UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

AUG 27 1985

MEMORANDUM FOR: Darrel Wiedeman, Chief
Materials Inspection Section 1

FROM: Bruce Mallett, Ph.D., Chief
Materials Licensing Section

RE: Closeout of Atlantic Richfield/Harvey Technical Center Facility (Control No. 79495)

We are requesting that you perform a closeout survey of the facility described in the attached enclosure. We ask that you make the determination as to whether this facility meets our guidelines for release for unrestricted use. Of particular interest would be an assessment of residual levels in the storage well. Your contact in licensing for this matter should be W. Adam.

for Bruce S. Mallett, Ph.D.
Materials Licensing Section

cc: w/o enclosures W. Axelson

ORIGINAL FILE COPY

A1110

ARCO Petroleum Products Comapny
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License #12-00140-04

Attachment A

Contents

1. Radioactive Gold-198 Testing Material Disposition

2. Gamma wipe test results

3. Beta wipe test results 3 pages

CONTROL NO. 7 9495

ARCO Petroleum Products Company | Internal Correspondence

Date: May 28, 1985 ?

Subject: Radioactive Gold 198 Testing Material Deposition

From/Location: D. A. Wunsch - CP 6-3841-2278

To/Location: J. D. Phelps, Jr. - HTC

On May 6, 1985 the testing apparatus and 50 sample containers of coker intermediate streams were evaluated with an Eberline Model E-120, SN7998 for residual radioactive contamination. No measurable readings were seen on the .01 MR/HR scale. At that time Bill Kidd removed, disposed, and returned all of the sampling materials with the exception of the unused 53 mCi (2/26/85) Gold 198.

This gold material was surveyed 5/28/85 and found to have no measurable amounts of radiation and disposed the same day.

A wipe sample of the radiation storage area floor (1 square foot) is being sent to your attention to verify cleanliness of the area.

All of the testing apparatus has been removed. We have three small lead storage containers in the event of subsequent testing.

Call me if there are any further questions.

Doris

D. A. Wunsch

DAW/ss
CORR75.28d

cc: F. Formway
W. T. Kidd
W. R. Powell

H022860

WORK CONTINUED FROM PAGE

AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE

6/19/85 Wiped 100 cm² area with wet paper towel

ARCO Petroleum Products Company Division of AtlanticRichfieldCompany

Calculations Chart

Subject: Houston γ counting

Sheet number of

Date: 6/19/85

MS-2 Sen # 1921+ SPA 4 #126

			Ave blk 576 net cpm	net dpm	
Cs137 "A"	27450/1	27450			
Sample blkg	5653/10	565			
1, 2, 3, 4	5729/10	573	−3	0	<MDA
5, 6, 7, 8	5693/10	569	−7	0	<MDA
9, 10, 11, 12	5800/10	580	+4	31	<MDA
13, 14, 15, 16	5760/10	578	+2	16	<MDA
17, 18, 19, 20	5776/10	578	+2	16	<MDA
Wipe from Cherry Point Cherry Pt. wipe 1 of 2	5986/10	599	+23	180	<MDA
blkg	5862/10	586			

$$\text{eff} = \frac{27450}{215{,}000} = .1277$$

$$3\sigma\ \text{MDA} = \pm 3\sqrt{\frac{576 \pm 2}{10}} = \pm 32\ \text{cpm} \Rightarrow 252\ \text{dpm} \Rightarrow 1.1 \times 10^{-4}\ \frac{\mu c}{100\ cm^2}$$

APPC 504 (10-81)

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DATE

SUBJECT

OBJECTIVE

DATE

6/26/85 Bunnos from Houston. Wiped 100 cm² with wet paper towel. Counted for 20 min in ~20 ml Aquasol in Tri Carb

PROGRAM #= 12 ~~06/05/85~~ 00:54
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0- 0 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 20.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	20.00	123961.	.13	14848.5	.37	.00	.00	1104	19.024	^	22
12	2	20.00	17351.6	.34	128160.	.12	.00	.00	1085	23.695		43
12	3	20.00	17534.9	.34	30.25	8.13	.00	.00	593.	11.961		65
12	4	20.00	20.95	9.77	19.15	10.2	.00	.00	653.	15.927		86
12	5	20.00	24.40	9.05	17.55	10.6	.00	.00	615.	16.227		107
12	6	20.00	33.85	7.69	22.75	9.38	.00	.00	401.	16.132		128
12	7	20.00	27.25	8.57	21.15	9.72	.00	.00	386.	15.220		149
12	8	20.00	23.45	9.24	19.55	10.1	.00	.00	370.	15.210		170
12	9	20.00	63.50	5.61	29.15	8.28	.00	.00	475.	15.642		191
12	10	20.00	19.55	10.1	19.55	10.1	.00	.00	441.	13.817		212
12	11	20.00	23.30	9.26	18.30	10.4	.00	.00	572.	15.425		237
12	12	20.00	21.20	9.71	19.00	10.2	.00	.00	605.	16.697		258
12	13	20.00	17.45	10.7	20.95	9.77	.00	.00	306.	17.142		279
12	14	20.00	18.55	10.3	18.80	10.3	.00	.00	299.	17.384		300
12	15	20.00	18.50	10.4	22.75	9.38	.00	.00	333.	16.021		323
12	16	20.00	17.75	10.6	18.95	10.2	.00	.00	312.	17.163		343
12	17	20.00	21.25	9.70	19.35	10.1	.00	.00	372.	15.236		365
12	18	20.00	16.15	11.1	19.65	10.0	.00	.00	332.	17.049		386
12	19	20.00	20.65	9.84	20.65	9.84	.00	.00	309.	17.697		406
12	20	20.00	26.30	8.72	19.00	10.2	.00	.00	302.	14.885		427
12	21	20.00	14.65	11.6	17.40	10.7	.00	.00	330.	16.344		449
12	22	20.00	21.90	9.56	22.85	9.36	.00	.00	417.	17.726		470
12	23	20.00	16.20	11.1	17.55	10.6	.00	.00	347.	16.406		491
12	24	20.00	29.40	8.25	19.90	10.0	.00	.00	317.	17.637		512
12	25	20.00	15.35	11.4	18.50	10.4	.00	.00	303.	18.303		533
12	27	20.00	19.80	10.0	18.80	10.3	.00	.00	543.	16.777		558
12	28	20.00	16.45	11.0	23.20	9.28	.00	.00	266.	18.634		578

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H022862

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE 6/20/85

Houston Pb wipes + cheany Pt wipe.
Paper towel wetted and wipe 100 cm² counted
in Aquasol for 20 min in Tri Carb

Sample	Item	gross cpm H^3/C^{14}	net cpm H^3/C^{14}	net dpm	µCi/100cm²
1	NEN H^3	123961/14899	123938	eff H^3 = .621	
2	NEN C^{14}	17352/128110	128141	eff C^{14} = .946	
3	2ml H_2^3O	17535/30	17512	eff H^3 = .417 (eff C^{14} = .96	
4	blg wipe	21/19	0/0		
5	blg wipe	24/18	1/0		
6	Houston #1	* 34/23	11/4	26/7	1.2×10^{-5}/3H
7	2	27/21	4/2	10	
8	3	23/19	0/0	0	
9	4	* 64/29	41/10	98/24	4.4×10^{-5}/1.1
10	5	20/20	0/1	2	
11	6	23/18	0/0	0	
12	7	21/19	0/0	0	
13	8	17/21	0/3	4	
14	9	19/19	0/0	0	
15	10	* 19/23	0/4	0/7	<MDA/3H
16	11	18/19	0/0	0	
17	12	21/19	0/0	0	
18	13	16/20	0/0	0	
19	14	21/21	0/2	4	
20	15	26/19	3/0	7	
21	16	15/17	0/0	0	
22	17	* 22/20	0/4	0/7	<MDA/3H 10^{-}
23	18	16/18	0/0	0	
24	19	* 29/20	6/1	14/2	6×10^{-6}/<MD
25	20	15/19	0/0	0	
27	Chem Pt. 2ml H_2O	20/19			
28	Chem Pt wipe	* 17/23	0/4	0/7	<MDA/3H

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AtlanticRichfieldCompany

Harvey Technical Center

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PROJECT NO.

SUBJECT

OBJECTIVE

DATE

H^3 std 199,600 dpm (copy H022840)
C^{14} std 151,400 dpm
H_2O std 42,000 dpm

H^3 3σ MDA = $\pm 3\sqrt{\frac{2\times 23}{20}}$ = 5 cpm → 11 dpm = 4.9×10^{-6} μc/wipe

C^{14} 3σ MDA = $\pm 3\sqrt{\frac{2\times 19}{20}}$ = 4 cpm → 7 dpm = 3.3×10^{-6} μc/wipe

H^3 counts above 28 dpm or C^{14} counts above 23 dpm are > MDA

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ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License #12-00140-04

Attachment A

Contents

1. Beta wipe test results 13 pages

2. Gamma wipe test results 5 pages

3. Gamma survey results

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE	
5/31/85	Assay of equipment to be moved Counted for 20min in Tri Carb, Wet paper towels, wiped 100cm2 area. Counted in Aquasol

	Sample	ITEM	gross cpm H-3/C-14	net cpm. H-3/C-14	µc/wipe H3/C14
	1	NEN H-3	162127/19270	0.617 eff	
	2	NEN C-14	12718/85277	0.828 eff	
	3	H^3_2O std	17907/34	0.417 eff (H3) / eff 0.560 (C14)	
	4	File 1 TOP	29/18		<MDA
	5	File 1 BOT	29/21		
	6	File 2 TOP	28/17		
	7	File 2 BOT	29/19		<MDA
	8	File 3 TOP	* 38/22	9/0	$\frac{(0 \times 10^{-5}\ \mu c}{<MDA}$
	9	File 3 BOT	47/20		<MDA
	10	File 4 TOP	25/19		
	11	File 4 BOT	24/18		
	12	File 5 TOP	28/20		
	13	File 5 BOT	27/18		
	14	Old Type	25/17		
	15	Steel table	24/19		
	16	N-4 chairs	25/19		
	17	N-4 Desk	25/18		
	18	Hot Plate	25/19		
	19	Balance RE2000	25/19		
	20	Bal Analytical	27/17		
	21	Dept Top File N-4	29/20		
	22	Small File N-1	28/21		
	23	IBM Tye writer	27/20		
	24	IBM Tye Table	25/20		
not moved	25	GAU DESK	24/21		
	26	TOP DESK	26/18		
	27	N-2 Lab Handle	27/18		<MDA

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AtlanticRichfieldCompany

Harvey Technical Center

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PROJECT NO.

SUBJECT

OBJECTIVE

DATE

	Sample	ITEM	Gross cpm H-3/C-14	net cpm H-3/C-14	<MDA
	28	N-2 Cab Bot	23/19		
cleaned and resurveyed	29	N-2 Cab Shelf 2nd from bottom	* 41/26	12/4	$\frac{13\times10^{-5}\mu c}{3\times10^{-6}\mu c}$ <MDA
not moved	30	N-6 N Cab Handle	29/20		
	31	N-6 N Cab Bot	* 28/27	0/5	$\frac{<MDA}{4\times10^{-6}\mu c}$ <MDA
	32	N-6 N Cab mid	31/20		
	33	N-6 Cab 2nd shelf from bot handle	* 84/150	55/132	$\frac{5.9\times10^{-5}\mu c}{1.06\times10^{-4}\mu c}$ <MDA
	34	N-6 E Cab bot	29/21		
not moved	35	N-6 E Cab inside 2nd shelf from bot	27/21		
	36	WIPE BKG	29/18		
	37	TRI CARB HANDLE	27/19		
	38	TRI CARB CONTROLS	27/21		
	39	TRI CARB CHAMBER FLOOR	25/20		
	40	TRI CAR FRONT	25/18		

<MDA

3σ MDA(H^3) $= \pm 3\sqrt{\frac{29\times2}{20}} = \pm 5$ cpm/.417 = 12dpm or $5.4\times10^{-6}\frac{\mu}{wi}$

3σ MDA (C^{14}) $= \pm 3\sqrt{\frac{18\times2}{20}} = \pm 4$ cpm/.560 = 7dpm or $3.2\times10^{-6}\frac{\mu}{wi}$

H^3 std 284500 (1/12/84) $\xrightarrow{.923}$ 262,600 (5/31/85)
C^{14} std 103,200 dpm
H^3 std 42,000 dpm (5/30/85)

Wipe less than MDA if $H^3 \leq 34$ cpm
$C^{14} \leq 22$ cpm

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE						
6/2/85	Assay of equipment to be moved. Counted for 20min in Tri Carb (Wet paper towels, wiped 100cm² area. Counted in Aquasol					
	Sample ITEM		gross cpm H3/C-14	net cpm H3/C-14	μc/wipe H3/C14	
	1	NEW H3	124586/14815	.624 eff		
	2	NEW C-14	17391/28001	.846 eff		
	3	H2O std	17537/33	.418 eff H3 (at .567 (C14		
	4	Dry Cove 5/2/85	25/18		<MDA	
	5	JDP Bookshelf	27/20			
	6	JDP Bulk core handle	30/21			
	7	JDP Bookshelf bottom	28/20			
	8	JDP chair	19/18		<MDA	
not moved	9	LAB Attention Equip	* 71/53	46/31	5×10⁻⁹μc/ 2×10⁻⁹	
	10	P200 Balance	* 34/27	9/5	1×10⁻⁹μc/ 4×10⁻⁶	
not moved	11	Vac Pump	* 63731/37	63731/15	6.9×10⁻²μc/ (.2×10	
not moved	12	Drill 1/4"	* 1521/37	1496/15	1.6×10⁻³μc/ 1.2×10	
cleaned resurveyed ~~not moved~~	13	Variac	* 675/23	650/1	7×10⁻⁴μc/ 8×10	
	14	PE-100 Bal	* 35/27	10/5	10×10⁻⁵μc/ 4×10	
	15	New Hammermill	* 41/23	16/1	1.7×10⁻⁵μc/ 8×10	
cleaned resurveyed	16	Chart Recorder	* 51/57	26/35	3×10⁻⁵μc/ 3×10	
	17	N-2 Cab shelf 1	27/19		<MDA	
	18	N-2 Cab shelf 2	27/19			
	19	N-2 Cab 3rd shelf	28/20			
	20	N-2 Cab 4th shelf	29/20		<MDA	
	21	N-2 Cab 5th shelf	* 33/24	8/2	9×10⁻⁶μc/ 1.6×10	
	22	N-2 cab inside left door	* 31/19	6/0	6×10⁻⁶μc/ <MDA	
	23	N-2 cab inside right door	* 40/29	15/7	1.6×10⁻⁵μc/ 6×10⁻⁶μ	
	24	N-2 cab outside left door	25/20		<MDA	
	25	N-2 cab outside right door	26/19		<MDA	
	26	N-2 cab left side out	* 33/20	8/0	9×10⁻⁶μc/ <MDA	
	27	N-2 cab right side out	25/20		<MDA	

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H022841

AtlanticRichfieldCompany

Harvey Technical Center

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PROJECT NO.

SUBJECT

OBJECTIVE

DATE

Sample	ITEM	gross/cpm H3/C14	net cpm H3/C14	µc/gm H3/C14
28	N-2 cab top	24/18		<MDA
29	N-2 cab back *	35/21	10/0	1.1×10⁻⁵µc/ <MDA
30	wipe blg	26/19		<MDA
31	screwdriver X 261	27/20		<MDA
32	Tri Lab Pan *	30/23	5/1	5×10⁻⁶µc / 8×10⁻⁷
33	Tri Lab Tray box	26/21		<MDA
34	MS-2 1278 *	29/23	4/1	4×10⁻⁶µc / 8×10⁻⁷
35	MS-2 1521	29/21		<MDA
36	MS-2 1185	22/20		
37	SPA 4 152	27/24		
38	SPA 4 126	26/20		
39	SPA 3 probe	27/17		
40	SPA-3 cable	26/18		
41	SPA-4 cable #1	26/19		
42	SPA-3 long cable	27/20		
43	Sealed cable	25/17		<MDA
44	Power Cord #1 *	27/24	2/2	2×10⁻⁶µc/ 1.6×10⁻⁶
45	Power Cord #2	26/21		<MDA
46	Power Cord #3	23/20		
47	#126 quency stds	29/21		
48	#177 quency stds	23/20		
49	Packard stds	26/18		
50	Tri Lab pan	24/19		
51	Chartrecorder #1	21/18		
52	Wipe blg 5/31/85	24/18		<MDA

54 30 MDA (H3) = ±3 $\sqrt{\frac{25\times2}{20}}$ = 5 cpm → 12 dpm = 5.4×10⁻⁶ µc/wipe

30 MDA (C14) ± 3 $\sqrt{\frac{18\times2}{20}}$ = 4 cpm → 7 dpm = 3.2×10⁻⁶ µc/wipe

WORK DONE BY H3 gl/cl 296,200 dpm (1/20/81) DATE → 199,600 dpm 6/2/85 WORK CONTINUED ON PAGE

C14 gl/cl (SIGNATURE)

READ AND UNDERSTOOD BY (1) 151,400 dpm CONTROL NO. 7949 DATE

H3 osl/cl (SIGNATURE)

(2) 42,000 dpm (5/30/85) DATE

HU22842

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE 6/4/85

Assay of equipment to be moved - Counted for 10 min in Tri Carb. Wet paper towels, wiped 100 cm² area. Counted Aquasol

Sample	Item	gross cpm H3/C14	net cpm H3/C14	pCi/cm H3/C14
1	NEN H-3	124244/14840	eff .622	
2	NEN C-14	175511/178252	eff .847	
3	H2O STD	17532/31	eff .417 (H3) (eff .968 (C14))	
4	BLG WIPE	27/18		
5	A02 562	31/21		<MDA
6	A02 509	28/18		
7	E120/0045	25/21		
8	ET20/0833	27/17		
9	E530 672	27/19		
10	E530 186	25/19		
11	DOSE 24684	24/20		
12	DOSE 2688/83	29/17		<MDA
13	LOG METER	* 57/23	25/5	3×10^{-5}/4×10^{-6}
14	MACRO SET PIPETTER	27/19		<MDA
15	BIBOT	* 33/19	8/1	9×10^{-6}/8×10^{-7}
16	DEMET CAT	* 32/29	7/1	8×10^{-6}/8×10^{-7}
17	PIPET TIPS	30/19		<MDA
18	SCINT REPLICA 4 BTL	* 46/39	21/21	2×10^{-5}/1.7×10^{-5}
19	SCINT TOL	29/20		<MDA
20	AQUASOL #1	* 34/25	9/7	1.0×10^{-5}/6×10^{-6}
21	AQUASOL #2	* 34/18	9/5	1.0×10^{-5}/4×10^{-6}
22	LEAD RENC	23/23		<MDA
23	LEAD LIO	23/23		<MDA
24	MET SUITCASE	* 33/21	8/3	9×10^{-6}/2×10^{-6}
25	SCINT VIALS	23/18		<MDA
26	FLOW COUNTER HEAD	* 30/34	5/16	5×10^{-6}/1.3×10^{-5}
27	FLOW COUNTER BASE	* 39/27	14/9	1.5×10^{-5}/7×10^{-6}

