
DEPARTMENT OF ENERGY

BRIDGEPORT BRASS COMPANY
SEYMOUR, CONNECTICUT

At the request of the Department of Energy (then ERDA), a preliminary survey was performed at the Bridgeport Brass Company in Seymour, Connecticut (Fig. 1) on January 26, 1977, to assess the radiological status of those facilities used under Atomic Energy Commission (AEC) contract during the period 1962 through 1964. Mr. Edwin F. Rich, Plant Engineer, provided information about the project and identified those areas utilized in the project. Contract work involved the developmental process of cold-forming (extrusion) of natural uranium metal, associated storage, and laboratory support. This operation was moved to the site from the Company's Havens Laboratory, Bridgeport, Connecticut, in 1962.

Present Use of Facilities

From information contained in ERDA records and that obtained during the survey, the extrusion operations were conducted in a portion of only one building (area approximately 30 x 100 ft). An adjacent area of similar size was used for uranium and general storage, machine shop, cutting and grinding room, and laboratory hood area (Fig. 2). The area is now a printing plant with associated offices, warehousing, etc., owned by National Distillers and Chemical Corporation. Bridgeport Brass Company is a subsidiary of this company. It was determined that the Health and Safety Laboratory (HASL) conducted a radiological survey of the facility in 1964 when the project terminated (report attached).

Results of Preliminary Survey

The preliminary survey was conducted by H. W. Dickson and M. T. Ryan of the Oak Ridge National Laboratory and W. T. Thornton of the DOE/Oak Ridge Operations Office (then ERDA). A survey was conducted in the former Dynapak Extrusion Area, in an adjacent area used for uranium storage (see Fig. 2), in a space formerly used for offices, and in an area above the former office area (see Fig. 3). The survey consisted of gamma-ray exposure-rate measurements 1 m above the floor surface,

beta-gamma dose-rate measurements 1 cm above the surface, and direct alpha radiation measurements made at contact with the surface.

Gamma-ray measurements in the former extrusion area (Fig. 2) resulted in a maximum reading of 9 μR/hr 1 m above the surface. The maximum beta-gamma dose rate 1 cm from the surface in that area was 0.6 mrad/hr, and the maximum gamma-ray exposure rate was 50 μR/hr 1 cm from the surface. The maximum direct alpha radiation measured was 300 dpm/100 cm^2. In the former storage area just outside the extrusion plant, the following maximum readings were observed: 6 μR/hr gamma-ray exposure rate 1 m above the surface, 0.20 mrad/hr beta-gamma, and 30 μR/hr gamma-ray exposure rate at 1 cm from the surface. No alpha activity above background was detected in this area. In the former office area (now print shop) (Fig. 3), the following maximum readings were observed: 8 μR/hr gamma-ray exposure rate at 1 m above the surface, 1.75 mrad/hr beta-gamma, and 130 μR/hr gamma-ray exposure rate at 1 cm from the surface. The corresponding direct alpha radiation measured at this point (crack in concrete floor) was 180 dpm/100 cm^2. All measurements made on the second level of the facility were at background levels.

An effort was made to confirm radiation levels presented in a report of a survey conducted by A. J. Breslin, former HASL, October 21, 1964 (see attached report). Most of the current measurements were found to be in agreement with those in the 1964 survey and within existing Nuclear Regulatory Commission guidelines for unrestricted use. However, in one area, radiation levels were found to approach or exceed these guidelines. Because of this, some additional measurements should be taken at this site.

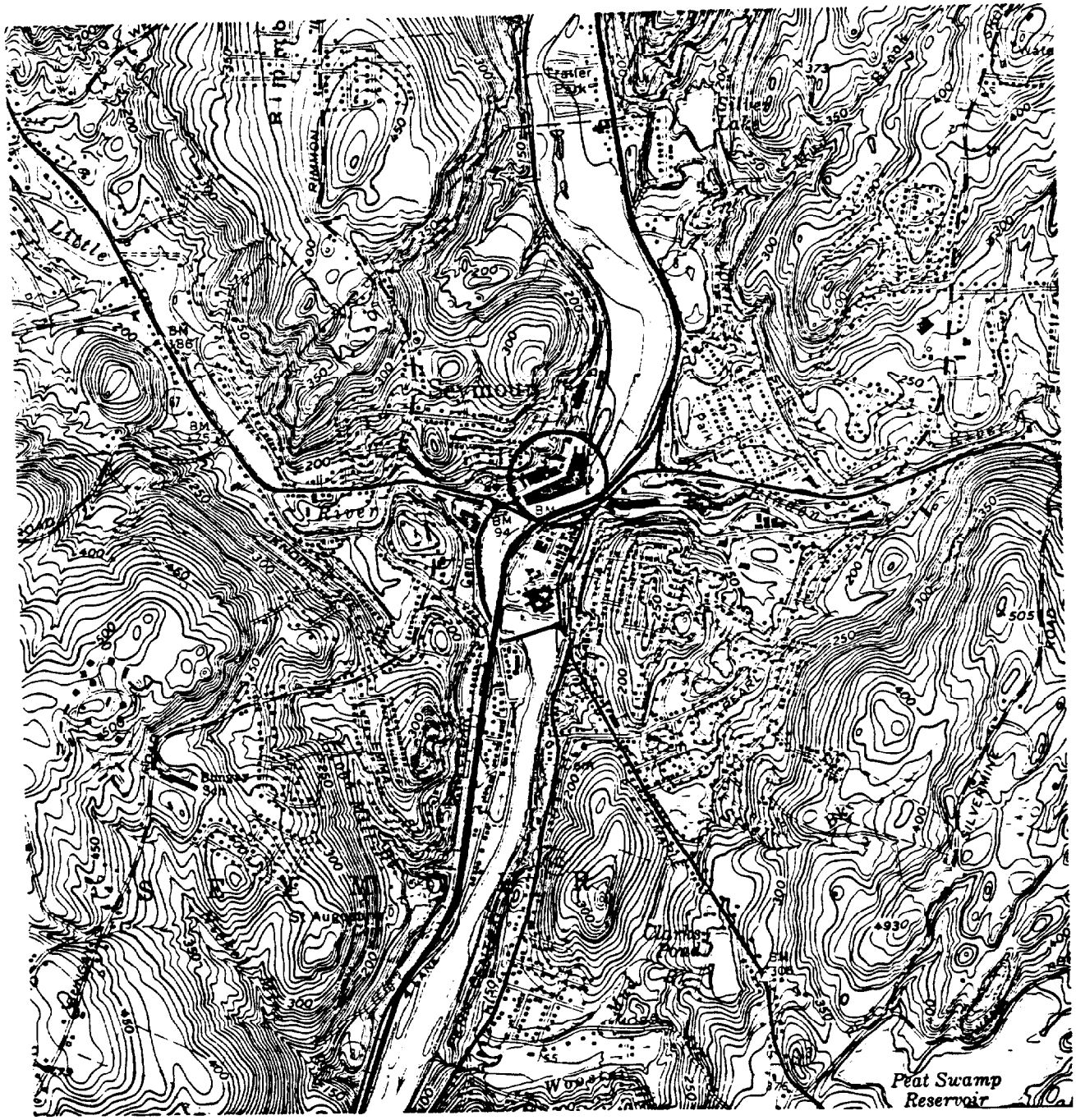


Fig. 1. Location of the Bridgeport Brass Company in Seymour, Connecticut.