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE

Sample	ITEM	gross cpm H3/C14	NET cpm H3/C14	
28	FLOW COUNTER TURN TABLE	28/21		<MDA
29	6" crescent	25/20		
30	Vice grip	26/21		
31	hack saw	24/16		
32	tubing cutter	25/19		
33	Ice pick	21/19		
34	8" crescent PB	24/18		<MDA
35	pliers	22/19		
36	press reg	* 37/20	12/2	1.3×10^{-5} / 1.6×10^{-6}
37	FLOW COUNTER CABLE	* 195/41	180/23	1.9×10^{-4} / 1.8×10^{-5}
38	CHAMBER LFO	* 37/44	12/23	1.3×10^{-5} / 1.8×10^{-5}
39	CHAMBER	* 94/57	69/39	7×10^{-5} / 3×10^{-5}
40	CHAMBER FEET	* 32/25	7/7	8×10^{-6} / 6×10^{-6}
41	0 BLOW HAND TRUCK PLAT	* 63/17	38/0	4×10^{-5} <MDA
42	0 BLOW HAND TRUCK HANDL	* 54/16	29/0	3×10^{-5} <MDA
43	METAL SHEARS	20/21		<MDA
44	Rot Tach	22/20		
45	USSV Pliers	27/20		
46	half round file	21/17		
47	Chisel	21/16		
48	Hand file	20/18		
49	10" pipe wrench	25/19		
50	screwdriver	22/17		
51	Square	21/19		
52	1/2" drill	23/18		
53	O_2 cyl	18/20		
54	Level D102D	24/21		<MDA

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H022844

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE	Sample	ITEM		gross cpm H3/C14	net cpm H3/C14	
	55	Manometer	*	50/24	25/6	3×10⁻⁵/5×10⁻⁶
	56	GP tube		22/20		<MDA
	57	Riffler	*	40/30	23/12	2×10⁻⁵/1.0×10⁻⁵.
	58	RA Pan #4		27/21		<MDA
	59	Rifflle Pan #3		27/20		↓
	60	Riffle Pan #2		23/17		<MDA
	61	Riffle Pan #1	*	30/26	5/8	5×10⁻⁶/6×10⁻⁶
cleaned recovered	62	Torch	*	134/24	109/6.	1.2×10⁻⁴/5×10⁻⁶
	63	Thor 1/4" drill		21/20		<MDA
	64	RAD MAT'L ~~LARGE~~		26/22		↓
	65	~~LARGE RAD~~ ~~LARGE~~		31/17		<MDA
	66	RAD ~~LARGE~~ SMALL	*	34/18	9/0	1.0×10⁻⁵/<MDA
	67	HDS 3A CART		23/17		<MDA
	68	New BOY SCENT UTIL		24/20		↓
	69	Beable stel tag		30/21		<MDA
	70	8 Stds can		26/18		
not moved	71	power glat	*	299/67	274/49	3×10⁻⁴/4×10⁻⁵
	72	BP test Hose		3/22		<MDA
	73	Day test meter #4	*	45/21	20/3	2×10⁻⁵/2×10⁻⁶
	74	aqueous degreser tap	*	58/19	33/1	4×10⁻⁵/8×10⁻⁷
	75	Aquasol		30/22		<MDA
	76	BIG CAPE		23/17		↓
	77	SMART Al tube		31/21		
	78	3/4" Al tube		20/19		
	79	Long Al tube		21/18		
	80	keyboard		22/19		<MDA
	81	Computer terminal		27/20		

WORK DONE BY _____ (SIGNATURE) DATE _____ WORK CONTINUED ON PAGE _____

READ AND UNDERSTOOD BY (1) _____ (SIGNATURE) DATE _____

(2) _____ DATE _____

WORK CONTINUED FROM PAGE

AtlanticRichfieldCompany

Harvey Technical Center

H022845

PROJECT NO.

SUBJECT

OBJECTIVE

DATE

	Sample	ITEM	gross cpm H3/C14	net cpm H3/C14
	82	RAD SHOP LABELS	22/18	LMDA
	83	RAD MAN LOCKS	22/17	
	84	BADGE BOARD	24/19	
	85	SCISSORS	21/16	
	86	Virginia foam	23/19	
	87	Baggies	23/16	
	88	9V #1	21/18	
	89	9V #2	22/17	
	90	D #1	21/17	
	91	D #2	25/20	
	92	D #3	23/20	LMDA
not moved	93	BTM N2 FILT *	62/26	37/8 $7\times10^{-5}/6\times10^{-6}$
	94	temp sensor	25/19	LMDA
	95	TV *	41/24	16/6 $1.7\times10^{-5}/5\times10^{-6}$
	96			LMDA
	97			
	98	HOUSTON CAB FRONT WIPE	30/17	
	99	HOUSTON FLOOR WIPE	28/19	LMDA
	100			
	101			

s/ds same as on pg H022841

3σ MDA (H^3) $= \pm 3\sqrt{\frac{25\times2}{10}} = 7$ cpm $\Rightarrow 11$ dpm $= 5\times10^{-6}$ µc

3σ MDA (C^{14}) $= \pm 3\sqrt{\frac{18\times2}{10}} = 6$ cpm $\Rightarrow 10$ dpm $= 5\times10^{-6}$ µc

WIPES LESS THAN 32 cpm (H^3) AND 24 cpm (C^{14}) are less than MDA

WORK DONE BY _____ (SIGNATURE) DATE _____ WORK CONTINUED ON PAGE _____

CONTROL NO. 949

READ AND UNDERSTOOD BY (1) _____ (SIGNATURE) DATE _____

(2) _____ (SIGNATURE) DATE _____

H022846

WORK CONTINUED FROM PAGE

AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE

6/5/95 Assay of equipment to be moved. Counted for 10 min in Tri-Carb. Wet paper towel wipes, wiped 100 cm² area. Counted in Aquasol

Sample	Item	gross cpm H3/C14	net cpm H3/C14	µc/wipe H3/C14
1	NEW H3 STD	129179/14691	,622	
2	NEW C14 STD	17974/27978	,845	
3	2ml H2O std	~~17526/35~~	,417 H3 std/est std	
~~4~~	~~BKG WIPE~~	~~22/17~~		
5	Chart Recorder	* 30/37	8/20	9×10^{-6}/1.6×10
6	Screen	* 24/29	2/12	2×10^{-6}/1.0×10
7	Torch	25/21	<MDA	
8	BLUE EXT CORD	24/20	<MDA	

std same as pg H022841

3σ H3 MDA $= \pm 3\sqrt{\frac{22+2}{10}} = 6$ cpm → 15 dpm $= 7\times10^{-6}$ µc/wipe

3σ C14 MDA $= \pm 3\sqrt{\frac{17+2}{10}} = 6$ cpm → 10 dpm $= 4\times10^{-6}$ µc/wipe

anything less than 28 cpm (H3) or 23 cpm (C-14) is less than MDA

WORK DONE BY [signature] (SIGNATURE) DATE WORK CONTINUED ON PAGE

READ AND UNDERSTOOD BY (1) (SIGNATURE) DATE

(2) DATE

H022840

WORK CONTINUED FROM PAGE

AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE

Data on pg H022838 JOP NOTEBOOK #6

PROGRAM #= 12 30/05/85 15:56

REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0

REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0

REGION C: LL-UL= 0- 0 LCR= 0 BKG= .00 % 2 SIGMA= .0

TIME= 20.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	20.00	162127.	.11	19270.2	.32	.00	.00	1099	19.072	^	22
12	2	20.00	12718.4	.40	85276.6	.15	.00	.00	1013	23.665		43
12	3	20.00	17507.0	.34	33.80	7.69	.00	.00	592.	11.976		64
12	4	20.00	29.30	8.26	20.00	10.0	.00	.00	608.	15.007		85
12	5	20.00	28.75	8.34	20.60	9.85	.00	.00	597.	13.093		106
12	6	20.00	28.15	8.43	17.45	10.7	.00	.00	578.	14.630		127
12	7	20.00	28.70	8.35	19.15	10.2	.00	.00	597.	15.612		149
12	8	20.00	37.95	7.26	21.90	9.56	.00	.00	618.	14.022		170
12	9	20.00	46.70	6.54	19.55	10.1	.00	.00	591.	13.768		191
12	10	20.00	24.70	9.00	19.20	10.2	.00	.00	625.	14.268		212
12	11	20.00	23.80	9.17	18.90	10.2	.00	.00	639.	15.372		233
12	12	20.00	28.25	8.41	20.05	9.99	.00	.00	582.	15.211		254
12	13	20.00	27.20	8.57	18.30	10.4	.00	.00	615.	15.214		275
12	14	20.00	24.80	8.98	17.25	10.7	.00	.00	628.	15.991		296
12	15	20.00	23.85	9.16	18.95	10.2	.00	.00	571.	14.898		317
12	16	20.00	24.75	8.99	18.80	10.3	.00	.00	614.	16.106		338
12	17	20.00	25.10	8.93	18.20	10.4	.00	.00	608.	14.928		359
12	18	20.00	25.20	8.91	19.40	10.1	.00	.00	618.	15.030		380
12	19	20.00	25.10	8.93	18.65	10.3	.00	.00	565.	14.813		402
12	20	20.00	27.00	8.61	17.40	10.7	.00	.00	618.	15.525		423
12	21	20.00	28.50	8.38	19.50	10.1	.00	.00	597.	15.676		444
12	22	20.00	27.70	8.50	20.80	9.81	.00	.00	597.	14.557		465
12	23	20.00	26.50	8.69	20.40	9.90	.00	.00	639.	13.511		486
12	24	20.00	25.05	8.94	19.55	10.1	.00	.00	589.	15.482		507
12	25	20.00	23.85	9.16	20.75	9.82	.00	.00	527.	15.396		528
12	26	20.00	26.00	8.77	17.85	10.5	.00	.00	604.	15.336		549
12	27	20.00	26.65	8.66	18.10	10.5	.00	.00	652.	15.877		570
12	28	20.00	22.55	9.42	19.00	10.2	.00	.00	620.	14.697		591
12	29	20.00	41.45	6.95	26.30	8.72	.00	.00	413.	13.538		612
12	30	20.00	28.50	8.38	19.60	10.1	.00	.00	588.	14.472		633
12	31	20.00	27.70	8.50	26.75	8.65	.00	.00	630.	16.626		654
12	32	20.00	30.60	8.08	20.00	10.0	.00	.00	552.	14.151		676
12	33	20.00	83.95	4.88	150.45	3.65	.00	.00	648.	17.691		697
12	34	20.00	28.60	8.36	21.40	9.67	.00	.00	573.	14.491		718
12	35	20.00	27.40	8.54	20.95	9.77	.00	.00	568.	14.687		739
12	36	20.00	28.95	8.31	18.05	10.5	.00	.00	641.	14.116		760
12	37	20.00	26.65	8.66	18.85	10.3	.00	.00	577.	14.791		781
12	38	20.00	26.75	8.65	20.50	9.85	.00	.00	591.	15.143		802
12	39	20.00	25.40	8.87	20.40	9.90	.00	.00	609.	14.970		823
12	40	20.00	24.90	8.96	17.85	10.3	.00	.00	631.	15.052		844

WORK DONE BY _____ (SIGNATURE) DATE _____ WORK CONTINUED ON PAGE ____

READ AND UNDERSTOOD BY (1) _____ (SIGNATURE) DATE _____

(2) _____ DATE _____

WORK CONTINUED FROM PAGE

AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE

PO H022840 JOP NOTEBOOK #6

PROGRAM #= 12 02/06/85 04:44
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0- 0 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 20.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	20.00	124586.	.13	14814.5	.37	.00	.00	1101	18.950		22
12	2	20.00	17390.6	.34	128081.	.12	.00	.00	1083	23.582		44
12	3	20.00	17537.3	.34	33.00	7.78	.00	.00	589.	11.803		65
12	4	20.00	24.60	9.02	17.55	10.6	.00	.00	629.	16.069		86
12	5	20.00	26.85	8.63	20.20	9.95	.00	.00	564.	15.405		107
12	6	20.00	30.40	8.11	20.90	9.78	.00	.00	586.	15.133		128
12	7	20.00	27.70	8.50	20.40	9.90	.00	.00	580.	15.019		149
12	8	20.00	19.20	10.2	18.45	10.4	.00	.00	435.	16.370		170
12	9	20.00	71.15	5.30	52.85	6.15	.00	.00	384.	16.071		191
12	10	20.00	33.95	7.68	27.25	8.57	.00	.00	605.	13.922		212
12	11	20.00	63731.2	.18	36.95	7.36	.00	.00	449.	10.162	^	233
12	12	20.00	1520.80	1.15	36.55	7.40	.00	.00	607.	12.610		255
12	13	20.00	674.70	1.72	23.05	9.31	.00	.00	526.	11.566		276
12	14	20.00	35.25	7.53	26.75	8.65	.00	.00	616.	15.583		297
12	15	20.00	41.00	6.98	23.40	9.25	.00	.00	649.	13.332		318
12	16	20.00	51.45	6.23	56.55	5.95	.00	.00	624.	15.210		339
12	17	20.00	26.65	8.66	18.90	10.2	.00	.00	606.	15.266		360
12	18	20.00	27.10	8.59	19.25	10.1	.00	.00	524.	14.701		381
12	19	20.00	27.65	8.50	19.65	10.0	.00	.00	557.	15.046		402
12	20	20.00	28.85	8.33	20.05	9.99	.00	.00	503.	14.697		423
12	21	20.00	32.50	7.84	24.25	9.08	.00	.00	506.	14.647		444
12	22	20.00	30.60	8.08	19.35	10.1	.00	.00	558.	14.827		465
12	23	20.00	40.05	7.07	28.70	8.35	.00	.00	499.	13.372		486
12	24	20.00	25.30	8.89	19.95	10.0	.00	.00	534.	15.300		507
12	25	20.00	26.25	8.73	18.90	10.2	.00	.00	529.	14.929		528
12	26	20.00	32.65	7.83	20.40	9.90	.00	.00	462.	14.023		549
12	27	20.00	25.45	8.86	19.50	10.1	.00	.00	514.	13.187		571
12	28	20.00	24.40	9.05	18.05	10.5	.00	.00	590.	15.662		592
12	29	20.00	34.50	7.61	21.10	9.74	.00	.00	410.	14.746		613
12	30	20.00	26.45	8.70	19.10	10.2	.00	.00	625.	16.114		634
12	31	20.00	26.65	8.66	19.70	10.0	.00	.00	631.	13.716		655
12	32	20.00	29.50	8.23	23.30	9.26	.00	.00	467.	15.270		676
12	33	20.00	26.45	8.70	20.60	9.85	.00	.00	576.	15.466		697
12	34	20.00	28.65	8.36	22.60	9.41	.00	.00	552.	15.922		718
12	35	20.00	25.05	8.94	20.85	9.79	.00	.00	603.	15.860		739
12	36	20.00	21.80	9.58	20.30	9.93	.00	.00	505.	14.259		760
12	37	20.00	26.80	8.64	23.95	9.14	.00	.00	603.	15.462		782
12	38	20.00	26.35	8.71	19.85	10.0	.00	.00	606.	15.384		803
12	39	20.00	26.65	8.66	17.45	10.7	.00	.00	616.	15.610		824
12	40	20.00	25.70	8.82	17.75	10.6	.00	.00	616.	15.485		845
12	41	20.00	26.40	8.70	19.45	10.1	.00	.00	635.	15.193		866
12	42	20.00	26.90	8.62	19.90	10.0	.00	.00	593.	15.516		887
12	43	20.00	25.20	8.91	17.35	10.7	.00	.00	671.	16.535		908
12	44	20.00	26.50	8.69	24.15	9.10	.00	.00	603.	15.827		929
12	45	20.00	26.00	8.77	20.50	9.88	.00	.00	558.	14.307		950
12	46	20.00	22.55	9.42	19.60	10.1	.00	.00	497.	15.533		971

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	47	20.00	24.80	8.98	21.10	9.74	.00	.00	586.	15.960		993
12	48	20.00	23.40	9.25	20.30	9.93	.00	.00	573.	13.494		1014
12	49	20.00	26.45	8.70	18.30	10.4	.00	.00	628.	15.736		1035
12	50	20.00	24.00	9.13	19.35	10.1	.00	.00	573.	15.316		1056
ES	ERROR											
12	51	20.00	21.70	9.60	8.10	15.7	.00	.00	.000	16.552		1078
12	52	20.00	24.40	9.05	18.00	10.5	.00	.00	624.	15.840		1099

WORK DONE BY _____ (SIGNATURE) DATE _____ WORK CONTINUED ON PAGE _____

READ AND UNDERSTOOD BY (1) _____ (SIGNATURE) DATE _____

(2) _____ DATE _____

H022842 JOP Notebook #6

REGION A: LL=UL= 0 - 12 LOR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL=UL= 12 - 15 LOR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL=UL= 0 - 0 LOR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 10.00 F# 1.000 DIP=SIE