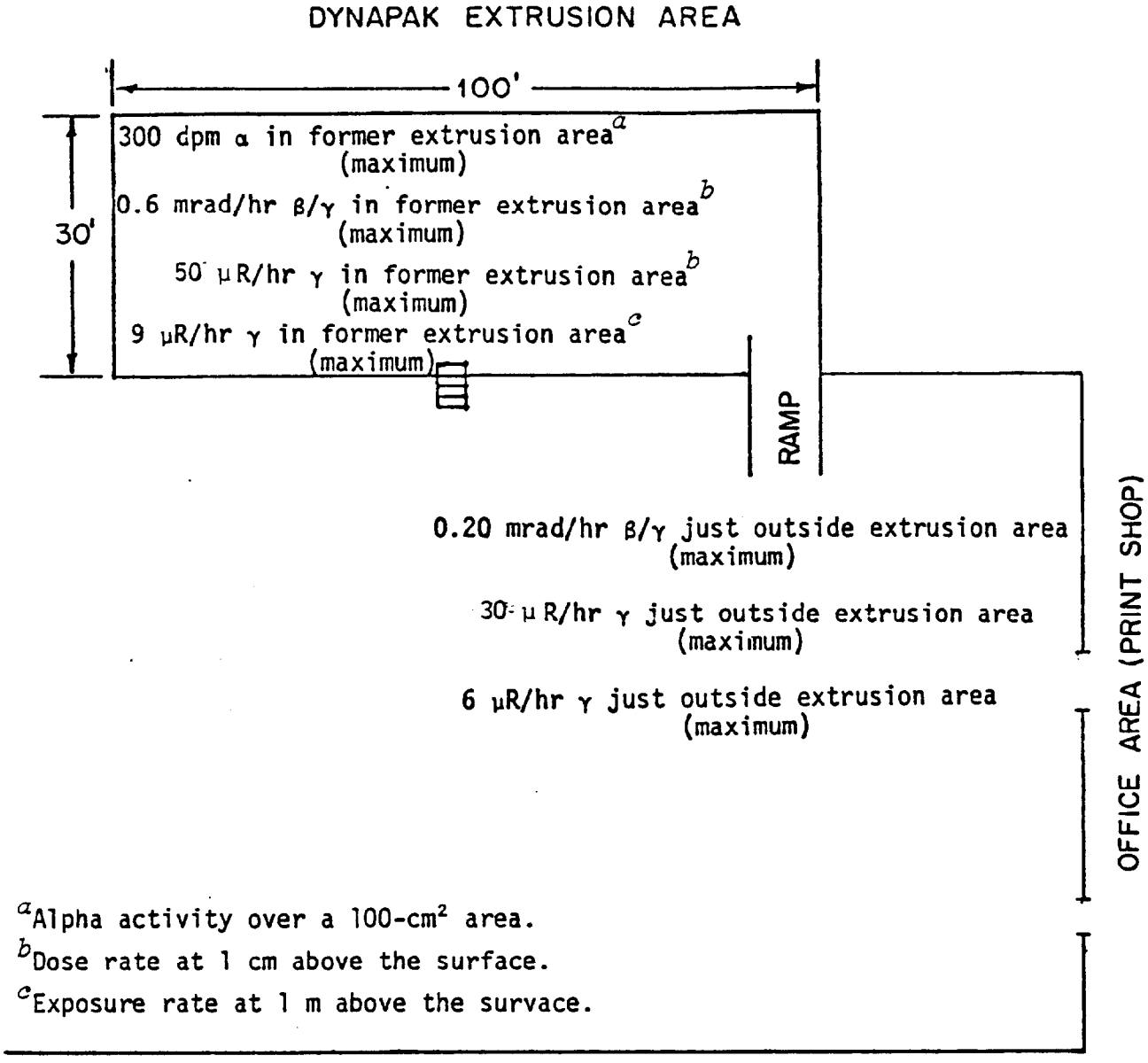


Fig. 2. Location and radiation levels inside the area once used for extrusion operations at the Bridgeport Brass Company site.

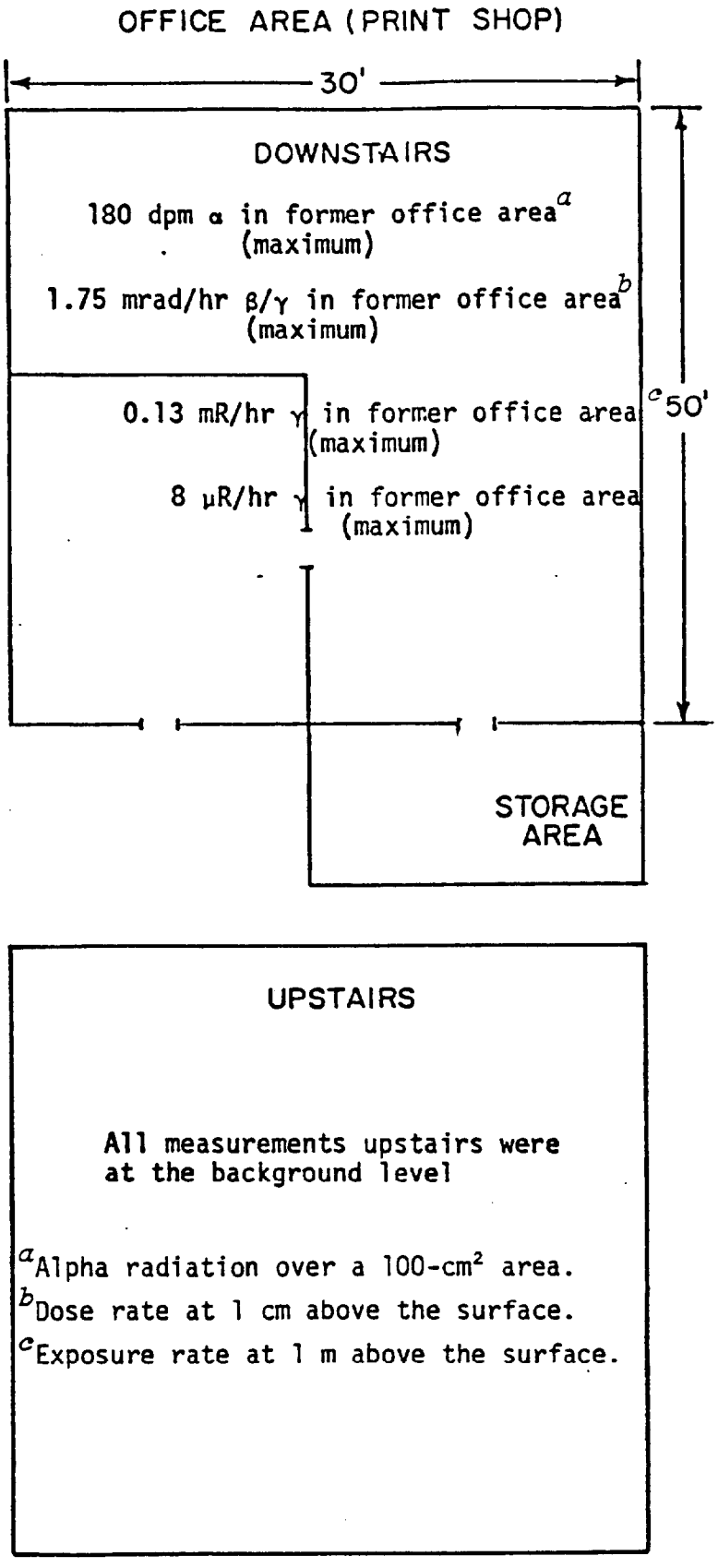


Fig. 3. Location and radiation levels inside the area used for office operations at the Bridgeport Brass Company site.

Bud — 11/5/10
From — 11/5/10
Return to AWG.

OCT 30 1964

John W. Ruch, Director
Feed Materials Division - OR

A. J. Breslin, Director
Health Protection Engineering Division, HASL, NY

CONTAMINATION SURVEY AT REACTIVE METALS, INC., SEYMOUR, CONNECTICUT

HSH:AJB

Summary
Accompanied by Mr. A. Grella of Reactive Metals, on October 21, 1964, I visited the Seymour facility, formerly occupied by Reactive Metals, to perform the survey requested in your telegram to Dr. Harley dated October 7. We inspected all rooms that were related to AEC contract activities and measured surface contamination in the following areas: machine shop, metal storage area, lab hood area, cutting and grinding room, and Dynapack area. All rooms were free of process and office equipment and were clean in appearance. Local exhaust ventilation systems had been removed from the process areas. The only fixtures and equipment in evidence were lighting fixtures, electrical, gas and compressed air services, air conditioning systems, and a few portable fire extinguishers.

In my judgment, the process areas have been cleaned of uranium contamination satisfactorily and can be released for unrestricted use.

Survey
Following facility decontamination by Reactive Metals, but prior to my visit, Mr. Grella had performed a detailed survey of floor contamination. His measurements were made on grid patterns established for each of the process areas. His survey results are shown in Figures 1 - 4.

My measurements were performed at locations selected randomly from the same grid patterns, covering about one-third of the locations included in his survey. (It should be noted that the locations were only approximately the same.) In addition, I measured contamination on a few surfaces above the floor such as window sills and shelves. The results are shown in Figures 5 - 9. Numbers on the floor plans correspond to those on Mr. Grella's diagrams. The circled numbers indicate locations at which measurements were obtained.

An Eberline PAC 1SA alpha survey meter and a Universal Atomics Model #700 beta-gamma survey meter were used for contact measurements. Smear sampling consisted of rubbing a one inch diameter filter paper over an area of approximately 100cm^2.

Measurements with the Eberline PAC 1SA are reported in Figures 5 - 9 in counts/minute/60 square centimeters. Those values may be converted approximately to disintegrations/minute/100 square centimeters, the usual units for surface contamination, by subtracting an instrument background of 100 counts/minute and multiplying the result by 4. In using this calculation, surface roughness is neglected. Consequently, contamination is underestimated to some degree.

The beta-gamma measurements are reported in units of millirad/hour. Any measurement up to .05 millirad/hour is equivalent to background.

The smear measurements are reported directly as net alpha disintegrations/100 square centimeters.

Results

Taking the measurements in all areas into account, 50% of the direct alpha measurements were $\leq$ 300 α dis/min/100cm^2, 87% were $\leq$ 2000 α dis/min/100cm^2, and 97% were $\leq$ 3200 α dis/min/100cm^2. The maximum value was 25,000 α dis/min/100cm^2.

The smear measurements were in a rather narrow range of 20 to 90 α dis/min/100cm^2. The single measurement in the lab hood area was 3 α dis/min/100cm^2.

With the exception of three or four values, the beta-gamma measurements did not exceed background. The highest value was 0.5 millirad/hour.

Agreement with Mr. Grella's data is good and certainly within the limits of expected differences for this kind of survey. According to Mr. Grella, the fixed alpha values listed on his survey sheets represent readings from a PAC 1SA corrected for a 50 c/m background. Therefore, a more appropriate heading for his measurements would be "net counts/min/60cm^2."