F#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	10.00	124244.	.18	14840.4	.52	.00	.00	1100	18.971		11
12	2	10.00	17511.2	.48	128252.	.18	.00	.00	1086	23.545		23
12	3	10.00	17532.1	.48	31.20	11.3	.00	.00	590.	11.848		34
12	4	10.00	27.20	12.1	18.30	14.7	.00	.00	564.	15.624		45
12	5	10.00	30.50	11.4	21.40	13.6	.00	.00	573.	14.952		56
12	6	10.00	27.60	12.0	18.10	14.8	.00	.00	589.	13.611		67
12	7	10.00	24.90	12.6	20.60	13.9	.00	.00	623.	15.709		78
12	8	10.00	26.50	12.2	17.20	15.2	.00	.00	592.	14.516		89
12	9	10.00	26.50	12.2	19.40	14.3	.00	.00	616.	15.324		100
12	10	10.00	25.10	12.6	19.30	14.4	.00	.00	617.	14.923		111
12	11	10.00	24.30	12.8	20.30	14.0	.00	.00	648.	15.235		122
12	12	10.00	28.50	11.8	17.00	15.3	.00	.00	650.	15.385		133
12	13	10.00	56.50	8.41	23.10	13.1	.00	.00	535.	11.132		144
12	14	10.00	26.70	12.2	19.20	14.4	.00	.00	593.	15.106		155
12	15	10.00	33.00	11.0	18.90	14.5	.00	.00	594.	14.594		166
12	16	10.00	32.40	11.1	29.00	11.7	.00	.00	614.	14.494		177
12	17	10.00	29.50	11.6	18.90	14.5	.00	.00	619.	15.332		188
12	18	10.00	45.60	9.37	39.20	10.1	.00	.00	593.	14.974		199
12	19	10.00	29.40	11.6	20.30	14.0	.00	.00	611.	13.650		210
12	20	10.00	33.50	10.9	24.50	12.7	.00	.00	553.	13.716		221
12	21	10.00	33.70	10.8	22.90	13.2	.00	.00	592.	14.767		232
12	22	10.00	22.80	13.2	23.40	13.0	.00	.00	487.	14.068		243
12	23	10.00	23.10	13.1	21.10	13.7	.00	.00	500.	13.269		254
12	24	10.00	33.00	11.0	20.50	13.9	.00	.00	562.	14.856		265
12	25	10.00	22.90	13.2	18.20	14.8	.00	.00	458.	15.730		276
12	26	10.00	30.00	11.5	34.00	10.8	.00	.00	587.	15.174		287
12	27	10.00	39.00	10.1	27.20	12.1	.00	.00	527.	14.804		298
12	28	10.00	28.40	11.8	20.50	13.9	.00	.00	634.	15.315		309
12	29	10.00	24.60	12.7	19.60	14.2	.00	.00	594.	14.688		320
12	30	10.00	26.40	12.3	20.60	13.9	.00	.00	637.	16.282		331
12	31	10.00	33.70	12.9	15.50	16.0	.00	.00	630.	15.317		342
12	32	10.00	24.60	12.7	19.00	14.5	.00	.00	653.	16.272		353
12	33	10.00	21.30	13.7	14.90	16.3	.00	.00	709.	14.163		364
12	34	10.00	24.10	12.8	17.50	15.1	.00	.00	659.	16.102		375
12	35	10.00	21.70	13.5	18.50	14.7	.00	.00	600.	13.853		386
12	36	10.00	36.70	10.4	19.70	14.2	.00	.00	575.	13.343		397
12	37	10.00	174.00	4.53	40.60	9.93	.00	.00	506.	16.813		408
12	38	10.00	36.60	10.4	40.80	9.90	.00	.00	508.	16.877		419
12	39	10.00	97.50	6.54	57.00	8.38	.00	.00	452.	15.106		430
12	40	10.00	32.20	11.1	25.30	12.5	.00	.00	516.	14.334		441
12	41	10.00	63.40	7.94	17.50	15.2	.00	.00	354.	10.655		452
12	42	10.00	54.10	8.50	15.70	15.9	.00	.00	641.	13.118		463
12	43	10.00	20.30	14.0	21.30	13.7	.00	.00	711.	14.642		474
12	44	10.00	22.30	13.3	19.30	14.2	.00	.00	556.	15.423		485
12	45	10.00	25.70	12.2	19.30	14.2	.00	.00	591.	14.226		496
12	46	10.00	21.00	13.8	17.30	15.2	.00	.00	672.	16.884		507
12	47	10.00	21.40	13.6	15.80	15.9	.00	.00	738.	16.262		518
12	48	10.00	19.70	14.2	18.30	14.7	.00	.00	724.	16.317		529
12	49	10.00	25.10	12.6	18.60	14.6	.00	.00	634.	14.014		540
12	50	10.00	21.70	13.5	17.10	15.2	.00	.00	695.	15.793		551
12	51	10.00	20.70	13.9	18.90	14.5	.00	.00	593.	16.120		562
12	52	10.00	23.20	13.1	18.40	14.7	.00	.00	580.	15.866		573
12	53	10.00	18.30	14.7	20.40	14.0	.00	.00	500.	16.933		584
12	54	10.00	24.20	12.8	21.00	13.8	.00	.00	601.	13.528		595
12	55	10.00	50.00	8.94	24.60	12.7	.00	.00	494.	13.597		606
12	56	10.00	21.90	13.5	20.10	14.1	.00	.00	641.	16.945		617
12	57	10.00	48.30	9.10	30.40	11.4	.00	.00	492.	13.280		628
12	58	10.00	27.40	12.0	21.30	13.7	.00	.00	606.	15.069		639
12	59	10.00	26.70	12.2	19.50	14.3	.00	.00	622.	16.012		650
12	60	10.00	23.40	13.0	17.10	15.2	.00	.00	658.	15.725		661
12	61	10.00	30.30	11.4	26.10	12.3	.00	.00	591.	14.304		672
12	62	10.00	134.30	5.46	23.70	12.9	.00	.00	469.	11.461		683
12	63	10.00	21.00	13.8	19.50	14.3	.00	.00	644.	15.970		694
12	64	10.00	26.30	12.3	21.70	13.5	.00	.00	618.	16.836		705
12	65	10.00	30.50	11.4	17.40	15.1	.00	.00	632.	12.467		716
12	66	10.00	33.80	10.8	17.80	14.9	.00	.00	621.	13.132		727
12	67	10.00	23.00	13.1	17.10	15.2	.00	.00	605.	15.673		738
12	68	10.00	24.20	12.8	20.20	14.0	.00	.00	616.	14.844		749
12	69	10.00	29.60	11.6	21.10	13.7	.00	.00	595.	15.012		760
12	70	10.00	25.50	12.5	17.70	15.0	.00	.00	693.	15.071		771
12	71	10.00	299.40	3.66	66.90	7.73	.00	.00	640.	13.810		782
12	72	10.00	30.70	11.4	22.00	13.4	.00	.00	490.	14.345		793
12	73	10.00	44.60	9.47	21.40	13.6	.00	.00	522.	12.285		804
12	74	10.00	58.00	8.30	18.90	14.5	.00	.00	618.	13.160		815
12	75	10.00	29.90	11.5	22.20	13.4	.00	.00	612.	15.050		826
12	76	10.00	23.40	13.0	17.00	15.3	.00	.00	657.	14.005		837
12	77	10.00	31.40	11.2	21.40	13.6	.00	.00	600.	12.448		848
12	78	10.00	20.30	14.0	18.50	14.7	.00	.00	550.	15.795		859
12	79	10.00	20.60	13.9	17.70	15.0	.00	.00	612.	16.719		870
12	80	10.00	22.20	13.4	18.90	14.5	.00	.00	616.	14.786		881
12	81	10.00	27.30	12.1	20.00	14.1	.00	.00	579.	14.355		892
12	82	10.00	22.40	13.3	18.10	14.8	.00	.00	693.	16.163		904
12	83	10.00	22.30	13.3	16.60	15.5	.00	.00	645.	15.480		915
12	84	10.00	23.90	12.9	19.40	14.3	.00	.00	567.	15.879		925
12	85	10.00	21.10	13.7	15.80	15.9	.00	.00	632.	14.479		936
12	86	10.00	23.10	13.1	18.60	14.6	.00	.00	693.	16.833		948
12	87	10.00	23.20	13.1	16.10	15.7	.00	.00	683.	14.334		959
12	88	10.00	20.90	13.8	17.80	14.9	.00	.00	692.	16.197		970
12	89	10.00	22.00	13.4	17.40	15.1	.00	.00	680.	15.965		981
12	90	10.00	21.20	13.7	16.70	15.4	.00	.00	678.	15.572		992
12	91	10.00	24.70	12.7	20.20	14.0	.00	.00	641.	14.709		1003
12	92	10.00	23.40	13.0	20.40	14.0	.00	.00	646.	15.664		1014
12	93	10.00	61.90	8.04	26.40	12.3	.00	.00	577.	14.475		1025
12	94	10.00	25.10	12.6	18.60	14.6	.00	.00	613.	16.247		1036
12	95	10.00	41.30	9.84	23.50	13.0	.00	.00	469.	15.018		1047
12	98	10.00	29.80	11.5	17.20	15.2	.00	.00	687.	15.190		1058
12	99	10.00	27.70	12.0	18.50	14.7	.00	.00	533.	16.705		1069

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Harvey Technical Center

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PROJECT NO.

SUBJECT

OBJECTIVE

DATE

1 NEN H3 STD
2 NEN C14 STD
3 2ml H_2O std.
4 BKG WIPE
5 CHART RECORDER
6 SCREEN
7 TORCH
8 BLUE EFT

P9H022846 JOP notebook #6

```
PROGRAM #=    12                                                    05/06/85  11:40
REGION A:     LL-UL=     0-  12  LCR=     0  BKG=     .00  % 2 SIGMA=     .0
REGION B:     LL-UL=    12- 156  LCR=     0  BKG=     .00  % 2 SIGMA=     .0
REGION C:     LL-UL=     0-   0  LCR=     0  BKG=     .00  % 2 SIGMA=     .0
TIME=  10.00  K= 1.000 QIP=SIE
```

F#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	10.00	124179.	.18	14691.4	.52	.00	.00	1101	18.987	^	11
12	2	10.00	17574.4	.46	127978.	.18	.00	.00	1081	23.529		22
12	3	10.00	17525.9	.48	24.60	10.7	.00	.00	589.	11.815		34
12	4	10.00	21.90	13.5	17.40	15.1	.00	.00	665.	16.575		45
12	5	10.00	30.20	11.5	26.90	10.4	.00	.00	595.	16.911		56
12	6	10.00	27.30	12.9	29.00	11.7	.00	.00	601.	17.045		67
12	7	10.00	24.50	12.7	20.60	13.9	.00	.00	522.	15.203		78
12	8	10.00	23.80	12.9	19.80	14.2	.00	.00	534.	15.706		89

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE	
6/5/85	γ wipe survey of equipment removed from N-bldg. 100 cm² + areas wiped with wet paper towels. Counted, 4 wipes at a time for 10 min in MS-SPA counter

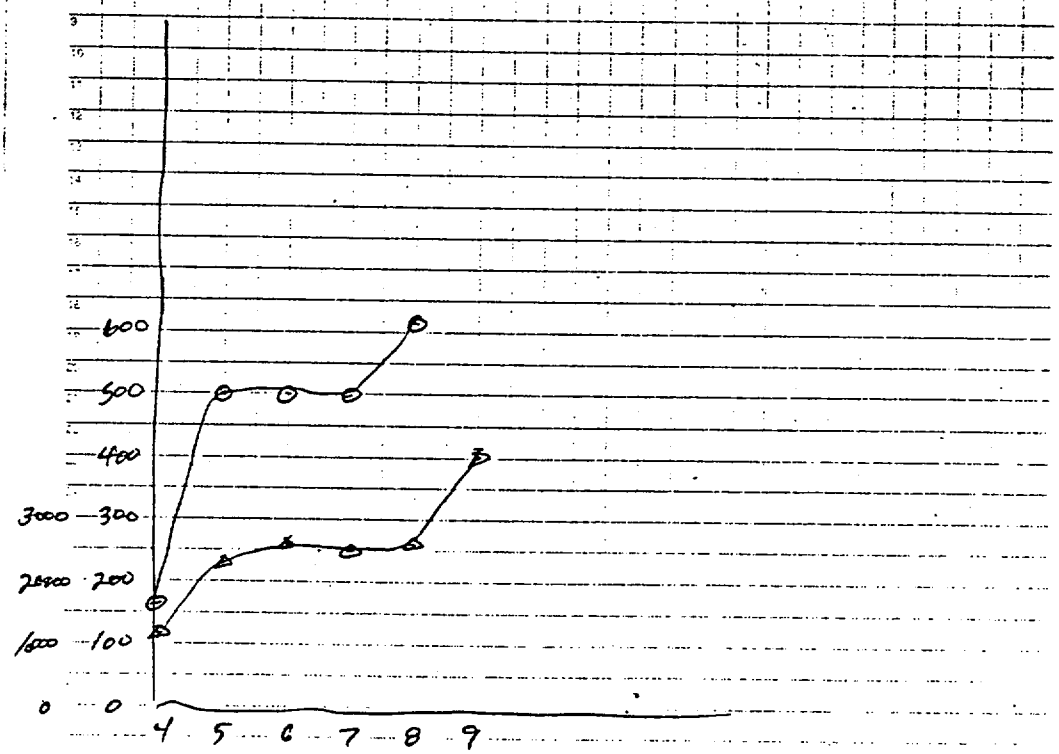
ARCO Petroleum Products Company — Division of AtlanticRichfieldCompany — **Calculations Chart**

Subject: MS-2 + SPA-4 Plateau Check — Sheet number — of

File — By: JDP — Date: 6/5/85

"A" W=out T=5

Hv	bkg cpm	cpm
4	477	12130
5	495	22750
6	497	26330
7	498	24920
8	617	26240
9	10637	40730



APPC 504 (10-81)

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READ AND UNDERSTOOD BY (1) _____ (SIGNATURE) DATE _____

(2) _____ DATE _____

READ / WORK

ARCO Petroleum Products Company — Calculations Chart

Division of AtlanticRichfieldCompany

Subject: Survey | Sheet number 1 of | File | By | Date 6/6/85

	counts	cpm	det cpm	net dpm
Cs137 "A" (215,000 dpm)	5406/10	541		
WIPE	27767/1	27767	27226	12.67%
1 File 1 Front 2 File 1 Top 3 File 2 Front 4 File 2 Top	5393/10	539	0	0
5 File 3 Front 6 File 3 Top 7 File 4 Front 8 File 4 Top	5479/10	548	7	55 2.9×10^{-5} μc/100 cm²
9 File 5 Front 10 File 5 Top 11 Book case A Top 12 Book case A Front	5407/10	541	0	0
13 JAP Small File 14 JAP Desk 15 JAP chair 16 IBM Typewriter	5772/10	577	36	284 1.3×10^{-4} μc/100 cm²
17 Typewriter stand 18 Book shelf 19 Computer Terminal 20 Computer keyboard	5361/10	536	0	0
21 TV 22 Stationery box 23 boxes 24 LAB chair	5404/10	540	0	0

3σ MDA $= \pm 3\sqrt{\frac{541\times2}{10}} = \pm 31$ cpm $\xrightarrow{12.67\%}$ 246 dpm $= 1.1\times10^{-4}$ μc/wipe

MS-2 Ser 1521
SPA-4 Ser 126
W = out, NU = 6, T = 5

Cs137 "A" 0.105 μc 2/23/82
×.928
.097 μc 5/6/85
215,000 dpm

APPC 504 (10-81)

ARCO Petroleum Products Company — Calculations Chart

Division of AtlanticRichfieldCompany

Subject | Sheet number 2 of | File | By | Date 6/7/85

bkg Cs137 std "A"	5568/10 27678/1	557 27678	bkg 562 net cpm	
	10 mins	gross cpm		
25 LAB DESK 26 LAB TYPEWRITER 27 Large file box 28 Small file box 29 Steel table 30 TI calculator	5498	550	0	0
31 steel table base 32 coffee stand 33 Dry temperature 34 Vacuum Pump	5536	554	0	0
35 Stroke Tag 36 New Attrition Machine	5623	562	0	0
37 Attrit Chart Recorder 38 PE 2000 Bal 39 Screen 40 Filter Paper	603	603	41	324 1.7×10^{-4} μc/100 cm²
41 Vanity 42 Aqueous Dispenser 43 Alum tubing 44 hack saw	5486	549	0	0
45 H-75 hammer 46 Scissors 47 N-70 square 48 Ice pick	5382	538	0	0

APPC 504 (10-81)

ARCO Petroleum Products Company
Division of AtlanticRichfieldCompany

Calculations Chart

Subject: | Sheet number 3 of | File: | By: | Date 6/7/85

	cs/10min	gross CPM	net cpm	net dpm
49 DR120R caliper 50 large rat tail file 51 small rat tail file	5454	545	0	0
52 half rd file w/handle 53 yellow screwdriver 54 needle nose #272 55 screwdriver #201 56 half rd with handle	5337	534	0	0
57 jewelers drill 58 epoxy 59 tricomb paper box 60 chart recorder #1	5373	537	0	0
61 scint vials 62 step watches 63 L124L 10" pipewrench 64 P136P channel lock	5483	548	0	0
65 V56V 10" crescent 66 L195L 10" pipewrench 67 8" crescent 68 P16P pliers	5510	551	0	0
69 Lg rat tail file fine 70 Lg rat tail file coarse 71 half rd file heat handle 72 V2V 12" crescent	5313	531	0	0

CONTROL NO. 7 9 4 9 5

DATE

PAGE

APPC 504 (10-81)

ARCO Petroleum Products Company
Division of AtlanticRichfieldCompany

Calculations Chart

Subject: | Sheet number 4 of | File: | By: | Date

	cs/10min	gross CPM	net cpm	net dpm
73 V22 vise grips 74 4" crescent 75 X288X tubing cutter 76 X309 tubing cutter 77 K286 4" crescent wrench	5702	570	8	63
78 Lineman's pliers 79 BLUE CHISEL 80 ~~[illegible]~~ tricomb top 81 ~~[illegible]~~ tricomb controls 82 ~~[illegible]~~ tricomb front 83 ~~[illegible]~~ tricomb chamber floor 84 ~~[illegible]~~ 1/2" drill	5359	535	0	
85 ~~[illegible]~~ 1/4" thor drill 86 ~~[illegible]~~ torch + hose 87 O_2 tank & regulator	5361	536	0	
88 propane tank & reg 89 solder supply box	5795	580	18	
90 hole saw 91 small grind wheel 92 Y85Y Hacksaw 93 vent turbine 94 Left out N-2 cab 95 Right out N-2 cab 96 Back N-2 cab 97 Top N-2 cab	5810	581	19	
	5926	593	31	
BKG	5658/10	566		

Acc bkg 562

net cpm/dpm

$2.8 \times 10^{-5} \mu c/100 cm^2$

142

$6.4 \times 10^{-5} \mu c/100 cm^2$

150

$6.8 \times 10^{-5} \mu c/100 cm^2$

245

$1.1 \times 10^{-4} \mu c/100 cm^2$

APPC 504 (10-81)

REF WO

ARCO Petroleum Products Company
Division of AtlanticRichfieldCompany

Calculations Chart

Subject
File
By
Sheet number 5
Date 6/7/85

		Counts	gross cpm	net cpm	net dpm	
	BKG	5572/10	557	Avg bkg		
	Cs137 "A"	27745/1	27745	568		
97	RIGHT DOOR OUT					
98	N-2 CAD					
99	LEFT DOOR OUT					
100	N-2 CAD	5654/10	565	0	0	0
101	N-2 CAD					
102	SHELF 2					
103	N-2 CAD					
104	SHELF 3	5791/10	579	11	87	3.9×10^{-5} µc/cm²
105	N-2 CAD					
106	SHELF 5					
107	MS-2 1185					
108	PROBE SPA-4 152	5590/10	559	0	0	0
109	MS-2 1278					
110	SPA-3 probe 6666					
111	ARC					
112	MS-2 pan-cards	5695/10	570	2	15	0.8×10^{-6} µci/cm²
113	MS-2 1521					
114	SPA-4 126					
115	outside count chamber					
116	key & rect.					
117	ob count chamber	5847/10	585	17	134	6.04×10^{-5} µci/cm²
118	hand wing					
119	lead lid					
120	small steel table					
	granulite storage	5727/10	573	5	39	1.8×10^{-5} µc/cm²
	Flow counter head					

APPC 504 (10-81)

ARCO Petroleum Products Company
Division of AtlanticRichfieldCompany

Calculations Chart

Subject
File
By
Sheet number 6
Date 6/7/85

			NO BKG 568 gross cpm	net cpm	net dpm	
121	BLUE paper cart					
122	PE 2000 DAC					
123	pipette tips	5812/10	581	13	103	4.6×10^{-5} µc/cm²
124	old attrition washer					
125	chart paper					
126	Virginia Alcan					
127	Battenmix	5763/10	576	8	63	2.9×10^{-5} µc/cm²
128	scint vials					
129	Tricomb Trays					
130	AC13AC 12 Gauge					
131	X4/18 screw driver	5773/10	577	9	71	3.2×10^{-5} µc/cm²
132	needle nose pliers					
133	tin snips					
134	4' crescent					
135	Flow counter bowl	5662/10	566	0	0	0
136	Flow counter tray					
137	manometer					
138	Flow counter tray					
139	HDS 3A cart	5699/10	570	2	16	7.2×10^{-6} µc/cm²
140	Level DIV 2D					
141	Temp indicator					
142	middle tray 1-4					
143	mixer	5916/10	592	24	189	8.5×10^{-5} µc/cm²
144	OP column					

APPC 504 (10-81)

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AtlanticRichfieldCompany

Harvey Technical Center

PROJECT NO.

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OBJECTIVE

DATE

ARCO Petroleum Products Company
Division of AtlanticRichfieldCompany

Calculations Chart

Subject

Sheet number 7 of

File

By

Date 6/7/85

AVG
3/40
568

		gross cpm	net cpm	net dpm	
145 metal suitcase 146 BBOT 147 deaner cart 148 log meter	5841/10	584	16	126	9.7×10^{-5} µc/100cm²
149 E-120 10045 150 E-120 10833 151 RO-2 509 152 RO-2 562	5914/10	591	23	182	0.2×10^{-4} µc/100cm²
153 DOSE 268-0183 154 DOSE 24 684 155 E530 672 156 E530 186	6018/10	602	34	268	1.2×10^{-4} µc/100cm²
157 ~~E53~~ Aquasol #1 158 Aquasol #2 159 Scint Tol 160 Scint + liquids	5860/10	586	18	142	6.4×10^{-5} µc/100cm²
161 All Solds Flux 162 Torch stand 163 Soldering Iron 164 Whole Flux	5812 ~~5868~~/10	581	13	103	4.6×10^{-5} µc/100cm²
165 Flux scan down 166 55gal drum 167 Stretcher 168 Red scan down	6093/10	609	39	308	1.4×10^{-4} µc/100cm²

BKG 5776/10 578

Cs^{137} "A" 27170/1 27170

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AtlanticRichfieldCompany

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Harvey Technical Center

PROJECT NO.