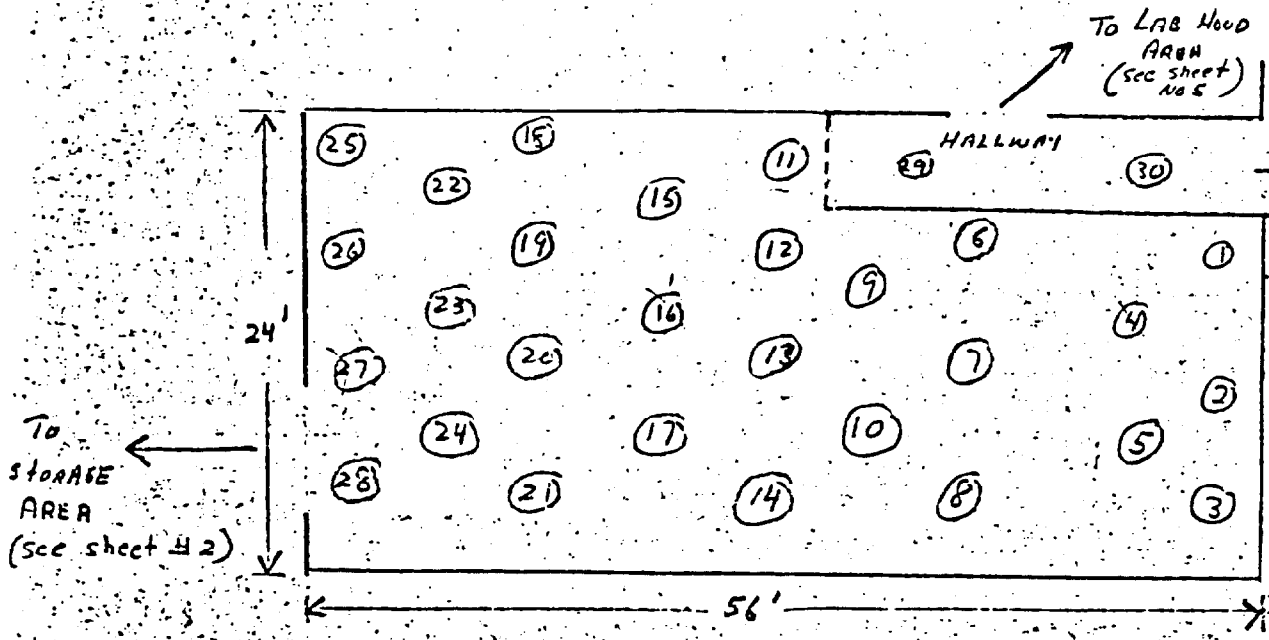
I am not aware of any AEC standards for surface contamination with which the survey data may be compared. However, the values are quite low and certainly are insignificant with respect to any mode of exposure that can be hypothesized.

As a point of reference, these values are well below the limits mentioned in the report "Health Protection Program Review of Special Metals Development Department, Reactive Metals, Inc., Saymour, Connecticut - June 1964" by William A. Pryor and Raymond L. Hervin.

Enclosures:
Figures 1 - 9

cc: C. S. Shoup, OR, w/encl.
A. Grella, RMI, w/Figs. 5-9
J. Hyder, Compliance Div., w/encl.

① MACHINE SHOP

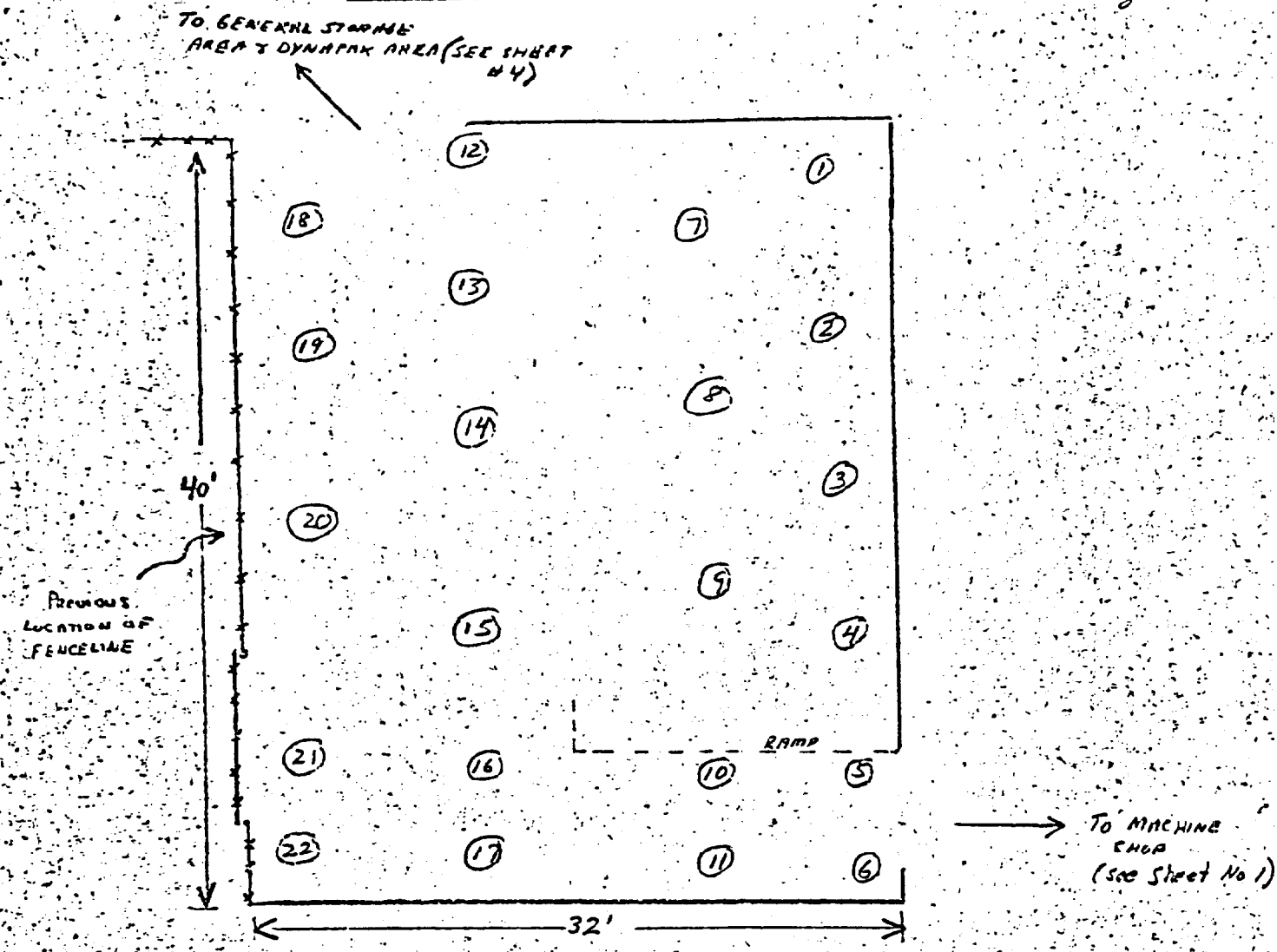


	alpha dlm/100cm² FIXED	alpha dlm/100cm² REMOVABLE	mrad/hr Beta-gamma
1	200	16	.05
2	350	21	.05
3	300	11	.10
4	500	18	.10
5	450	11	.25
6	400	6.5	.05
7	500	9.3	.05
8	400	24.1	.10
9	500	31.8	.20
10	500	23.6	.15
11	300	64.8	.05
12	300	25.8	.15
13	500	17.5	.15
14	100	34.6	.05
15	500	71.9	.05
16	1100	110	.25
17	400	98.3	.05
18	150	51.6	.05
19	600	48.9	.10
20	1000	19.2	.15
21	1300	72.5	.45
22	250	50.5	.05
23	250	42.8	.10
24	250	3.8	.15
25	150	36.8	.20
26	100	39.5	.05
27	400	63.7	.30
28	150	42.8	.10

HALLWAY

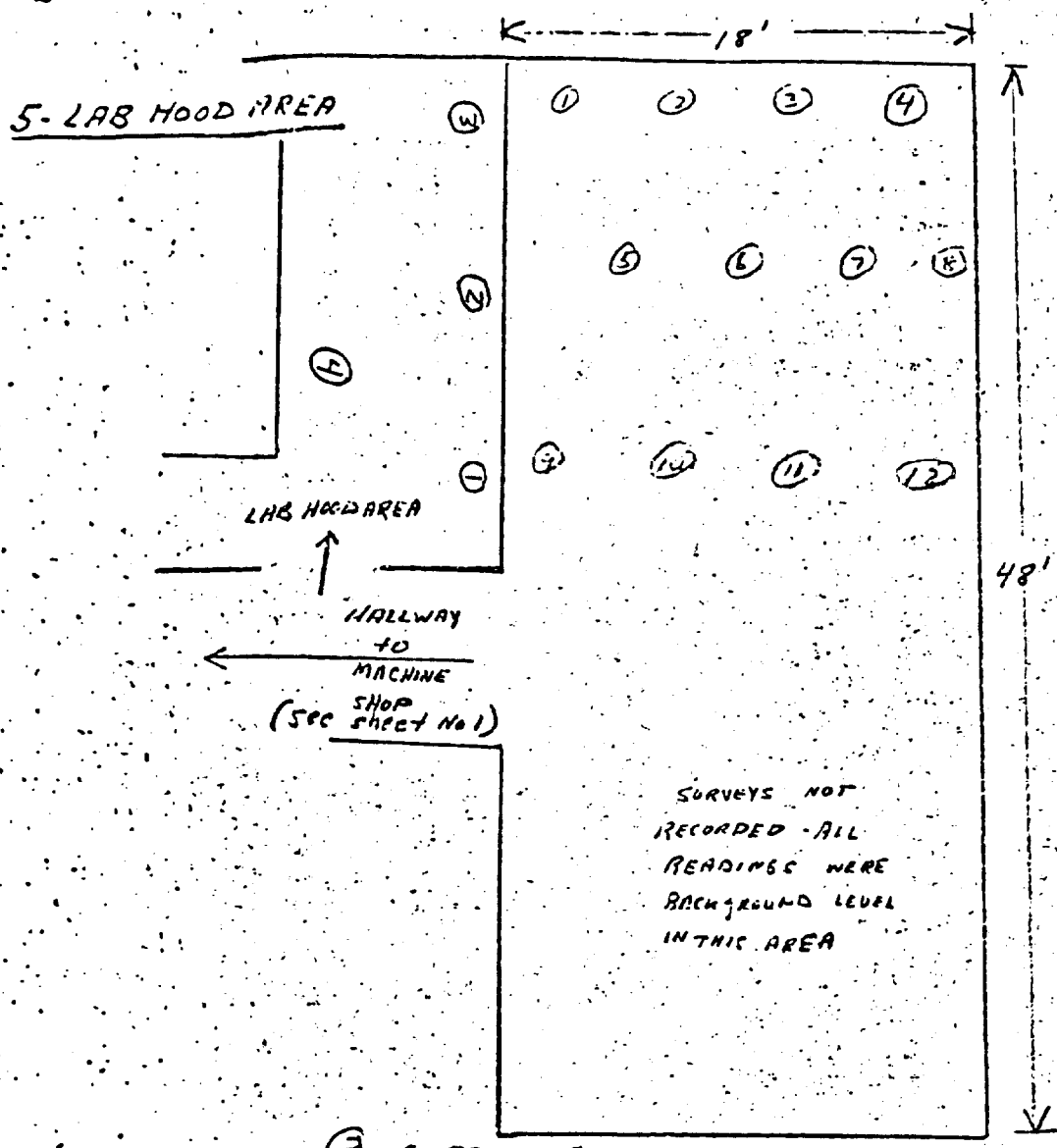
	Fixed alpha	Beta-gamma
29	250	.03
30	250	.02

2 - METAL STORAGE AREA



	Alpha d/m/100 cm² Fixed	Alpha d/m/100 cm² Removable	mRAD/HR Beta-gamma
1	50	0.5	0
2	500	71.4	0
3	100	18.6	0
4	100	1.0	0
5	300	9.3	.05
6	200	45.0	0
7	400	47.8	0
8	200	—	.05
9	200	112.0	0
10	150	7.1	0
11	200	28.0	0
12	400	12.6	.05
13	200	14.2	.05
14	400	27.4	.15
15	700	60.9	.30
16	300	39.0	.05
17	200	18.6	0
18	700	52.7	.10
19	200	19.7	.05
20	100	12.6	0
21	150	14.2	.30
22	150	30.7	.30