SUBJECT

OBJECTIVE

DATE	
6/7/95	Surveyed "O" building and all equipment moved from "N" building with Eberline Model E-530 Ser # 86 Survey meter. Used with probe shield open to increase sensitivity. No activity beyond background ~0.01 mr/hr was seen John D. Phelps Jr.
6/7/95	Surveyed "H" building mezzanine and conference room equipment moved from "N" building using the above meter and survey technique. No activity above background by 0.01 mr/h was seen. John D. Phelps Jr.

CONTROL NO. 9495

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(2) _____ DATE _____

ARCO Petroleum Products
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License # 12-00140-04

Attachment A

Contents

1. Results of Initial Radiation Survey and Sample Results

2. Packard Analysis of the Hot Cell Water Pool Samples

3. Calculations of H-3 Concentration Discharged to the Metropolitan Sanitary District

4. Argonne Analysis by Dr. E. Dolecek

CONTROL NO. 7 9 4 9 5

sahci Consultants to Nuclear Medicine • Radiology • Nuclear Industry

STAN A. HUBER CONSULTANTS, INC. □ 200 NORTH CEDAR ROAD □ NEW LENOX, IL 60451 □ (815) 485-6161

June 3, 1985

For: ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Blvd.
Harvey, Illinois 60426

Results of Initial Radiation Survey and Sample Analysis

This is the summary report of the preliminary radiation survey conducted in the Radiation Laboratory Building ("N" Building) on May 31, 1985, by Stan Huber, John Hollinden, and Mark Rudin of Stan A. Huber Consultants, Inc., New Lenox, Illinois.

A walk through radiation survey was performed using Victoreen Thyac III and Ludlum 14C G.M. survey meters. The highest reading obtained was 5 mr/hr in the radiation cave. This reading was probably due to the storage of radioactive material nearby. The reading at the front entrance to the radiation cave was 0.07 mr/hr.

A reading of 0.1 mr/hr and 0.15 mr/hr was obtained near the two (2) fume hoods where radioactive material was used and stored in the Tracer Laboratory. There were sources present in both of these hoods when the survey was taken.

All other survey readings taken in the remaining rooms of the building were at background levels ($<$0.05 mr/hr).

Representative wipe tests (smears) were taken in each room of the building to determine the extent of contamination, if any, present in each of these rooms. Each wipe test covered an area of approximately 300cm^2. The attached facility sketch shows the location and coding where each wipe was taken in each of the rooms.

Samples were taken in the water well of the radiation cave at the surface, middle, and top levels of the pool as a representative analysis of the water for contamination. One (1) sample was also taken in the underground (external) storage tank outside the Tracer Laboratory.

The wipe tests and samples of water and storage tank contents were counted in a G.E (L1) detector for detection of gamma contamination and a liquid scintillation counter for detection of alpha and beta contamination at Argonne

National Lab by Dr. E. Dolocek. Copies of the printouts are attached. The results are as follows:

1. No alpha, beta, or gamma contamination was found in the wipe tests.

2. No gamma or alpha activity was found in the storage well. Tritium (H-3) was found in concentrations listed below:

   A) Top of pool 11,107 DPM/ML

   B) Middle of pool 11,407 DPM/ML

   C) Bottom of pool 11,571 DPM/ML

   The concentration of Tritium in the storage well is essentially uniform throughout the pool.

3. Tritium (H-3) was also found in the underground storage tank. The approximate concentration based on the one (1) sample taken was 473,128 DPM for a 4ml sample, or 118,282 DPM/ML (0.05328 uCi/ml).

The gamma analysis of the external storage tank sample indicated the presence of 9.5×10^{-4} uCi of Co-60 and 3.85×10^{-4} uCi of Cs-137 in the 4ml sample, or 2.375×10^{-4} uCi of Co-60 per ml and 0.962×10^{-4} uCi of Cs-137 per ml.

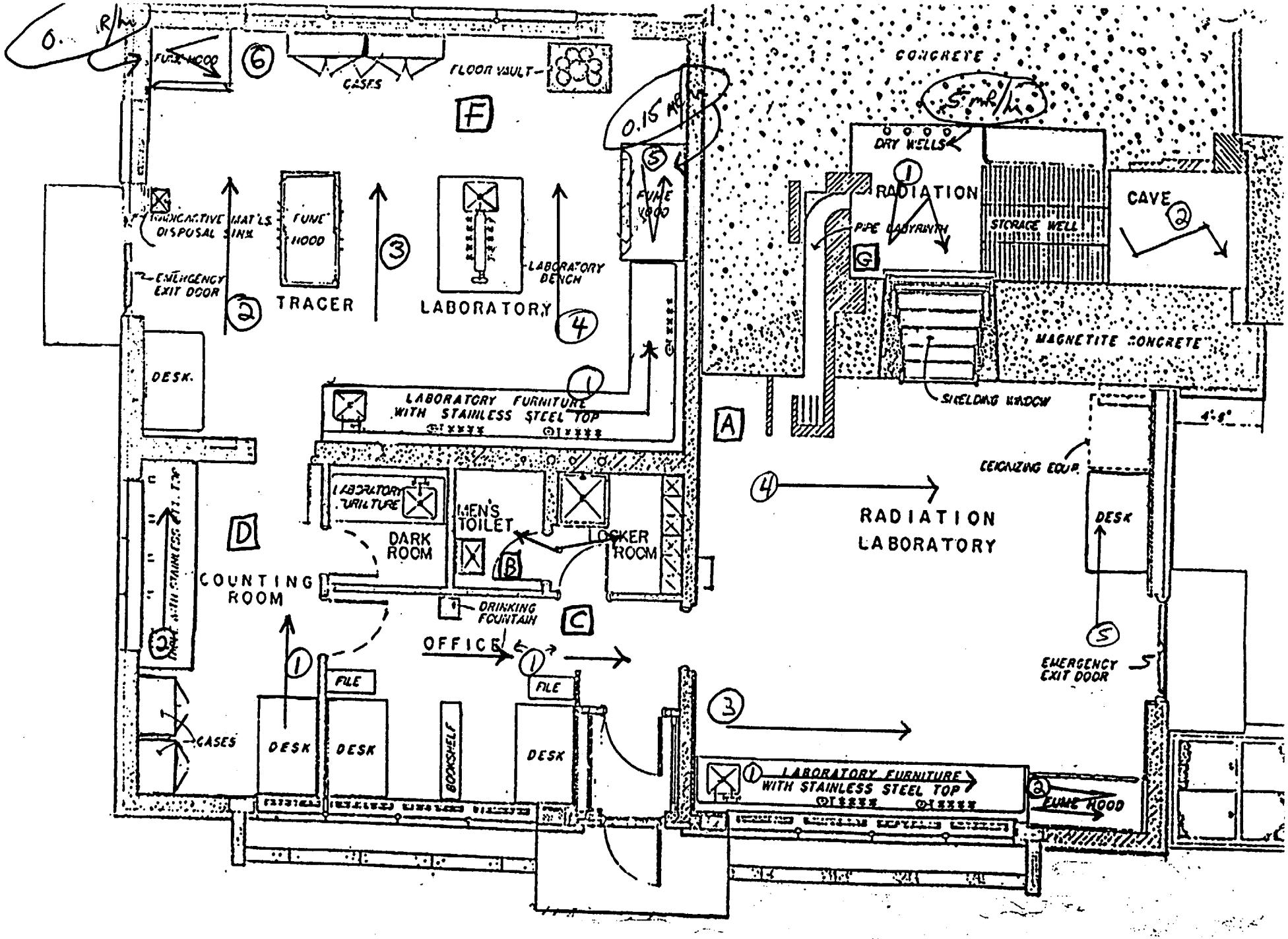
All wipe tests and water samples have been saved for future reference and recounts if needed. These samples will be disposed via Argonne Lab or ADCO Services when the ARCO license termination is issued by the NRC.

Report prepared by: John J. Hollinden
Health Physicist

Stan A. Huber
President

Date: June 3, 1985

JJH:amw


FUME HOOD
CASES
FLOOR VAULT
F
CONCRETE
DRY WELLS
RADIATION
PIPE LABYRINTH
STORAGE WELL
CAVE
G
RADIOACTIVE MAT'LS DISPOSAL SINK
FUME HOOD
EMERGENCY EXIT DOOR
TRACER
LABORATORY
LABORATORY BENCH
FUME HOOD
MAGNETITE CONCRETE
DESK
LABORATORY FURNITURE WITH STAINLESS STEEL TOP
SHIELDING WINDOW
A
CEILING FAN
LABORATORY FURNITURE
MEN'S TOILET
DARK ROOM
LOCKER ROOM
B
D
COUNTING ROOM
DRINKING FOUNTAIN
C
OFFICE
RADIATION LABORATORY
DESK
EMERGENCY EXIT DOOR
FILE
FILE
CASES
DESK
DESK
BOOKSHELF
DESK
LABORATORY FURNITURE WITH STAINLESS STEEL TOP
FUME HOOD

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STAN A. HUBER CONSULTANTS, INC. ☐ 200 NORTH CEDAR ROAD ☐ NEW LENOX, IL 60451 ☐ (815) 485-6161

June 3, 1985

John Phelps
Radiation Safety Officer
ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Blvd.
Harvey, Illinois 60426

Dear John:

Enclosed is a copy of the Packard analysis of the Hot Cell water pool samples taken at the ARCO Radiation Lab Building and counted at Packard, Downers Grove, IL on May 28, 1985.

As shown at the top of the enclosed printout, the four (4) samples were weighed and the results were expressed as follows:

Sample #	Wt	DPM
1	1.4810 g	23,322
2	1.5141 g	23,836
3	1.5178 g	24,020
4	1.6306 g	25,561

To extend that data one additional step, by the definition of 1 gram of water equals 1 cc, we can express exact results in terms of DPM per cc of each sample as follows:

Sample #	DPM/cc
1	15,747
2	15,743
3	15,826
4	15,676

The liquid scintillation analysis indicated only the presence of Tritium.

The three water samples taken from the same Hot Cell water pool (bottom, center and surface levels) during our visit on May 31, 1985 were immediately transferred to Argonne National Lab for additional analysis and we expect to have the results of those tests shortly.

We are also having Argonne assay the sample we took on the external holding tank and the few dozen wipe test samples we took during our preliminary survey of the building on May 31, 1985.

CONTROL NO. 7 9 4 9 5

I trust you will share this information with Dr. Snow and any other appropriate ARCO personnel, and advise me if there are any questions. I will conduct the preliminary and continuing coordination of this disposal and close-out radiation survey with ADCO, the Nuclear Regulatory Commission and the Illinois Department of Nuclear Safety.

Sincerely,

Stan A. Huber
President

SAH:ghh

cc: Bob Bassett, ADCO Services
Bruce Mallett, Ph.D. (or delegate), NRC
Paul Eastvold (or delegate), IDNS

H-3 test results on
ARCO - Harvey, IL - water samples
from Hot Cell water pool

5-28-85

Sample #	Wt.	DPM
1	14810 g	28322
2	[illegible]	23836
3	[illegible]	24020
4	[illegible]	25561

PROGRAM #= 10

28/05/85 09:34

REGION A: LL-UL= 0- 19 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 2- 19 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 2.00 K= 1.000 QIP=SIE
LUMINESCENCE CORRECTION OFF
NUCLIDE 1= 218203

P#	S#	TIME	CPMA/K DPM1/K	%DEV	CPMB/K DPM2/K	%DEV	CPMC/K RATIO	%DEV	SIE	SIS	FLAGS
10	1	2.00	147532. 217743.	.37	123152. .00	.40	148074.	.37	985.	19.215	L2 quenched
10	2	2.00	140920. 217914.	.38	113779. .00	.42	141081.	.38	875.	17.278	L1
10	3	2.00	130460. 217168.	.39	100242. .00	.45	130497.	.39	749.	15.064	L1
10	4	2.00	116997. 218529.	.41	84613.0 .00	.49	117026.	.41	635.	[illegible]	[illegible]
10	5	2.00	99942.0 218343.	.45	66732.5 .00	.55	99965.0	.45	530.	[illegible]	[illegible]
10	6	2.00	77728.5 220030.	.51	46213.5 .00	.66	77755.5	.51	421.	[illegible]	[illegible]
10	7	2.00	57463.0 219252.	.59	31292.5 .00	.80	57492.0	.59	358.	8.646	L1
10	8	2.00	46204.0 217857.	.66	23875.5 .00	.92	46221.5	.66	323.	8.145	L1
10	9	2.00	33699.0 218948.	.77	16511.5 .00	1.10	33710.5	.77	281.	7.640	L1
10	10	2.00	24321.0 217202.	.91	11413.0 .00	1.32	24338.5	.91	250.	7.275	U1
10	11	2.00	29.00 49.58	26.2	23.50 .00	29.1	44.50	21.2	718.	17.102	Insta Cal: Background
10	12	2.00	11350.0 23322.0	1.33	7699.50 .00	1.61	11373.0	1.33	566.	11.773	Sample
10	13	2.00	11611.0 23836.0	1.31	7878.00 .00	1.59	11633.0	1.31	567.	11.820	
10	14	2.00	11692.5 24019.8	1.31	7961.50 .00	1.58	11695.5	1.31	565.	11.826	
10	15	2.00	12299.5 25560.9	1.28	8328.00 .00	1.55	12325.0	1.27	559.	11.658	
10	16	2.00	25.50 43.99	28.0	20.00 .00	31.6	44.50	21.2	708.	17.215	I-Cal Bkg 2

Performed @ Packard - Downers Grove, IL
on Packard Model 4640 Liquid Scintillation Counter

by D. Moryka
Q.C. Supervisor

S. Affeldt

ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426
Telephone 312 210 3000

Research & Development

June 13, 1985

Mr. John Hollinden
S. A. Huber Consultants, Inc.
200 North Cedar Road
New Lenox, Illinois 60451

Dear Sir:

At the request of Stan Huber, I am detailing the calculations used to assure that the concentration of H-3 in the cave pool water discharged to the Metropolitan Sanitary District sewer was within regulatory limits.

Stan A. Huber Consultants, Inc. reported a maximum H-3 concentration of 15,826 dpm/ml or 7.13×10^{-3} µc/ml in the N-Building cave pool (1). This agreed well with a value of 17,500 dpm/ml or 7.9×10^{-3} µc/ml which I measured (2). No other radioactivity was detected in the water. Since the pool contained about 4300 gallons or 1.63×10^{7} milliliters, there was a total of 1.29×10^{5} µc (0.129 curies) of H-3 present based on my higher concentration.

ADCO Services, Inc., discharged the pool water to the sewer near the front of N-Building over a period of about 8 hours. While the pool water was discharged and for a while afterwards, the sewer was flushed with water from a nearby fire hydrant. A flush rate at least twice the average pool discharge rate was used. The pool water was mixed with the total effluent from the Harvey Technical Center before being discharged to the Metropolitan Sanitary District Sewer. Average daily effluent from HTC is 112,000 gal/day. The pool water would have mixed with about 37,000 gal or 1.41×10^{8} ml of water giving a final H-3 concentration of 9.1×10^{-4} uc/ml in the discharge. This compares favorably with the NRC unrestricted area limit of 3×10^{-3} uc/ml for soluble H-3 which can be averaged over one year's effluent. Averaging over one year gives 8.3×10^{-7} µc/ml. Additional maximum limits on sanitary sewer discharges are 1×10^{-1} µc/ml at the point entering the plant sewer; and total sewer discharges of 5 curies/yr H-3, 1 curie/yr C-14, and 1 curie/yr for all other isotopes. We were well within these limits.

If you have any questions or need further information, please give me a call at 312-210-3676.

Yours very truly,

ARCO Petroleum Products Company

John D. Phelps, Jr.
Radiation Safety Officer

JDP:msk

Attachment

Doc# 85164HTC0008

1. Letter of June 3, 1985 from Stan A. Huber to John Phelps.

2. John D. Phelps, Jr., Notebook Pages H022836 and H022837, copies attached.

June 3, 1985

Dear Mr. Huber:

Enclosed are the results of the counting test from the samples you gave me on Friday, May 31, 1985. If you have questions, you can contact me at work at (312) 972-3322 or 972-3317.

Additionally, I am enclosing a copy of my personal vita for your records.

Sincerely,

Elwyn H. Dolecek

Elwyn H. Dolecek, Ph.D.
Sr. Health Physicist, ANL

Results of GE(LI) Counting

Detector System:

ORTEC GE(LI) Detector Model 8011-15200-5
Serial Number 20-6202, Shipped 5-8-80

Calibration:

Energy Calibration from NBS SRM-4275 at 25 cm from detector
Efficiency Calibration from NBS SRM-4276, 100 gm sample

Counting Conditions:

Sample in LSC 20 ml vial, midpoint of sample approximately 25 cm from detector

Spectrum Analysis Library:

SY:(Analysis)SRWCALC.LIB

Start, Stop 50,7900 SENS(%) 30 Multiplier 1.000000

Sample:

All results of the Top, Middle, & Bottom LSC Vial samples gave the same results. Therefore, only one analysis report is incluced.

GAMMA 2 <3.30 > 01-JUN-85 19:55:49 PAGE 1

SPECTRUM	ACQUISITION STARTED	LIVE	REAL
EHDMID1.SPC	01-JUN-85 07:36:16	25000	25002

SAMPLE
HUBER SAMPLE FROM MIDDLE OF TANK
LONG COUNT TIME FOR BETTER ID OF R/A

********** SUMMARY OF PEAKS IN SAMPLE **********

PK SEARCH CHANNEL	CENTROID KEV	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2SIG %	FWHM KEV
961.34	351.92	155.	63.	2.533E-03	59.7	1.07
NAT-RA	1.067E-05		5.844E+05		1.649E-02	
1399.51	511.00	121.	301.	1.204E-02	15.2	2.43
CO-56	1.521E-04		7.876E+01		1.150E-02	
1399.51	511.00	121.	301.	1.204E-02	15.2	2.43
CO-58	1.900E-04		7.080E+01		1.150E-02	
1399.51	511.00	121.	301.	1.204E-02	15.2	2.43
MN-52	9.622E-05		5.591E+00		1.150E-02	
1399.51	511.00	121.	301.	1.204E-02	15.2	2.43
NA-22	3.143E-05		9.504E+02		1.150E-02	
1399.51	511.00	121.	301.	1.204E-02	15.2	2.43
V-48	5.716E-05		1.597E+01		1.150E-02	
1399.51	511.00	121.	301.	1.204E-02	15.2	2.43
Y-88	7.072E-03		1.067E+02		1.150E-02	
1399.51	511.00	121.	301.	1.204E-02	15.2	2.43
ZN-65	9.989E-04		2.441E+02		1.150E-02	
1529.86	558.43	45.	88.	3.507E-03	29.9	1.77
IN-114M	2.043E-04		4.951E+01		1.057E-02	
1670.92	609.31	54.	37.	1.493E-03	63.1	1.13
NAT-RA	9.586E-06		5.844E+05		9.724E-03	

NUCLIDE	ACTIVITY (TOC)	T/2 D	EFFICIENCY

CONTROL NO. 9495

********** SUMMARY **********
TOTAL ACTIVITY: 0.000000

********** DISPOSITION OF PEAKS **********

351.92 & NAT-RA	511.00 & CO-56	511.00 & CO-58
511.00 & MN-52	511.00 & NA-22	511.00 & V-48
511.00 & Y-88	511.00 & ZN-65	558.43 & IN-114M
609.31 & NAT-RA		

ALL PEAKS FOUND BY PEAK SEARCH WERE MATCHED BY LIBRARY PEAKS.