3 - Cutting - Grinding Room



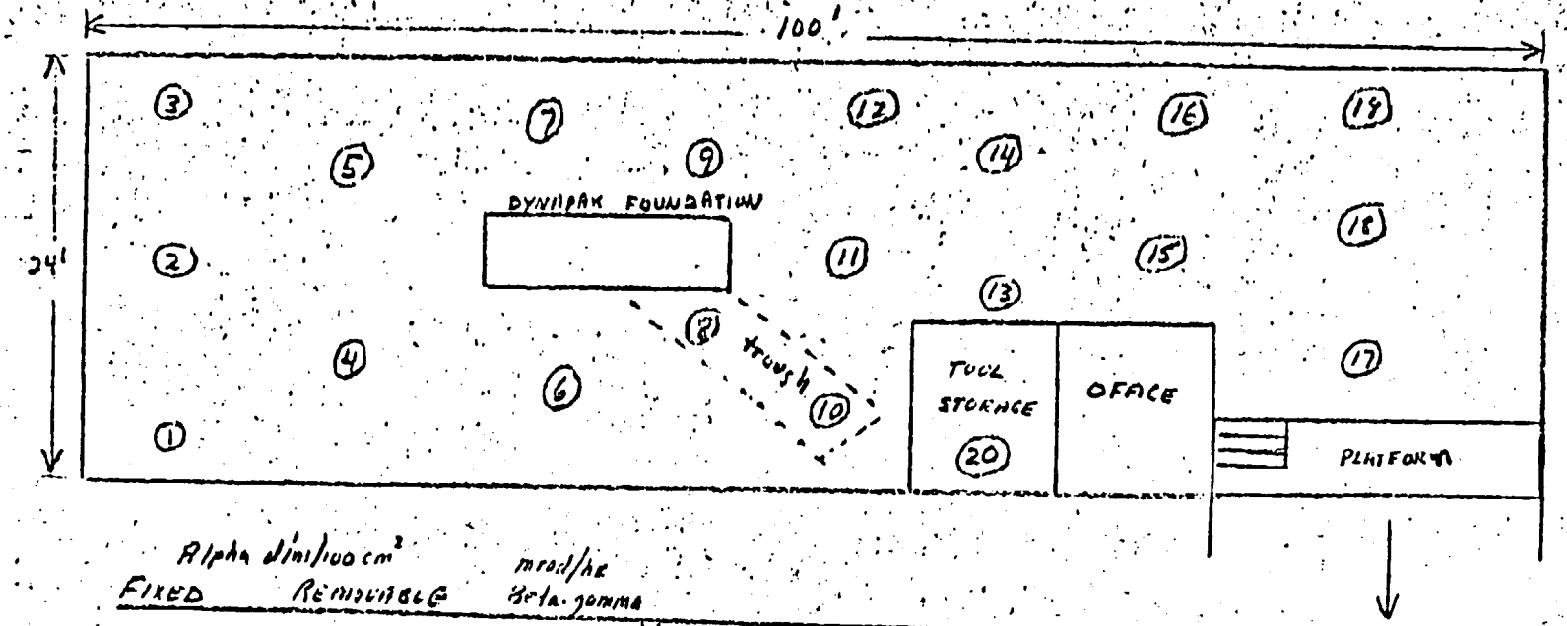
(3) CUTTING - GRINDING ROOM

	Alpha d/m/100 cm² Fixed	Alpha d/m/100 cm² Removable	mrad/hr Beta-Gamma
1	275	60	.05
2	275	21	.05
3	450	50	.45
4	150	25	0
5	150	20	.05
6	200	28	0
7	200	31	0
8	350	18	.05
9	100	14	0
10	150	31	0
11	50	20	0
12	50	32	0

(5) LAB HOOD AREA

	Fixed Alpha	Beta-Gamm
1	150	.03
2	200	.03
3	300	.03
4	200	.02

4 - DYNAPAK AREA

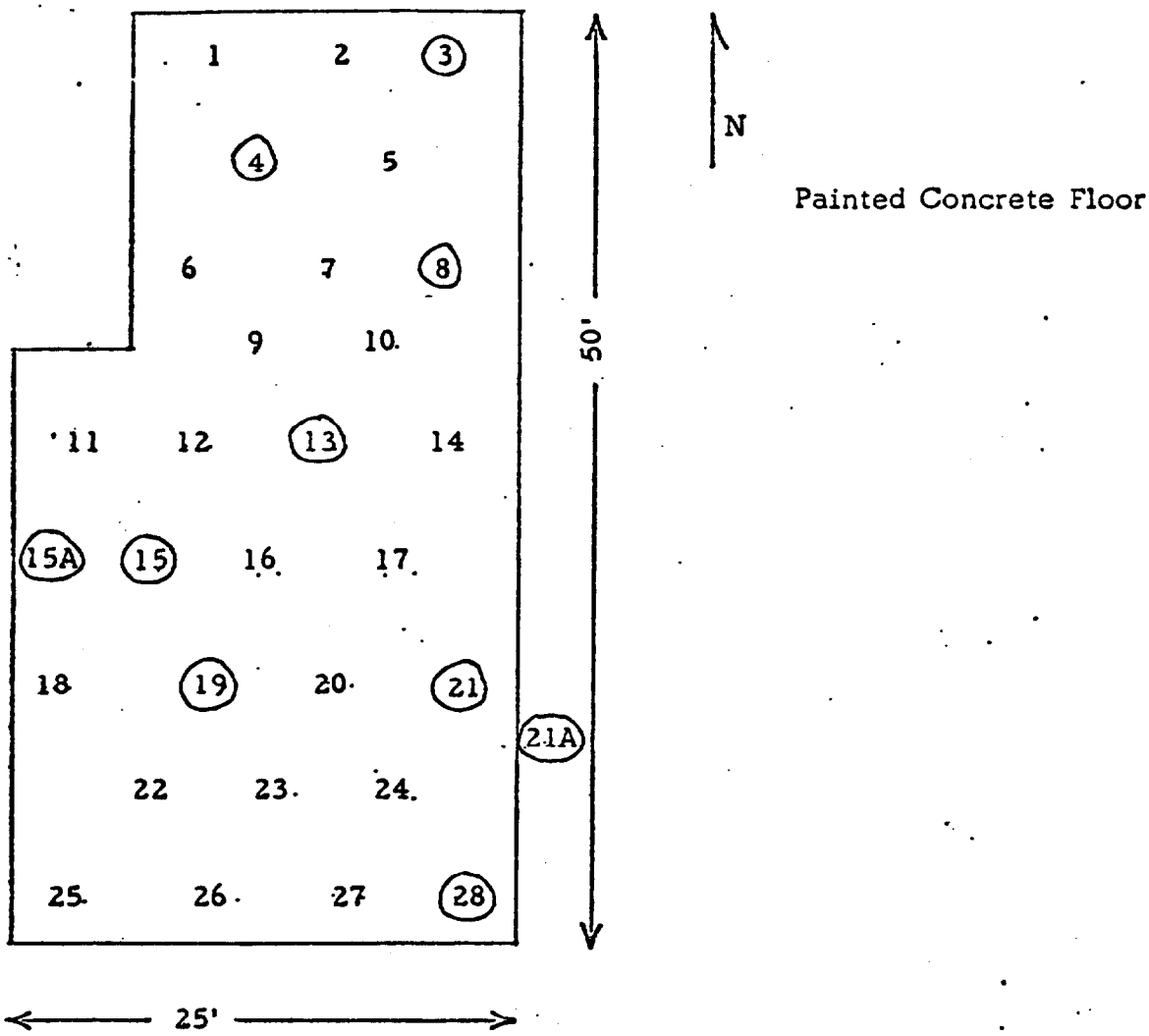


	Alpha dis/100 cm² Fixed	Removable	mrad/hr Beta-gamma
1	100	35.7	0
2	100	8.7	0
3	150	1.6	0
4	200	1.6	0
5	250	13.1	0
6	350	62.7	0
7	350	6.0	0
8	100	8.2	0
9	100	7.1	0
10	—	—	0
11	—	8.7	0
12	—	1.6	0