****

* = Peak is multiplet, only 1 peak in library.
! = Peak is multiplet, area went negative.
? = FWHM of peak is less than 0.8 x shape calib.
@ = Peak fails FW.04M but passes FW.10M test.
% = First peak for nuclide in library found, but this peak fails sensitivity test.
$ = Singlet peak of nuclide found by peak search, but first peak for nuclide not found.
& = Singlet peak of nuclide found by peak search, but first peak for nuclide fails sensitivity test.
+ = Peak activity higher than counting uncertainty range.
- = Peak activity lower than counting uncertainty range.
= Peak out of start, stop range.

ELAPSED TIME: 381.80 SECONDS
=EHDMID1/VE:2

Sample:

Small glass vial (approx. 6 ml in vial) inside larger glass jar.

GAMMA 2 <3.30 > 01-JUN-85 07:29:21 PAGE 1

SPECTRUM	ACQUISITION STARTED		LIVE	REAL
EHDVIAL1.SPC	31-MAY-85	21:39:47	25000	25007

SAMPLE
HUBER SAMPLE IN SMALL GLASS VIAL

********** SUMMARY OF PEAKS IN SAMPLE **********

PK SEARCH CHANNEL	CENTROID KEV	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2SIG %	FWHM KEV
6907.67	2505.75	0.	84.	3.360E-03	21.4	2.05U

********** SUMMARY OF PEAKS IN SAMPLE **********

PK SEARCH CHANNEL	CENTROID KEV	BACKGROUND COUNTS	NET AREA COUNTS	INTENSITY CTS/SEC	UNCERT 2SIG %	FWHM KEV
80.60	31.82	1479.	29.	1.143E-03	374.9	2.53D
CS-137	4.479E-05		1.096E+04	3.519E-02		
80.60	32.19	1168.	340.	1.361E-02	29.8	2.53D
CS-137	2.885E-04		1.096E+04	3.533E-02		
93.06	36.40	940.	122.	4.867E-03	72.1	0.89
CS-137	2.734E-04		1.096E+04	3.672E-02		
960.25	351.92	614.	112.	4.467E-03	64.3	1.87
NAT-RA	1.882E-05		5.844E+05	1.649E-02		
1399.22	511.00	717.	174.	6.967E-03	45.1	1.84
CO-56	8.800E-05		7.876E+01	1.150E-02		
1399.22	511.00	717.	174.	6.967E-03	45.1	1.84
CO-58	1.099E-04		7.080E+01	1.150E-02		
1399.22	511.00	717.	174.	6.967E-03	45.1	1.84
MN-52	5.567E-05		5.591E+00	1.150E-02		

NUCLIDE	ACTIVITY (TOC)	T/2 D	EFFICIENCY

```
1399.22   511.00      717.       174.   6.967E-03   45.1  1.84
 NA-22        1.819E-05    9.504E+02            1.150E-02

1399.22   511.00      717.       174.   6.967E-03   45.1  1.84
 V-48         3.308E-05    1.597E+01            1.150E-02

1399.22   511.00      717.       174.   6.967E-03   45.1  1.84
 Y-88         4.092E-03    1.067E+02            1.150E-02

1399.22   511.00      717.       174.   6.967E-03   45.1  1.84
 ZN-65        5.780E-04    2.441E+02            1.150E-02

1815.39   661.66      572.      2729.   1.091E-01    4.5  1.95
 CS-137       3.850E-04    1.096E+04            8.992E-03

3227.07  1173.24      397.      4591.   1.837E-01    3.1  2.23
 CO-60        9.454E-04    1.925E+03            5.255E-03

3666.75  1332.50      108.      4115.   1.646E-01    3.1  2.43
 CO-60        9.524E-04    1.925E+03            4.672E-03


**************** SUMMARY OF NUCLIDES IN SAMPLE ****************

          TIME OF COUNT      PERCENT       PERCENT
NUCLIDE     ACTIVITY       UNCERTAINTY  UNCERTAINTY
          MICROCURIES       COUNTING 2 S   TOTAL 2 S
-----------------------------------------------------
CO-60       9.489E-04          2.2           7.3
CS-137      3.850E-04          4.5           8.3

*************************** SUMMARY ***************************
TOTAL ACTIVITY:       0.133390E-02


************************* DISPOSITION OF PEAKS ************************

    31.82 % CS-137       32.19 % CS-137       36.40 % CS-137
   351.92 & NAT-RA      511.00 & CO-56       511.00 & CO-58
   511.00 & MN-52       511.00 & NA-22       511.00 & V-48
   511.00 & Y-88        511.00 & ZN-65
-----------------------------------------------------------------------
   PEAKS FOUND BY PEAK SEARCH, BUT NO MATCH IN LIBRARY PEAKS :

 2505.75

***********************************************************************

   * = Peak is multiplet, only 1 peak in library.
   ! = Peak is multiplet, area went negative.
   ? = FWHM of peak is less than 0.8 x shape calib.
   @ = Peak fails FW.04M but passes FW.10M test.
   % = First peak for nuclide in library found, but
       this peak fails sensitivity test.
   $ = Singlet peak of nuclide found by peak search,
       but first peak for nuclide not found.
   & = Singlet peak of nuclide found by peak search,
       but first peak for nuclide fails sensitivity test.
   + = Peak activity higher than counting uncertainty range.
   - = Peak activity lower than counting uncertainty range.
```

Revised 6/4/85

Results of Smear Counting:

Counting in a thin window proportional counter system (alpha window .5 mg/cm^2 beta window 1 mg/cm^2)

Alpha counting efficiency - 35% Standard used was Pu-239 Bkg. = 6 CPM

Beta counting efficiency - 42% Standard used was Sr-90/Y-90 Bkg. = 369 CPM

Location	GROSS Alpha CPM	GROSS Beta/Gamma CPM
A1	5	364
A2	4	337
A3	2	338
A4	1	325
A5	7	350
B1	4	331
C1	3	314
D1	4	373
D2	6	344
E1	5	353
F1	4	331
F2	8	369
F3	6	357
F4	4	378
F5	4	420
F6	2	370
F7	2	388
G1	5	328
G2	2	359
Well Light	3	383

Results: All CPM were less than or equal to background with 1 sigma.
Counting error is + or - 10%

CONTROL NO. 9495

ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License #12-00140-04

Attachment A4I

Inventory of Isotopes transferred to ADCO Services, Inc during June, 1985

Carbon-14	Item	Millicuries
barium carbonate	R-1	20
carbon monoxide	155	2.0
2-propanol	R-100a, b, c	0.2
ethyliodide	R-63	0.1
sodium acetate	R-66, R-66a	0.5
t-butyl alcohol	R-58	0.5
benzoic acid	R-130	0.0046
indole	R-93	0.0025
methane	R-80	0.1
ethylene	R-82a	0.5
propane	R-110a, b, c	0.4
butene-1	R-115	0.1
isobutane	R-47	0.01
methyl cyclopentane	R-126	0.05
benzene	76	0.49
n-heptane	33	0.9
toluene	11, 176, 178, 182	0.35
p-xylene	7	0.3
n-octane	118	3.5
naphthalene	R-65	0.0036
hexadecane (cetane)	128, 157, 157A, 181	10.9
heneicosane	R-95	0.05
dotriacontane	63, 119, 158, R-123	7.6
methanol	153	0.25
propylene	170	0.64
drag reducer polymer	180A, 180B	7.00
misc C-14	underground storage tank	7.27
misc C-14	dry active waste	1
Total Carbon-14		64.7 mc

CONTROL NO. 7 949 5

Inventory of Isotopes Transferred (Continued)

Hydrogen-3	Item	Millicuries
hydrogen	107	17000
propane	R-131	0.72
propylene	R-132	6.0
n-butane	R-124a, b, c	379
butene-1	R-133	39
n-hexane	R-134b, c, d	18.7
benzene	R-122	0.018
ethylcyclohexane	R-48a, b, c, d, aB	528
ethylbenzene	R-70a	150
p-xylene	R-136	0.23
durene	R-137	4.0
pentamethyl benzene	R-138, R-138a	1.4
cetane	141, 141a	3563
anisole	131, 145,147	3770
octanol	79a, 143, 143a, b	15.1
oleic acid	R-125	24.1
inhibitors	96a, b, c, d, 102	574
lube stocks	9a	24.3
water	117a, b, c, 130a, b, 135, 135a, 146, 168, 183	10363
toluene	184	0.009
misc H-3	underground storage tank	1892
misc H-3	dry active waste	100
Total Hydrogen-3		38453 mc

Inventory of Isotopes Transferred (Continued)

Other Isotopes	Item	Millicuries
Krypton-85	R-72, 3A, 35, 35a	5924
Cesium-137	R-75, R-102, R-103, R-107, R-113, R-207	212
Nickel-63	R-73, 173	10
Chlorine-36	86	0.4
Cobalt-60	4, R-109, R-109a, b	6.5
Scandium-46	160, 165, 166, 167, 187	1.5
Sulfur-35	149, 150	0.0008
Uranium-238	159A, misc	0.01
Thorium-230	172, misc	0.05
Strontium-90-Yttrium-90	174	0.0001
Radium-226	R-4	6.85
misc gamma emitters	underground storage tank	1.05
misc other isotopes	dry active waste	0.1

Sealed Sources	Item	Millicuries
Cesium-137	Ohmart level detector	155
Cesium-137	Accuray level detector	138
Cesium-137	Brick	6.6
Cesium-137	Ohmart gage	1368
Cesium-137	misc check sources	0.001
Cesium-137	Calibration Standard	9.38
Strontium-90	Eberline Monitor	0.331
Americium-241	Instrument	0.600
Nickel-63	Hewlett-Packard Chromatograph	2
Nickel-63	Perkin-Elmer Chromatograph	15
Radium-226	Misc check sources	0.006
Iron-55	Standard source	0.067
Carbon-14	Standard source	0.000148
Titanium Tritide	Instrument	1160
Polonium-210	Antistatic devices	0.001

ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License #12-00140-04

Attachment A4II

CONTROL NO. 9495

ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426
Telephone 312 210 3000

Research & Development

August 1, 1985

Director of Nuclear Material Safety & Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Gentlemen:

In accordance with NRC Regulation 32.12, we are reporting, in preparation for license termination, that under NRC License No. 12-00140-04, we have transferred radioactive material in products during the period July 1, 1982 to July 31, 1985 as follows:

Date	Location	Isotope	Quantity Transferred (Curies)	Max. Conc. Permitted by License (μc/ml)	Max. Conc. in Product Transferred (μc/ml)	Amount of Product Transferred (ml)	Type of Product
11/23/82	Phil., PA	H-3	0.300	3×10^{-2}	3×10^{-5}	1.03×10^{10}	Gasoline
/84	Phil., PA	H-3	0.0315	3×10^{-2}	3.2×10^{-6}	9.82×10^{9}	Gasoline
6/11/84	Phil., PA	H-3	0.0315	3×10^{-2}	3.2×10^{-6}	9.82×10^{9}	Gasoline
6/25/84	Phil., PA	H-3	0.063	3×10^{-2}	6.4×10^{-6}	9.82×10^{9}	Gasoline
7/25/84	Phil., PA	H-3	0.0774	3×10^{-2}	4.0×10^{-6}	1.95×10^{10}	Gasoline
2/27/85	Ferndale, WA	Au-198	0.037	5×10^{-4}	2.1×10^{-5}	$1.77 \times 10^{9*}$	Coke
2/28/85	Ferndale, WA	Au-198	0.052	5×10^{-4}	2.9×10^{-5}	$1.77 \times 10^{9*}$	Coke

* Units are grams. Density is approximately 1.0 gm/ml.

Yours very truly,

ARCO Petroleum Products Company

John D. Phelps, Jr.

John D. Phelps, Jr.
Radiation Safety Officer

cc: USNRC Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

ARCO Petroleum Products
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License # 12-00140-04

Attachment B

Contents

1. ARCO Soil Samples "N" Building β (Beta)

2. ARCO Soil Samples "N" Building γ (Gamma) 2 pages

3. ARCO Samples of Hot Cell Well Water and Ladder

4. ARCO Water Samples After Flushing Cave Well With Water

5. ARCO Ground Water Samples 7-8-85

6. ARCO Ground Water Samples 7-15-85

CONTROL NO. 7 9 4 9 5

ARCO Soil samples "N" Building β (Beta)
6-8-85

38. Northwest side of "N" Building
39. Southwest side of "N" Building
40. Southeast side of "N" Building
41. East side of "N" Building

12	38	1.00	22.00	42.6	16.00	50.0	53.00	27.4	490.	13.148	74
12	39	1.00	24.00	40.8	19.00	45.8	55.00	26.9	442.	9.920	76
12	40	1.00	28.00	37.8	24.00	40.8	65.00	24.8	417.	10.428	78
12	41	1.00	21.00	43.6	20.00	44.7	50.00	28.2	439.	10.438	80

Efficiency = .42

ARCO Soil Samples "N" Building γ (Gamma)
6-8-85

1. North West Side of "N" Building
2. Southwest side of "N" Building
3. Southeast side of "N" Building
4. East side of "N" Building

07-24-85
ARCO

SOIL SAMPLES FROM
JUNE 8, 1985

"N" Building γ (Gamma)

OSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 122
EFFICIENCY 83.5% (.835))

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835	=	DPM/ 100 SQ.CM
1	115		0			0
2	100		0			0
3	142		20			24
4	114		0			0

07-24-85
ARCO

SOIL SAMPLES FROM
JUNE 8, 1985

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

I-129 STANDARD CT
MEDIUM ENERGY .....
BACKGROUND 36
EFFICIENCY 71% (0.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	34		0			0
2	27		0			0
3	43		7			10
4	41		5			7

07-24-85
ARCO

SOIL SAMPLES FROM
JUNE 8, 1985

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 47
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .29	=	DPM/ 100 SQ.CM
1	33		0			0
2	36		0			0
3	35		0			0

ARCO samples of Hot Cell well water and ladder. β
6-17-85

Packard Tri-Carb 4530

KEY

1. Background
2. Northwest corner of well 2cc of water
3. Northeast corner of well 2cc of water
4. Southeast corner of well 2cc of water
5. Chip of wood from bottom of ladder
6. Chip of ladder at chest height
7. Fourth ladder step wipe

PROGRAM #= 12 17/06/85 14:07
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	19.00	45.8	19.00	45.8	49.00	28.5	651.	9.440		2
12	2	1.00	9972.00	2.00	26.00	39.2	10019.0	2.00	592.	11.003		4
12	3	1.00	7292.00	2.34	29.00	37.1	7340.00	2.33	586.	11.536		6
12	4	1.00	7008.00	2.39	18.00	47.1	7046.00	2.38	599.	11.794		8
12	5	1.00	39.00	32.0	17.00	48.5	74.00	23.2	562.	11.240		10
12	6	1.00	70.00	23.9	16.00	50.0	106.00	19.4	607.	12.318		12
12	7	1.00	140.00	16.9	31.00	35.9	192.00	14.4	553.	12.959		14

Efficiency 42%

CONTROL NO. 7 9 4 9 5

ARCO Water samples after flushing cave well with water - β
7-1-85

1. H^3 Standard
2. C^{14} Standard
3. ^3H_2O standard — 41780 on 7-3-85

$$Eff = \frac{17568 \text{ cpm}}{41780 \text{ dpm}} = .42$$

4. Background
5. 2cc of Northwest corner well water

7-1-85 After Flushing

PROGRAM #= 12 19/05/85 11:28
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	123900.	.57	14890.0	1.64	138814.	.54	1096	19.080		2
12	2	1.00	17194.0	1.53	128238.	.56	147972.	.52	1092	23.322		4
12	3	1.00	17568.0	1.51	31.00	35.9	17618.0	1.51	590.	11.925		6
12	4	1.00	27.00	38.4	19.00	45.8	67.00	24.4	655.	14.286		8
12	5	1.00	4415.00	3.01	15.00	51.6	4447.00	3.00	584.	11.585		10

ARCO Ground water samples - B
7-8-85

North Well

1. Ground water at top of water table
2. Ground water at depth of 30 feet
3. ^3H_2O standard 41780 dpm on 7-3-85

$$\text{Eff} = \frac{18322 \text{ cpm}}{41780 \text{ dpm}} = .43$$

4. Background

7-8-85

PROGRAM #= 12 26/05/85 12:54
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	26.00	39.2	13.00	55.4	55.00	26.9	599.	12.978		2
12	2	1.00	29.00	37.1	15.00	51.6	61.00	25.6	606.	11.947		4
12	3	1.00	18322.0	1.48	43.00	30.5	18390.0	1.47	643.	12.459		6
12	5	1.00	25.00	40.0	21.00	43.6	61.00	25.6	643.	10.831		8

ARCO Ground Water Samples - β
7-15-85

South Well

1. Ground water at top of water table

2. Ground water at depth of 25 ft

3. Ground water at depth of 30 ft

West Well

4. Ground water at top of water table

5. Ground water at depth of 30 ft

East Well

6. Ground water at top of water table

7. Ground water at depth of 25 ft

8. Ground water at depth of 30 ft

9. Background

PROGRAM #= 12 02/06/85 12:49
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 10.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	10.00	97.90	6.39	19.10	14.4	137.30	5.40	609.	13.114		11 SW
12	2	10.00	98.40	6.38	17.30	15.2	138.40	5.38	612.	12.914		22 S-25
12	3	10.00	98.70	6.37	18.60	14.6	141.90	5.31	603.	12.942		33 S-30
12	4	10.00	21.10	13.7	18.10	14.8	58.30	8.28	608.	15.660		44 W-W
12	5	10.00	24.00	12.9	18.50	14.7	62.80	7.98	605.	14.738		55 W-30
12	6	10.00	23.70	12.9	18.80	14.5	64.20	7.89	624.	17.069		67 E-W
12	7	10.00	22.40	13.3	17.90	14.9	61.70	8.05	629.	14.836		78 E-25
12	8	10.00	23.80	12.9	17.60	15.0	63.10	7.96	613.	16.909		89 E-30
	9	10.00	22.90	13.2	17.30	15.2	58.70	8.25	652.	13.982		100 Back

Eff. = 43%

CONTROL NO. 79495

ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License #12-00140-04

Attachment B2I

This is the summary report of the "Closeout Radiation Survey" performed at Harvey Technical Center located at 400 East Sibley Boulevard in Harvey, Illinois.

PRELIMINARY RADIATION SURVEY

1. A preliminary radiation survey was performed by Stan A. Huber Consultants, Inc. (S. Huber, Mark Rudin, and John Hollinden) on May 31, 1985. The representative wipe test and water samples were counted at Argonne National Lab by Dr. E. Dolocek. No unusual alpha, beta, or gamma contamination was found in any of the wipe samples, although extensive tritium contamination (129 millicuries) was found in the water samples for the Cobalt-60 storage well.

   The tritium concentration was rechecked by counting water samples on Packard liquid scintillation counters at both ARCO and Packard Company.

   The highest value of 17,500 dpm per ml or 7.9×10^{-3} microcuries per ml was used for determining compliance levels for 10 CFR Part 20 sewer dilution.

RADIATION CAVE "HOT CELL" WATER POOL

1. The Radiation Cave pool was emptied on June 5, 1985 by ADCO Services, Inc. and the calculations for determining the sewer concentrations are attached for your review. (Attachment A)

2. On June 17, 1985 water samples were again taken of the "Hot Cell" at the bottom where water was seeping back into the tank. These were counted in a Packard Liquid Scintillation Tri-Carb and a count of approximately 12,000 dpms per ml was obtained. A spectral analysis

CONTROL NO.

was also performed to insure these counts were not due to chemiluminescence instead of tritium.

3. On June 24, 1985, we consulted with Rod Ice, Ph.D. ABHP, and he recommended the pool be flushed and soil samples be taken at the four polar coordinates. The pool was flushed, filled, and reflushed and the count rate was reduced to approximately one half of its original values. Ground water samples were taken at the four polar coordinates and counted with only minimal levels of tritium being detected. The amount detected is well within the NRC limits. The results of the soil sample analysis, wipes, and water sample tests taken are attached. (Attachment B).