TO GENERAL STORAGE AND URANIUM STORAGE AREAS (SEE SHEET No 2)

Fig. 5

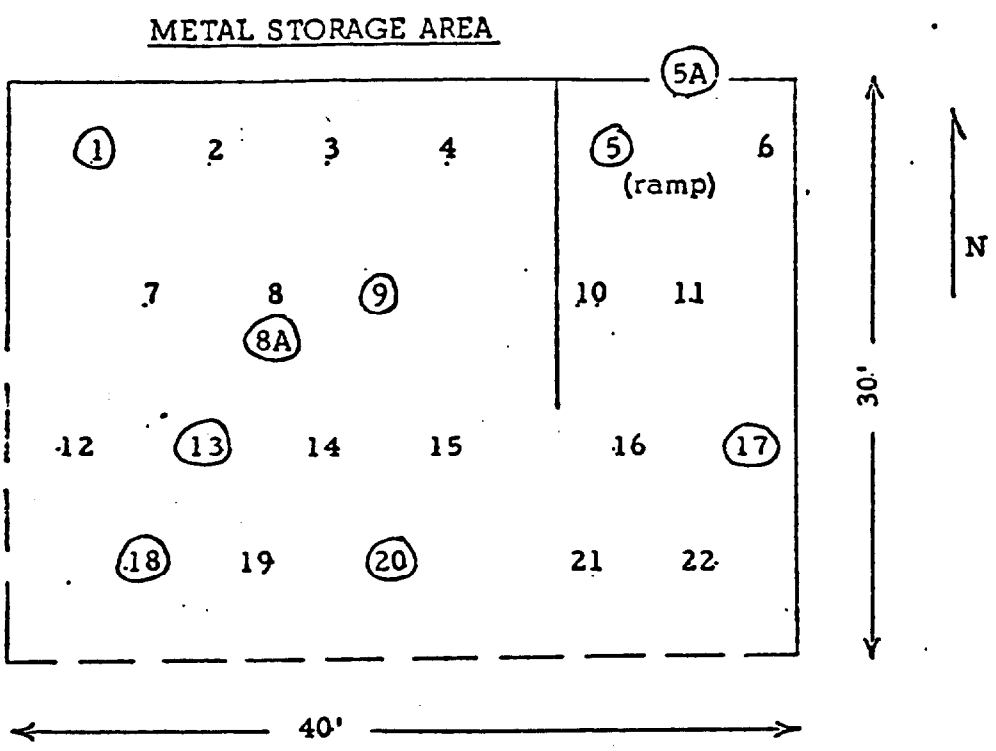
MACHINE SHOP



Location	Contact Reading α c/m/60cm²	Contact Reading β-γ mrad/hr	Smear α d/m/100cm²
3	400	.03	20
4	400	.04	20
8	500	.02	-
13	800	.05	90
15	600	.05	80
15A(Top of Shelf)	100	-	-
19	900	.02	70
21	6500	.5	-
21A (Window Sill)	300	-	-
28	700	.03	30

HASL - October 19

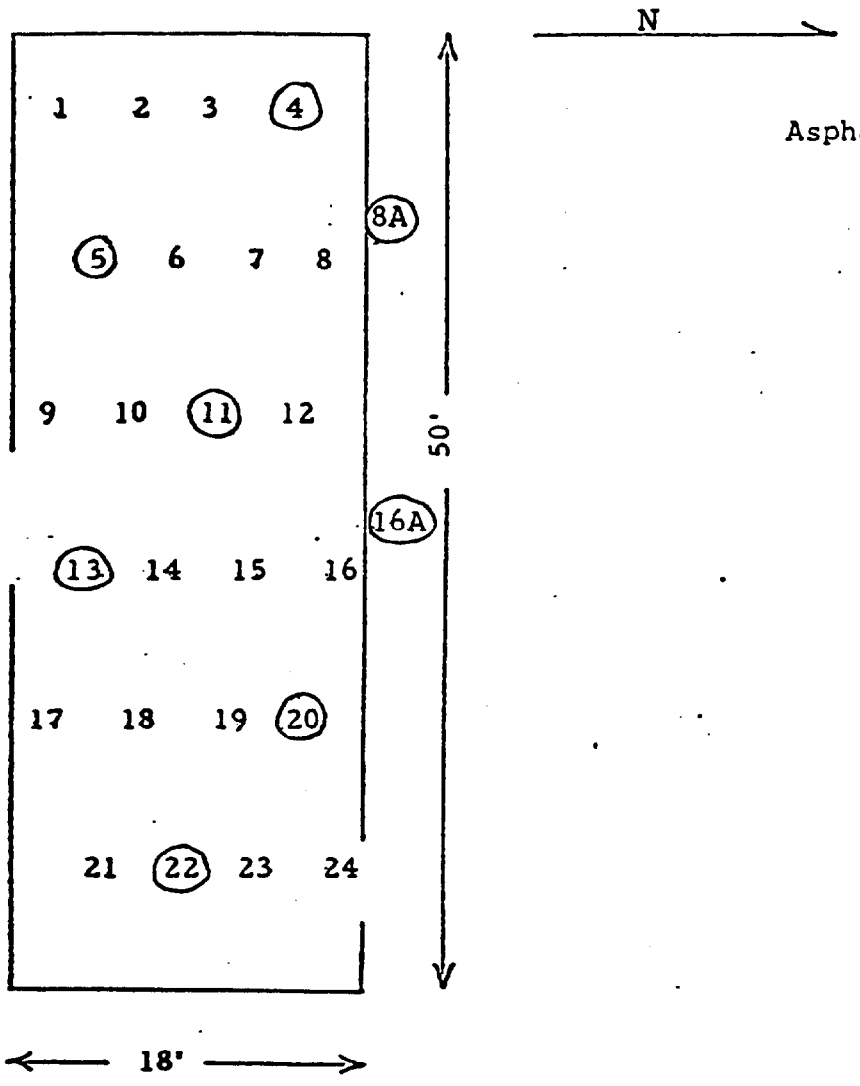
Fig. 6



Location	Contact Reading a c/m/60cm^2	Contact Reading β-γ mrad/hr	Smear a d/m/100cm^2
1	300	.02	40
5	400	.02	70
5A (Top of roll door housing)	300	-	30
8A (Light fixture)	100	-	60
9	700	.03	80
13	400	.10	80
17	400	.05	80
18	400	.08	-
20	500	.25	70