CONCLUSION

We are now awaiting for NRC analysis of the Hot Cell water pool results and determination that it would be acceptable to fill sand into the bottom of the pool and cap or seal the pool with a concrete cover since the soil samples indicate the remaining tritium contamination is contained within the lining surrounding the pool structure. This is the only portion of the close-out survey at the "N" (Research) Building of the Harvey Technical Center that remains in question. The remainder of the building has been cleaned and thoroughly decontaminated and there is no evidence of residual activity. The results of the remainder of the survey are as follows:

ANALYSIS OF THE E, L, D, and H BUILDINGS

ARCO radiation safety personnel had taken wipe tests of all other areas in the Technical Center where radioactivity had ever been used and no contamination was found. However, ARCO requested a third party analysis of these same areas.

Representative wipe tests (smears) were taken by S. A. Huber Consultants in the following locations:

a. In rooms E20 and E27 of the E Building where Nickle-63, Iron-55, Iron-57, and Tantalum-182 were used at one time.

b. In rooms L-259, L-122, and L-104 were Nickle-63, Iron-59, Carbon-14, and Radium-226 were used at one time.

c. In Room D-12 of the D Building where Carbon-14 was used at one time.

d. In the boiler house in the H Building on Tanks #24 and 25 where Carbon-14 and mostly tritium were used.

e. In Rooms H-111, H-106, and H-101 where Carbon 14 and tritium were used.

CONCLUSION

The wipe tests taken in each of the rooms of these buildings covered an area of approximately three hundred square centimeters per sample. The attached facility sketches show the location and coding where each wipe was taken in

each of the above mentioned rooms. Each of the wipes taken in these rooms were counted on ARCO's Packard TRICARB Model 4530 Liquid Scintillation counter for beta analysis and SAHCI's Nuclear Chicago, Model 4216 for gamma analysis. The results of these surveys are attached (with sketches) for your analysis and review. (Attachment C)

"N" Building

The "N" Building contained the Radiation Laboratory and Tracer Laboratory where the bulk of the radioactive materials used at Harvey Technical Center were stored and used. All of the rooms within the "N" Building were extensively surveyed for both beta and gamma contamination. The final close-out survey results are attached along, with a facility sketch of each room for your review and analysis. The following is a summary of contaminated items found during the close-out survey which warrants mentioning.

1. The "external" storage tank directly outside the Tracer Laboratory was confirmed to contain microcurie amounts of Co-60 and Cs-137. This was detailed during the May 31, 1985 analysis by Dr. E. Dolocek of Argonne National Lab. The outside tank was filled with vermiculite, removed by a crane and truck on June 15, 1985 by ADCO Services for radioactive waste disposal.

   The sink leading to the external storage tank was removed as contaminated waste. Wipe tests of the lead casing surrounding the piping proved to have no contamination. Therefore, the lead casing was left in the building wall but the piping from the sink to the external storage was disposed as rad waste.

2. The fume hoods and cabinets were removed from the Tracer Laboratory as rad waste, along with the work bench drawers. All of these items were contaminated in several locations. The hoods, drawers, and cabinets were packed in barrels and crates by ADCO Services.

3. The vents on the roof of the building, for the fume hoods located in the Tracer Laboratory were surveyed for gamma and beta analysis. Three of the vents were found to be contaminated. These three were removed from the roof and packaged for disposal. The clean vents were left on the building.

4. All floor tile and counter tops which were found to have contamination were either removed and disposed or cleaned with Radiac Wash until the contamination levels were less than 100 dpm per 100 square centimeters.

5. The attic which contained the vacuum pump for the Tracer Lab hood was wiped and determined to be free of contamination. The vacuum pump itself was found to be contaminated with tritium and both the pump and oil were disposed as rad waste.

6. The radiation cave was surveyed and a hot spot was found on the radiation cave steel door closing the pipe labyrinth from the radiation laboratory. The contamination was ground off and rewiped and found to be less than 100 dpm per 100 square centimeters (for

gamma emitters). Following the grinding of the door, the remainder of the radiation cave, including the floor and wells, were surveyed and all readings were less than 100 dpm per 100 square centimeters.

OVERVIEW

The "grid pattern" method of performing radiation surveys and wipe tests, as indicated in the NRC Guide for Decontamination of Facilities and Termination of Licenses, was used during the testing of these facilities and in the final close-out radiation survey. It is our opinion these facilities are now acceptable for release for unrestricted use, pending the NRC decision about handling the water pool closure described on page 2 herein.

The test results and facility sketches are attached for your convenience and review. (Attachment D) If there are any questions, please feel free to contact the undersigned at (312) 210-3676 or S. A. Huber Consultants at (815) 485-6161. A complete copy of all the above mentioned data, including the original wipes, will be kept on file at Harvey Technical Center or Stan A. Huber Consultants, Inc. until you have processed this license termination.

ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License #12-00140-04

Attachment B2II

Closeout at Other Existing ARCO Facilities

Under this license, Hydrogen-3, Carbon-14, Iodine-131, and Gold-198 have been used st the Atlantic Richfield Refinery, 4519 Grandview Road, Ferndale, Washington 98248. All radioactive material was used in tracer testing refinery process units. Radioactive material was shipped to the refinery when needed. No radioactive material under this license was stored at the refinery except for Gold-198 (half life 64 hours) and Iodine-131 (halflife 8 days) contaminated equipment, waste, and some unused Gold-198 which rapidly decayed. Contaminated equipment and waste material from the Hydrogen-3 and Carbon-14 tests were returned to our Harvey, Illinois facility for disposal. Except for Gold-198, no laboratory preparation of radioactive material was done at the refinery. The last tracer test was done in February, 1985 using Gold-198. After the test, the residue from the preparation, contaminated equipment, and remaining unused tracer were stored in the refinery's radioactive materials storeroom. After decay, this material was disposed of as nonradioactive waste. Attachment A.

Under this license, Hydrogen-3, Carbon-14, Gold-198, and Americium-241 have been used at the Atlantic Richfield Refinery, 3144 Passyunk Avenue, Philadelphia, Pennsylvania 19145. Except for the Americium-241, all radioactive material was used in tracer testing refinery process units. The Americium-241 was part of an instrument tested at the refinery and then returned to our Harvey, Illinois facility. Since 1977, no radioactive material was stored at the refinery except for Gold-198 contaminated equipment, and waste material; and unused Gold-198 tracer which would quickly decay. Radioactive material was shipped to the refinery when needed. Contaminated equipment and waste from the Hydrogen-3 and Carbon-14 tests were returned to our Harvey, Illinois facility for disposal. The last tracer tests was done in July 1984 using Hydrogen-3. In 1982, the building in which some tracer had been stored and Gold-198 prepared was torn down. Prior to demolition, the building was checked for any remaining radioactive material.

CONTROL NO. 9495

ARCO Petroleum Products Company
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License #12-00140-04

Attachment B2III

Survey Results on Items Removed from N-Building Prior to Start of Decontamination and Decommissioning

Prior to the start of decontamination and decommisssioning of N-Building, records, office equipment, radiation detection instruments, and some laboratory equipment were removed and stored in H-Building and O-Building. These items were wipe tested for beta/gamma contamination and surveyed for gamma contamination. All items removed were found to be within the contamination limits specified in "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material." See Attachment A. for survey results.

CONTROL NO. 7 9 4 9 5

ARCO Petroleum Products
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License # 12-00140-04

Attachment C

Analysis of E, L, D, and H Buildings

Contents

1. ARCO Wipes in Buildings E, L, and D β (Beta) 2 pages

2. ARCO Wipes in Buildings E, L, and D γ (Gamma) 3 pages

3. ARCO Rewipes of Building L γ (Gamma) 2 pages

4. Sketches of Buildings E, L, and D 8 pages

5. ARCO Wipes of "N" Building Roof, H Building, and Boiler House β (Beta) 3 pages

6. ARCO Wipes of "N" Building Roof γ (Gamma) 2 pages

7. ARCO Wipes of "H" Building; Rooms 106, 111, and 101 γ (Gamma) 2 pages

8. Sketches of "N" Building Roof, "H" Building Rooms 106, 111, and 101, and Boiler House 5 pages

CONTROL NO. 79495

ARCO Wipes in Buildings E, L and D β (Beta)
Wipes 6-8-85
Count 6-10-85

KEY

1. H^3 standard <0.2 mCi
   256200 dpm on Jan 20, 1981
2. C^{14} standard <0.01 mCi
   151400 dpm on Feb 7, 1984
3. H_2^3O Standard 42000 dpm on 5-30-85
4. Background count
5. L Building Room 104 β Wipe 1 Hood
6. L " " 104 β Wipe 2 Counter
7. L " " 104 β Wipe 3 Equipment
8. L " " 104 β Wipe 4 Floor
9. L " " 122 β Wipe 1
10. L " " 122 β Wipe 2
11. L " " 259 β Wipe 1
12. L " " Womens Restroom β Wipe 1
13. E " " 20 β Wipe 1
14. E " " 20 β Wipe 2
15. E " " 20 β Wipe 3
16. E " " 27 β Wipe 1
17. E " " 27 β Wipe 2
18. E " " 27 β Wipe 3
19. D " " 12 β Wipe 1
20. D " " 12 β Wipe 2
1A. D " " 12 β Wipe 3

ARCO wipes in BLDGS E, L, and D
Wipes - 6/8/85 Counted - 6/10/85

Packard Tri-Carb 4530

PROGRAM #= 12 10/06/85 10:19
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	124277.	.57	14604.0	1.65	138904.	.54	1097	18.986		2
12	2	1.00	17455.0	1.51	128253.	.56	147749.	.52	1075	23.629		4
12	3	1.00	17694.0	1.50	37.00	32.8	17751.0	1.50	587.	11.919		6
12	4	1.00	18.00	47.1	16.00	50.0	43.00	30.5	664.	9.600		8
12	5	1.00	29.00	37.1	19.00	45.8	58.00	26.2	550.	14.114		10
12	6	1.00	25.00	40.0	24.00	40.8	70.00	23.9	586.	11.508		12
12	7	1.00	26.00	39.2	22.00	42.6	62.00	25.4	580.	10.585		14
12	8	1.00	30.00	36.5	13.00	55.4	59.00	26.0	586.	11.573		16
12	9	1.00	32.00	35.3	20.00	44.7	72.00	23.5	586.	11.103		18
12	10	1.00	26.00	39.2	20.00	44.7	68.00	24.2	593.	8.770		20
12	11	1.00	21.00	43.6	16.00	50.0	53.00	27.4	644.	10.545		22
12	12	1.00	24.00	40.8	18.00	47.1	57.00	26.4	613.	10.400		24
12	13	1.00	21.00	43.6	16.00	50.0	55.00	26.9	526.	10.255		26
12	14	1.00	16.00	50.0	23.00	41.7	53.00	27.4	414.	9.300		28
12	15	1.00	26:00	39.2	24.00	40.8	61.00	25.6	508.	10.607		30
12	16	1.00	27.00	38.4	19.00	45.8	61.00	25.6	533.	12.114		32
12	17	1.00	18.00	47.1	19.00	45.8	58.00	26.2	489.	8.084		34
12	18	1.00	30.00	36.5	16.00	50.0	64.00	25.0	539.	11.543		36
12	19	1.00	18.00	47.1	15.00	51.6	45.00	29.8	410.	10.667		38
12	20	1.00	13.00	55.4	22.00	42.6	46.00	29.4	432.	9.477		40

PROGRAM #= 12 10/06/85 11:11
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1A	1.00	33.00	34.8	17.00	48.5	68.00	24.2	482.	10.469		2

Efficiency = .42

ARCO wipes in Buildings E, L, D γ (Gamma)
6-11-85

1.	Building	E	Room	20	1 γ
2.	"	E	"	20	2 γ
3.	"	E	"	20	3 γ
4.	"	L	"	104	1 γ
5.	"	L	"	104	2 γ
6.	"	L	"	104	3 γ
7.	"	L	"	104	4 γ
8.	"	E	"	27	1 γ
9.	"	E	"	27	2 γ
10.	"	E	"	27	3 γ
11.	"	L	"	259	1 γ
12.	"	L	"	122	1 γ
13.	"	L	"	122	2 γ
14.	"	D	"	12	1 γ
15.	"	D	"	12	2 γ
16.	"	D	"	12	3 γ
17.	"	L	Womens restroom		

06-11-85
ARCO

ARCO Wipes in Buildings E, L, D
6-11-85 (Gamma)

CLOSE-OUT SURVEY

SANCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 123
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	132	9		11
2	117	0		0
3	123	0		0
4	111	0		0
5	128	5		6
6	118	0		0
7	101	0		0
8	93	0		0
9	100	0		0
10	110	0		0
11	120	0		0
12	107	0		0
13	104	0		0
14	115	0		0
15	114	0		0
16	125	2		2
17	108	0		0

CONTROL NO. 7 9495

06-11-85
700

ARCO Wipes in Buildings E, L, D
6-11-85 γ (Gamma)

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY .....
BACKGROUND 77
EFFICIENCY 14% (0.14)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .14 =	DPM/ 100 SQ.CM
1	71	0		0
2	70	0		0
3	78	1		7
4	75	0		0
5	79	2		14
6	69	0		0
7	75	0		0
8	85	8		57
9	81	4		29
10	75	0		0
11	88	11		79
12	95	18		129
13	76	0		0
14	73	0		0
15	83	6		43
16	63	0		0
17	70	0		0

ARCO Rewipes of Building L γ (Gamma)
6-11-85

Room 122

1. Building L Room 122 1
2. " L " 122 2
3. Soil sample east of N Building
4. Soil sample south east of N Building
5. Soil sample at front gate
6. Soil sample by Medical Department Building

ARCO Rewipes of Building L
6-11-85 (Gamma)

06-11-85
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 119
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	125	6		7
2	153	34		41
3	118	0		0
4	144	25		30
5	116	0		0
6	105	0		0

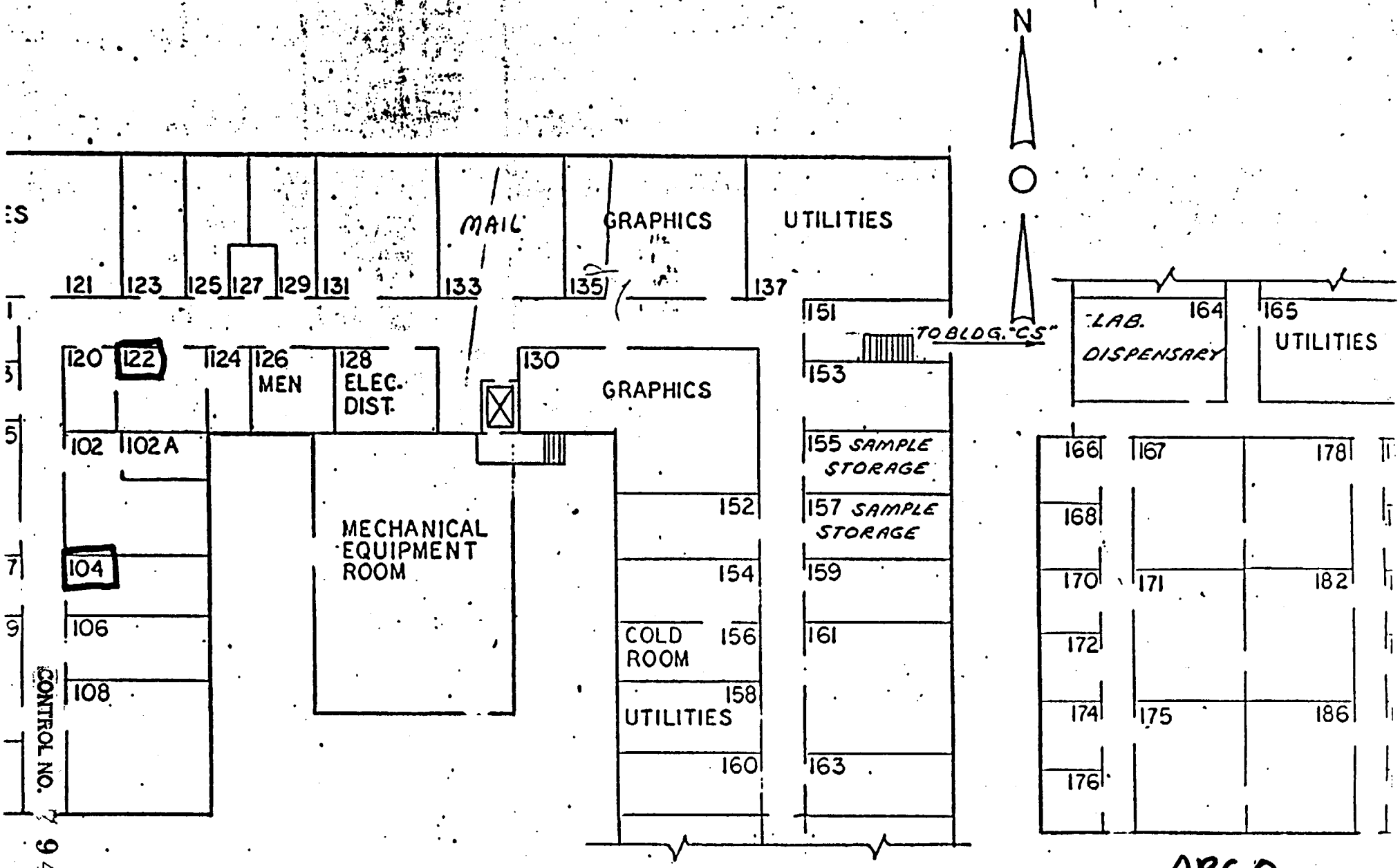
-13-85
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

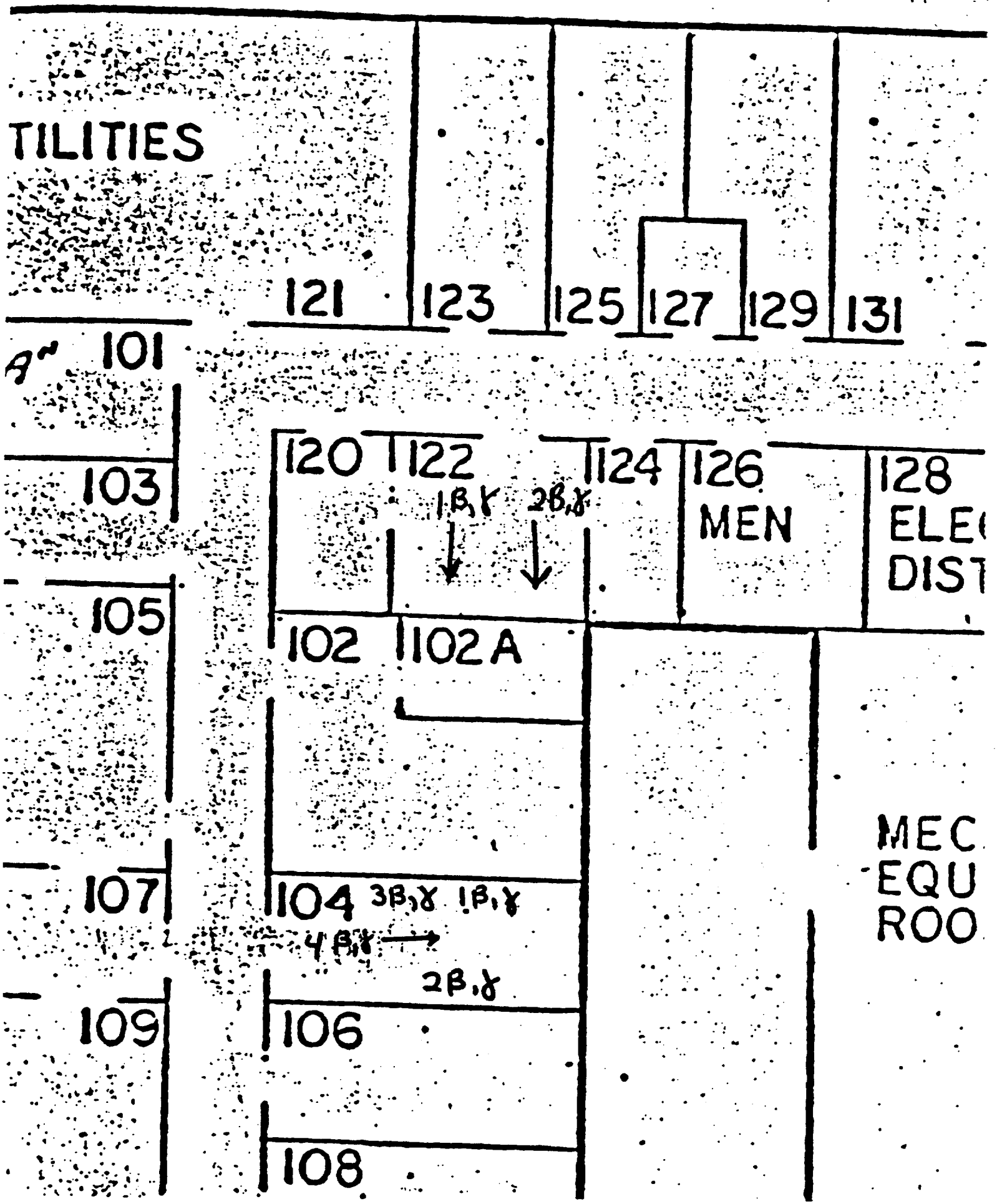
MEDIUM ENERGY .....
BACKGROUND 96
EFFICIENCY 14% (0.14)

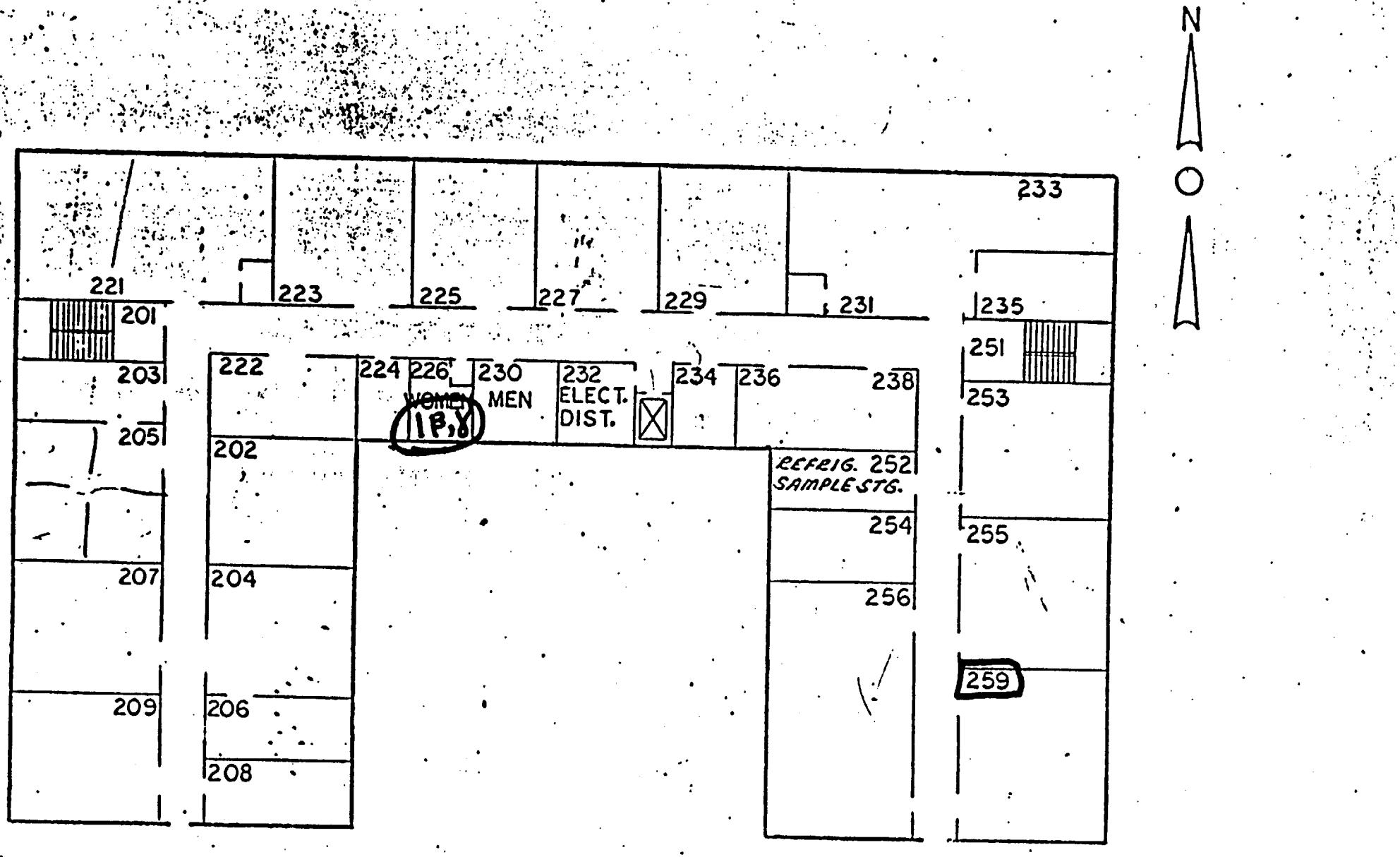
SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .14 =	DPM/ 100 SQ.CM
1	86	0		0
2	92	0		0
3	89	0		0
4	84	0		0
5	63	0		0
6	68	0		0



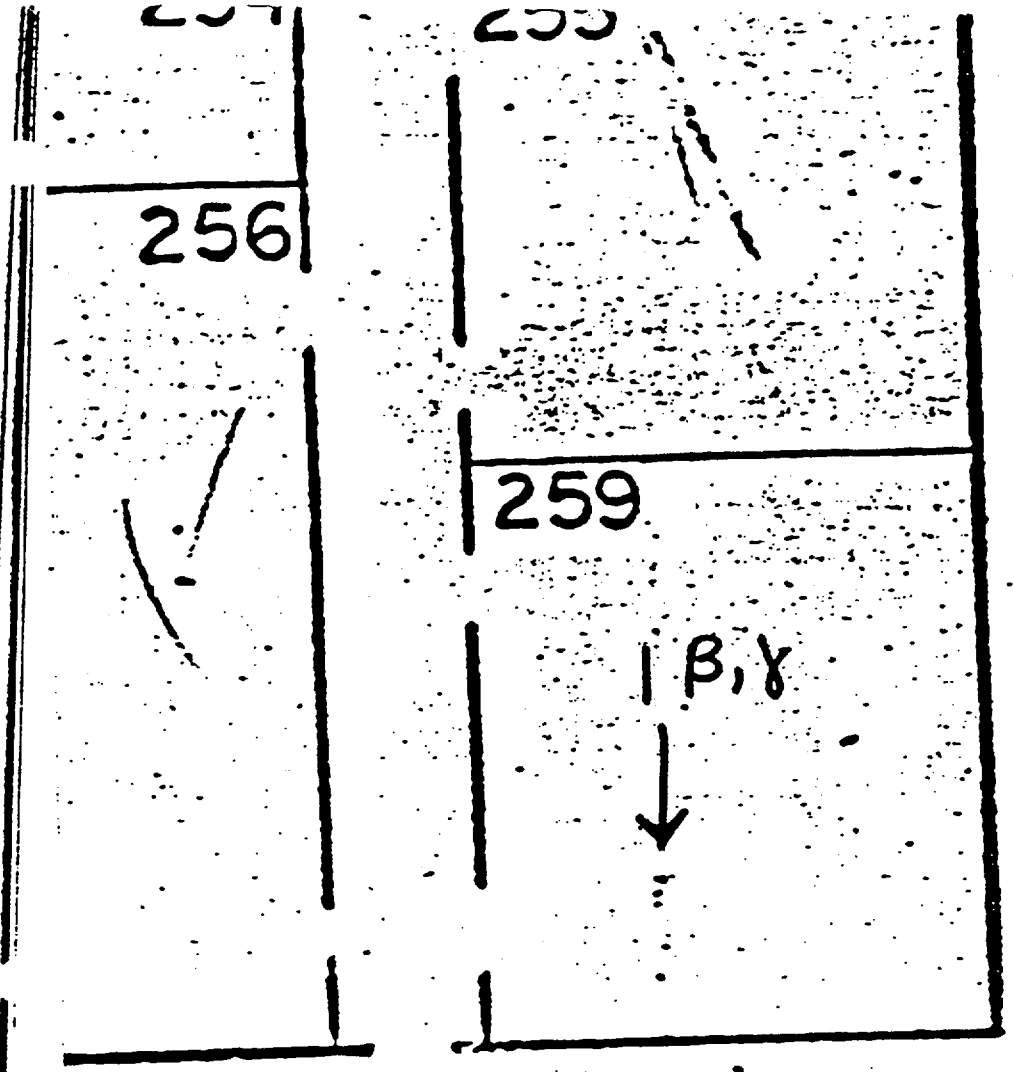
ARCO
FLOOR PLAN
BUILDING "L"
IST FLOOR

CONTROL NO. 7 9 4 9 5

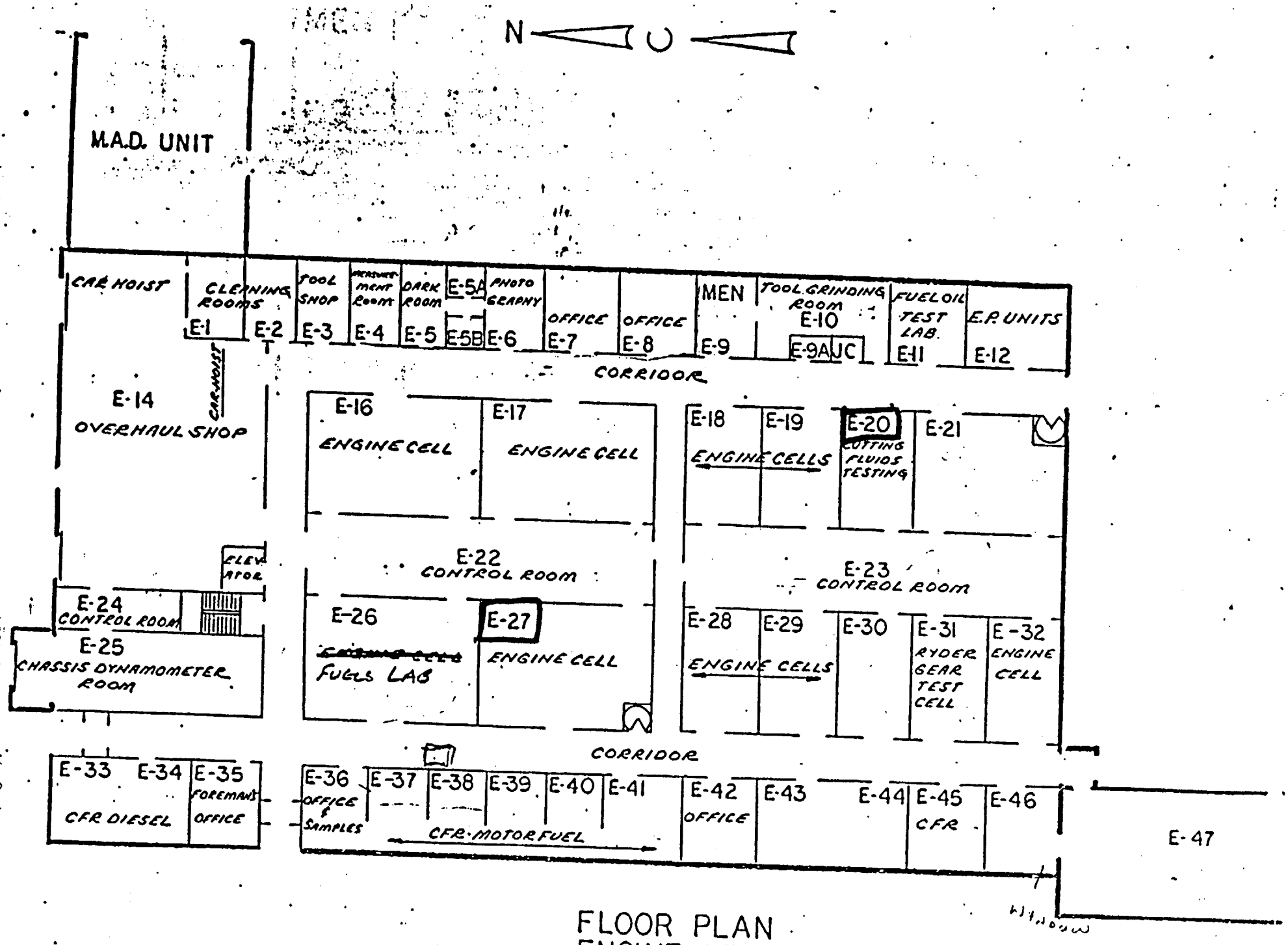

TILITIES
121
123
125
127
129
131
101
103
105
107
109
120
122
124
126
MEN
128
ELEC
DIST
1β,γ
2β,γ
102
102A
104
3β,γ
1β,γ
4β,γ
2β,γ
106
108
MEC
EQU
ROO