Fig. 7

CUTTING AND GRINDING ROOM

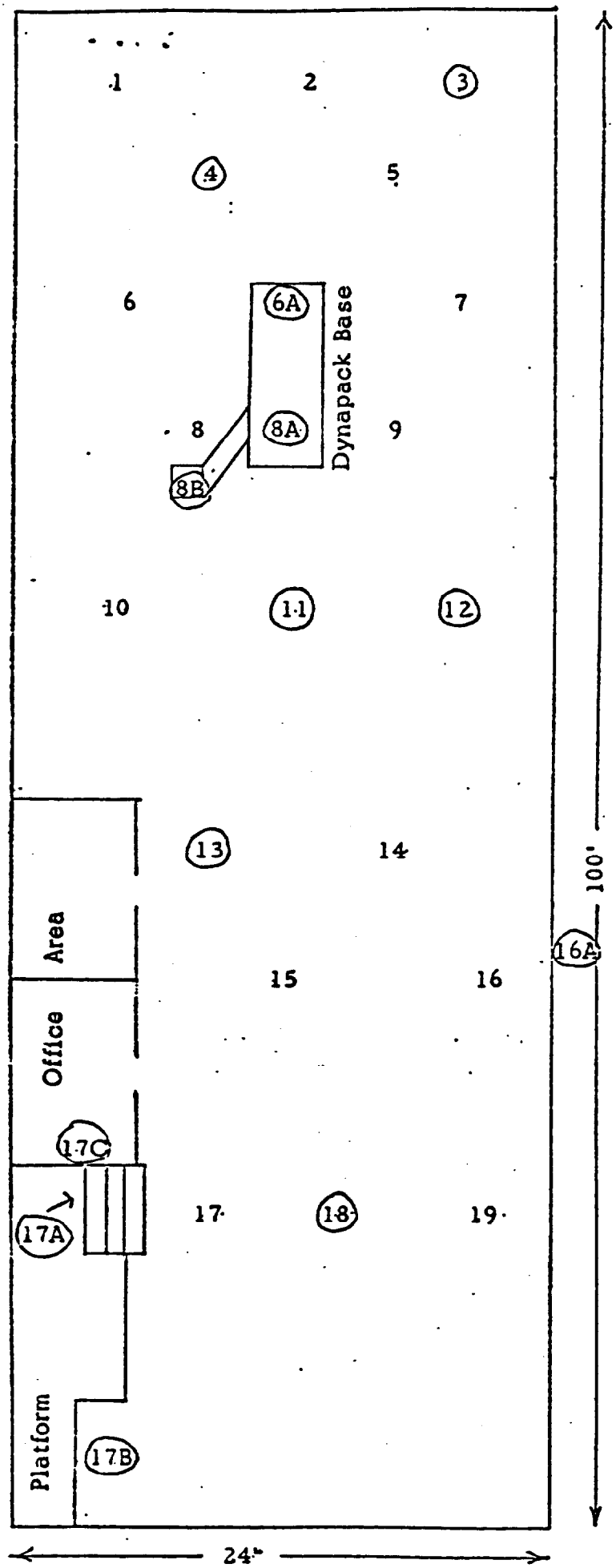


Location	Contact Reading α c/m/60cm²	Contact Reading β-γ mrad/hr	Smear α d/m/100cm²
4	300	.04	-
5	200	.06	50
8A (Window Sill)	800	.05	-
11	200	.02	-
13	200	.04	30
16A (Window Sill)	200	.02	-
20	100	.04	-
22	300	.01	20

DYNAPACK AREA

Fig. 8

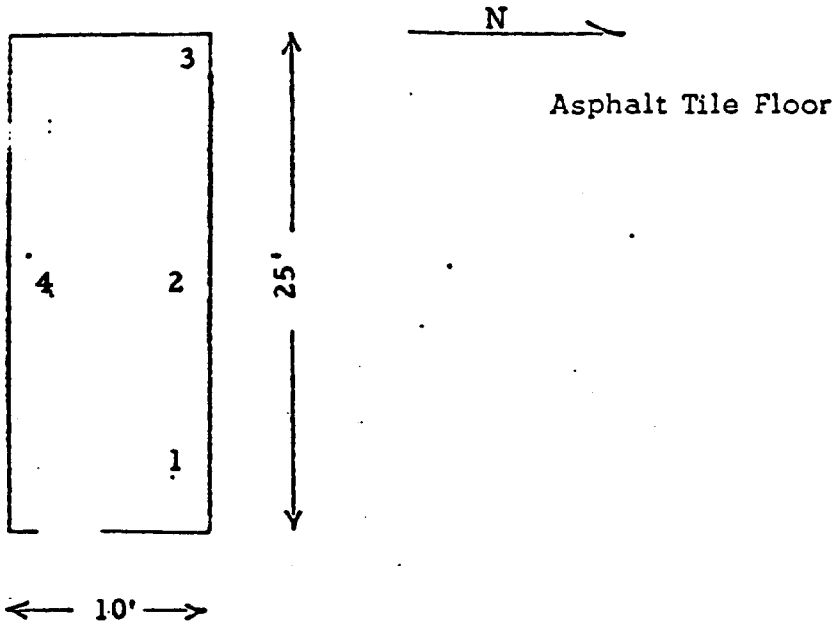
Painted Concrete Floor



Location	Contact Reading α c/m/60cm²	β-γ mrad/hr	α d/m/100cm²
3	100	.03	-
4	100	.01	20
6A (Base)	400	0.4	7
8A (Base)	200	.05	-
8B (Trench)	300	.07	-
11	100	.02	14
12	100	.03	-
13	250	.02	-
16A (Top Elect. Box)	250	.02	-
17A (Step)	350	.02	-
17B (Shelf)	400	.03	-
17C (Office Roof)	200	.03	-
18	200	.03	-

Fig. 9

LAB HOOD AREA



Location	Contact Reading a c/m/60cm^2	Contact Reading β-γ mrad/hr	Smear a d/m/100cm^2
1	300	.03	-
2	200	.03	3
3	150	.03	-
4	200	.02	-

HASL - October 1964