FLOOR PLAN
BUILDING "L"
2ND FLOOR

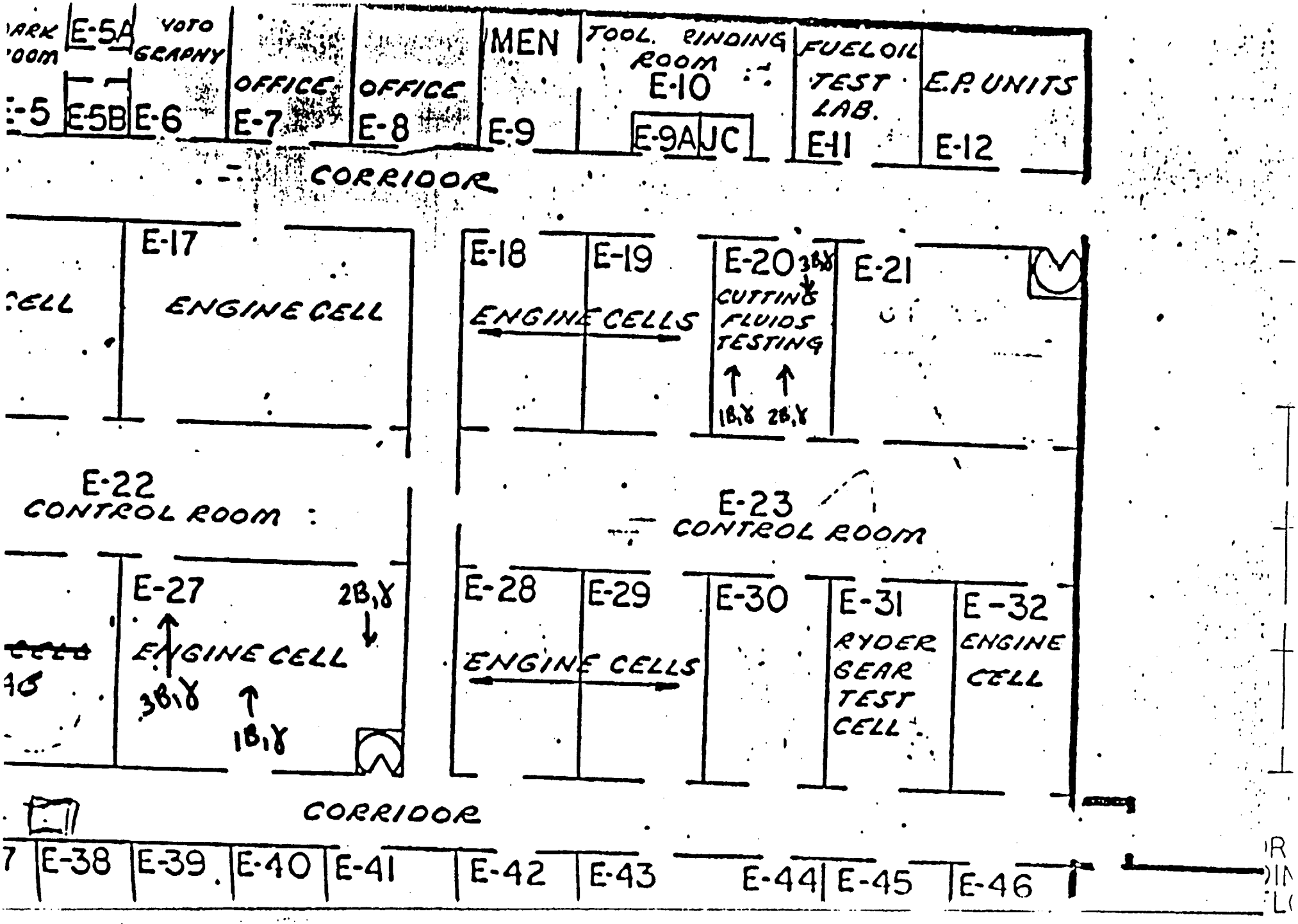


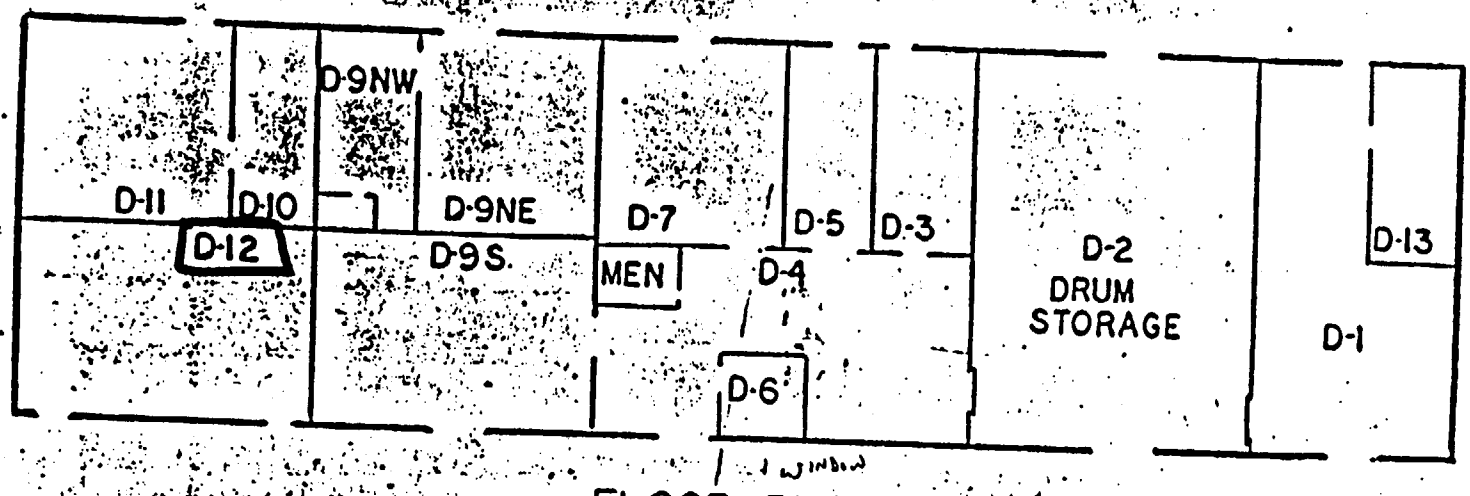
FLOOR PLAN
BUILDING "L"
2ND FLOOR



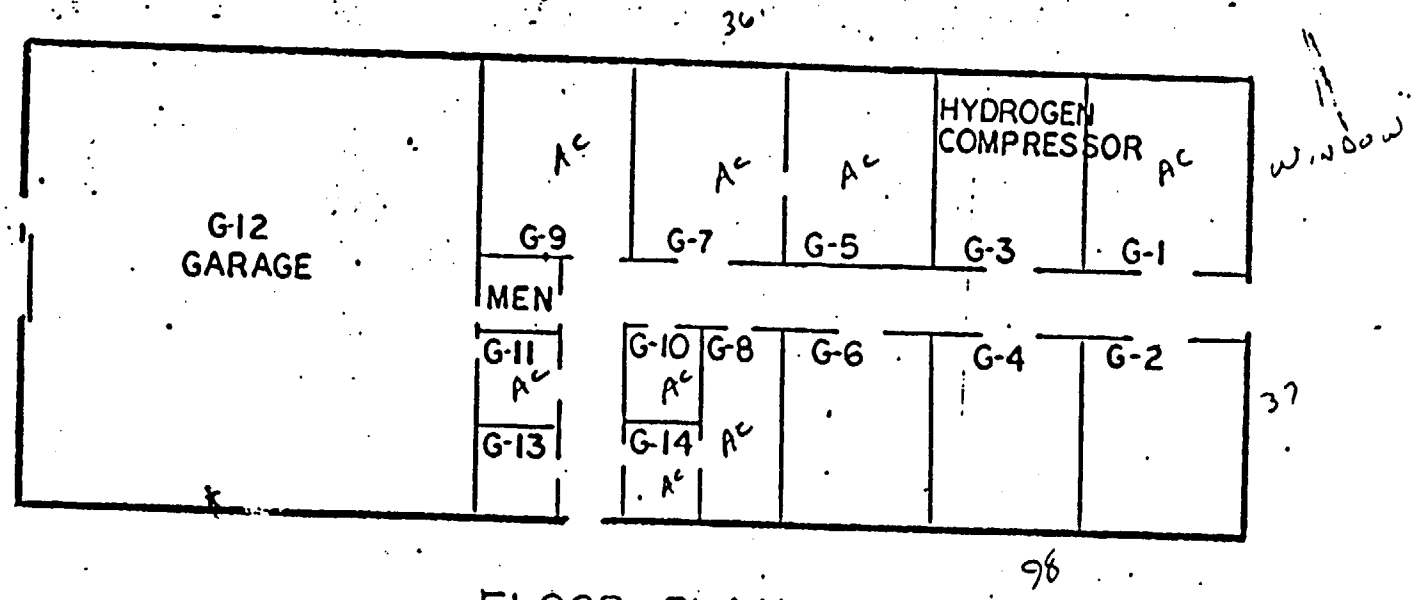
FLOOR PLAN
ENGINE LABORATORY

CONTROL NO. 9495

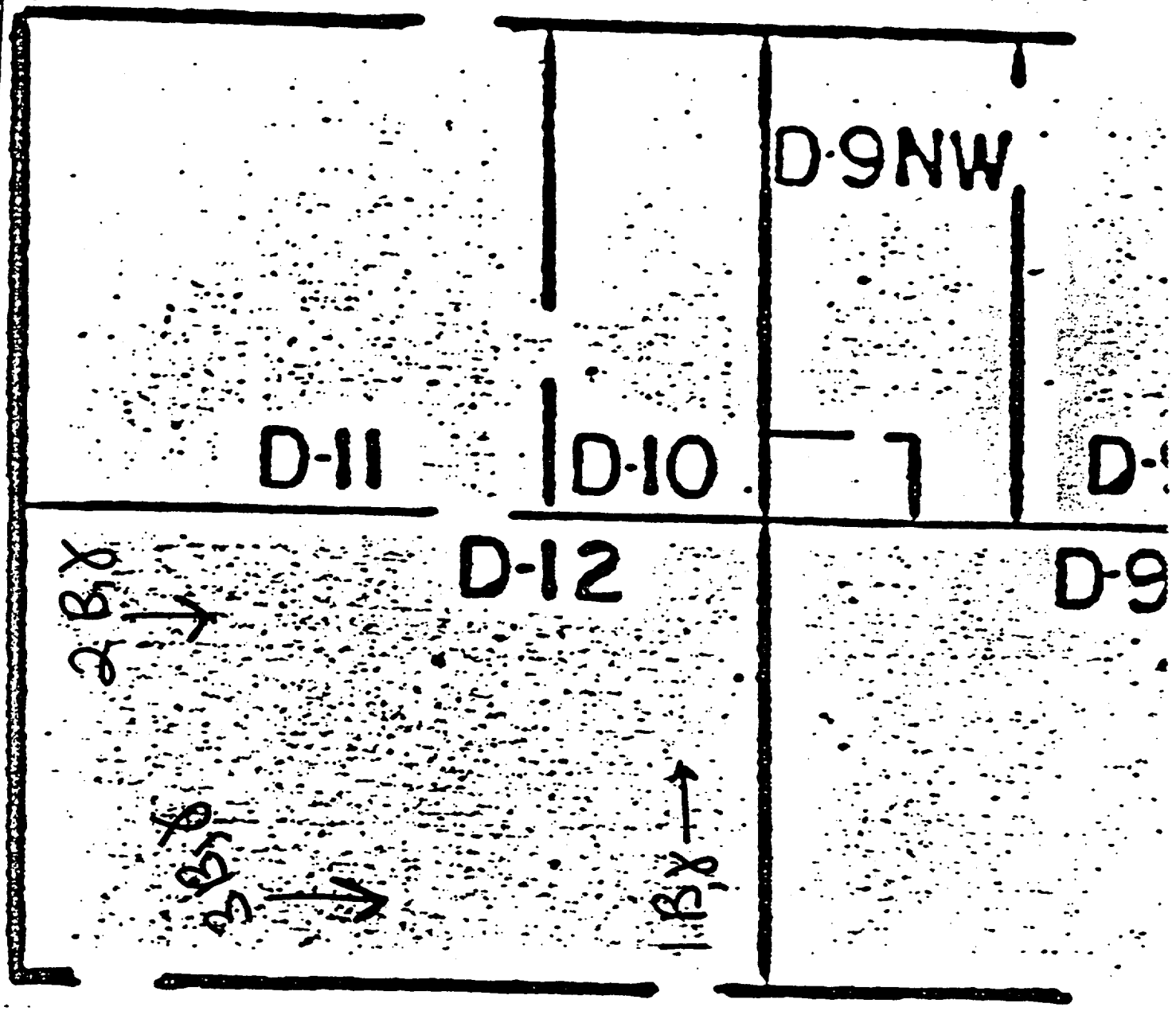

E-5A
YOTO GRAPHY
E-5
E-5B
E-6
OFFICE
E-7
OFFICE
E-8
MEN
E-9
TOOL. RINDING ROOM
E-10
E-9A
JC
FUEL OIL TEST LAB.
E-11
E.P. UNITS
E-12
CORRIDOR
E-17
ENGINE CELL
E-18
E-19
ENGINE CELLS
E-20
3B,γ
CUTTING FLUIDS TESTING
1B,γ
2B,γ
E-21
E-22
CONTROL ROOM
E-23
CONTROL ROOM
E-27
2B,γ
ENGINE CELL
3B,γ
1B,γ
E-28
E-29
ENGINE CELLS
E-30
E-31
RYDER GEAR TEST CELL
E-32
ENGINE CELL
CORRIDOR
E-38
E-39
E-40
E-41
E-42
E-43
E-44
E-45
E-46



FLOOR PLAN
BUILDING 'D'



FLOOR PLAN
BUILDING 'G'


D-11
D-12
D-10
D-9NW
D-9
$2B_\gamma$
$2B_\beta$
B_γ

ARCO wipes of "N" Building roof, H Building, and Boiler House β (Beta)
6-8-85

KEY

1. H^3 Standard < 0.2mCi
   256200 dpm on Jan 20, 1981
2. C^{14} Standard < 0.1mCi
   151400 dpm on Feb 7, 1985
3. H_2^3O Standard 42,000 dpm on 5-30-85
4. Background wipe
5. Roof 1-β
6. Roof 2-β
7. Roof 30β
8. Roof 4-β
9. Roof 5-β
10. Roof 6-β
11. Roof 7-β
12. Roof 8-β
13. Mark Rudin's hands
14. Vent
15. Base

16.	Building	H	Room	106	Wipe 1	North Doorway (Inside)
17.	"	H	"	106	Wipe 2	Between Stills 1 + 2
18.	"	H	"	106	Wipe 3	Between Stills 2 & 3
19.	"	H	"	106	Wipe 4	Between Stills 3 & 4
20.	"	H	"	106	Wipe 5	In front of big west still
21.	"	H	"	106	Wipe 6	West Lab Bench top
22.	"	H	"	106	Wipe 7	South Lab bench top
23.	"	H	"	111	Wipe 1	South Doorway (Inside)
24.	"	H	"	111	Wipe 2	West lab bench top
25.	"	H	"	111	Wipe 3	West Aisle
26.	"	H	"	111	Wipe 4	South Hood
27.	"	H	"	111	Wipe 5	Central Aisle
28.	"	H	"	111	Wipe 6	East Aisle and east doorway
29.	"	H	"	111	Wipe 7	Central Aisle lab bench top

CONTROL NO. 9495

30. Building H Room 101 Wipe 1 East doorway (Inside)
31. " H " 101 Wipe 2 West Doorway (Inside)
32. " H " 101 Wipe 3 Center of Room
33. Back of Boiler House Wipe 1 Base of tank #24
34. Back of Boiler house Wipe 2 Base of tank #25
35. Back of Boiler house Wipe 3 Pipes leading to #24
36. Boiler House Wipe 4 Circulating feed pump cylinder (Inside)
37. Soil sample West side of N Building - 3 meters away β

ARCO Wipes of "N" Building roof, H Building, and Boiler House β (Beta)
6-8-85

PROGRAM #= 12 08/06/85 11:09
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV.	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	124812.	.57	14426.0	1.67	139255.	.54	1094	18.825		2
12	2	1.00	17742.0	1.50	128130.	.56	147995.	.52	1075	23.525		4
12	3	1.00	17653.0	1.51	53.00	27.4	17724.0	1.50	587.	11.740		6
12	4	1.00	17.00	48.5	17.00	48.5	47.00	29.1	654.	8.889		8
12	5	1.00	42.00	30.8	13.00	55.4	78.00	22.6	494.	9.636		10
12	6	1.00	419.00	9.77	447.00	9.46	908.00	6.64	464.	12.422		12
12	7	1.00	56.00	26.7	29.00	37.1	109.00	19.1	473.	10.685		14
12	8	1.00	46.00	29.4	19.00	45.8	80.00	22.3	495.	11.733		16
12	9	1.00	32.00	35.3	20.00	44.7	68.00	24.2	434.	10.588		18
12	10	1.00	27.00	38.4	26.00	39.2	71.00	23.7	488.	10.229		20
12	11	1.00	27.00	38.4	16.00	50.0	64.00	25.0	585.	12.000		22
12	12	1.00	27.00	38.4	20.00	44.7	56.00	26.7	576.	8.914		24
12	13	1.00	27.00	38.4	17.00	48.5	64.00	25.0	593.	10.971		26
[illegible]	14	1.00	147.00	16.5	29.00	37.1	194.00	14.3	528.	9.632		28
[illegible]	15	1.00	142.00	16.7	44.00	30.1	202.00	14.0	506.	12.956		30
12	16	1.00	37.00	32.8	22.00	42.6	75.00	23.0	501.	10.626		31
12	17	1.00	46.00	29.4	17.00	48.5	79.00	22.5	489.	9.867		33
12	18	1.00	37.00	32.8	25.00	40.0	81.00	22.2	536.	11.495		35
12	19	1.00	47.00	29.1	18.00	47.1	87.00	21.4	494.	9.959		37
12	20	1.00	36.00	33.3	18.00	47.1	71.00	23.7	442.	10.147		39
12	21	1.00	34.00	34.3	27.00	38.4	77.00	22.7	480.	13.244		41
12	22	1.00	43.00	30.5	15.00	51.6	74.00	23.2	506.	7.111		43
12	23	1.00	39.00	32.0	16.00	50.0	73.00	23.4	532.	9.678		45
12	24	1.00	36.00	33.3	21.00	43.6	75.00	23.0	520.	11.242		47
12	25	1.00	45.00	29.8	17.00	48.5	81.00	22.2	539.	12.730		49
12	26	1.00	18.00	47.1	19.00	45.8	49.00	28.5	403.	7.579		51
12	27	1.00	48.00	28.8	19.00	45.8	86.00	21.5	523.	11.514		53
12	28	1.00	52.00	27.7	14.00	53.4	87.00	21.4	491.	10.489		55
12	29	1.00	53.00	27.4	29.00	37.1	102.00	19.8	534.	9.629		57
12	30	1.00	24.00	40.8	20.00	44.7	61.00	25.6	350.	10.112		59
12	31	1.00	24.00	40.8	18.00	47.1	56.00	26.7	368.	10.400		61
12	32	1.00	24.00	40.8	17.00	48.5	51.00	28.0	339.	10.304		63
12	33	1.00	18.00	47.1	20.00	44.7	49.00	28.5	539.	12.547		65
12	34	1.00	25.00	40.0	18.00	47.1	53.00	27.4	549.	9.664		67
12	35	1.00	23.00	41.7	16.00	50.0	51.00	28.0	454.	12.035		69
12	36	1.00	26.00	39.2	25.00	40.0	76.00	22.9	483.	11.259		71
12	37	1.00	26.00	39.2	24.00	40.8	63.00	25.2	464.	13.477		73

^{3}H Efficiency = .42

ARCO N Building roof wipes γ (Gamma)

Vent

1. Roof 1 γ
2. Roof 2 γ
3. Roof 3 γ
4. Roof 4 γ
5. Roof 5 γ
6. Roof 6 γ
7. Roof 7 γ
8. Roof 8 γ

Mark Rudin's hands

base

06-11-85
JD

ARCO "N" Building Roof Wipes
γ (Gamma)

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 111
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835	=	DPM/ 100 SQ.CM
VENT	106		0			0
1	131		23			28
2	134		23			28
3	115		40			48
4	115		4			5
5	94		0			0
6	115		4			5
7	114		3			4
8	124		13			16
MR	111		0			0
BASE	116		5			6

06-11-85
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY .....
BACKGROUND 82
EFFICIENCY 14% (0.14)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .14	=	DPM/ 100 SQ.CM
VENT	74		0			0
1	77		0			0
2	80		0			0
3	61		0			0
4	74		0			0
5	78		0			0
6	88		6			43
7	68		0			0
8	75		0			0
MR	80		0			0
BASE	80		0			0

CONTROL NO. 79495

ARCO Wipes of H Building, Rooms 106, 111, and 101 γ (Gamma) 6-8-85

Isotherm Lab H-106

1. North doorway floor (inside)
2. Floor between stills 1 and 2
3. Floor between stills 2 and 3
4. Floor between stills 3 and 4
5. Floor in front of big west still
6. West Lab bench top
7. South lab bench top

Room H-101

1. East Doorway floor (Inside
2. West doorway (inside)
3. Floor in center of room

Catalyst Lab H-111

1. South Doorway floor (inside)
2. West Lab bench top
3. West Aisle floor
4. South Hood
5. Central aisle floor
6. East aisle and doorway floor
7. Central aisle lab bench top

ARCO Wipes of H Building
Rooms 106, 111, and 101
6-8-85 (Gamma)

07-24-85
ARCO

BUILDING WIPES
ISOTHERM LAB
H-106

E-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 130
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	114	0		0
2	126	0		0
3	101	0		0
4	110	0		0
5	106	0		0
6	115	0		0
7	120	0		0

07-24-85
ARCO

BUILDING WIPES

ROOM H-101

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 123
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	117	0		0
2	113	0		0
3	108	0		0

07-24-85
ARCO

BUILDING WIPES
CATALYST LAB
ROOM H-111

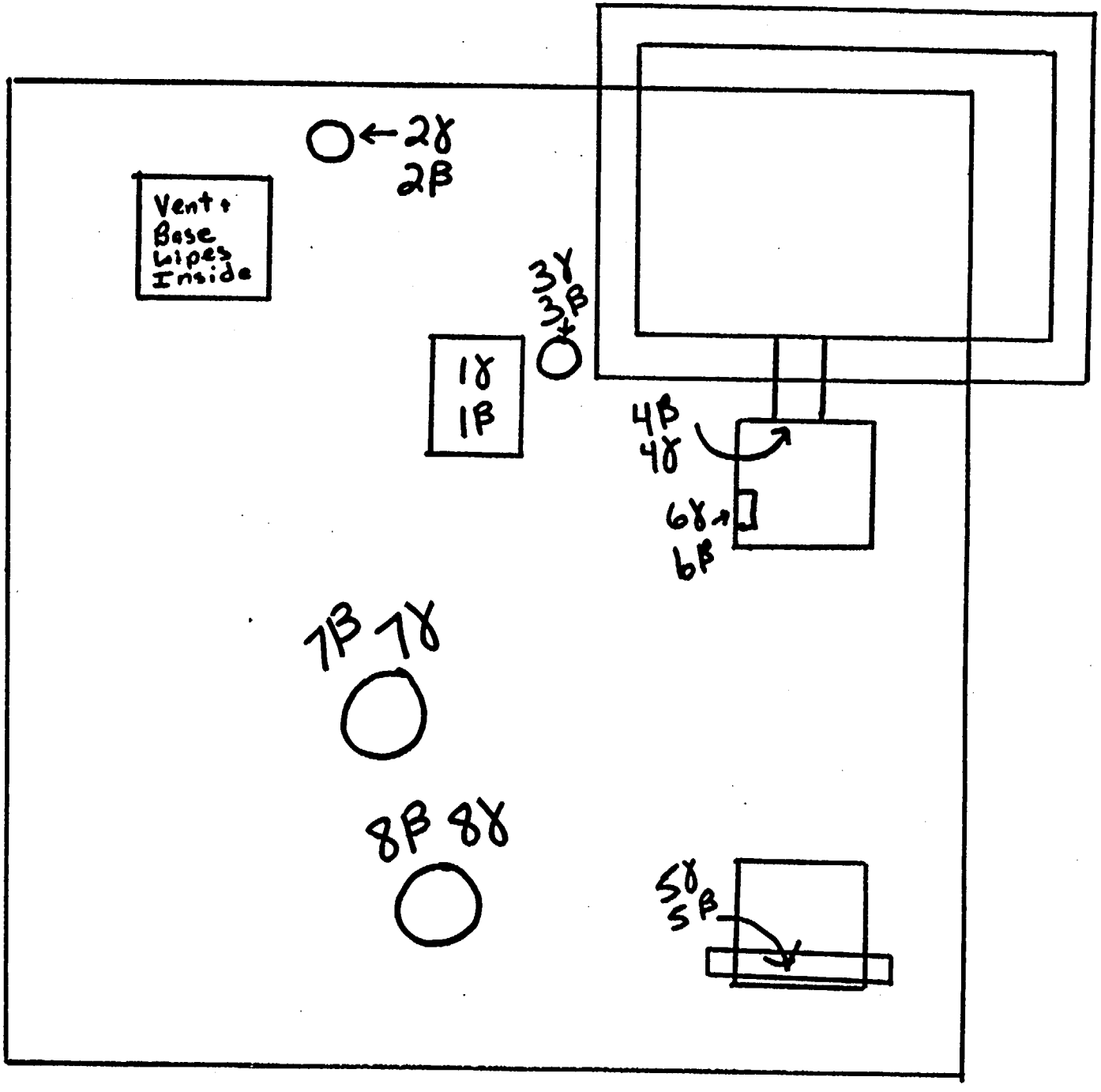
CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

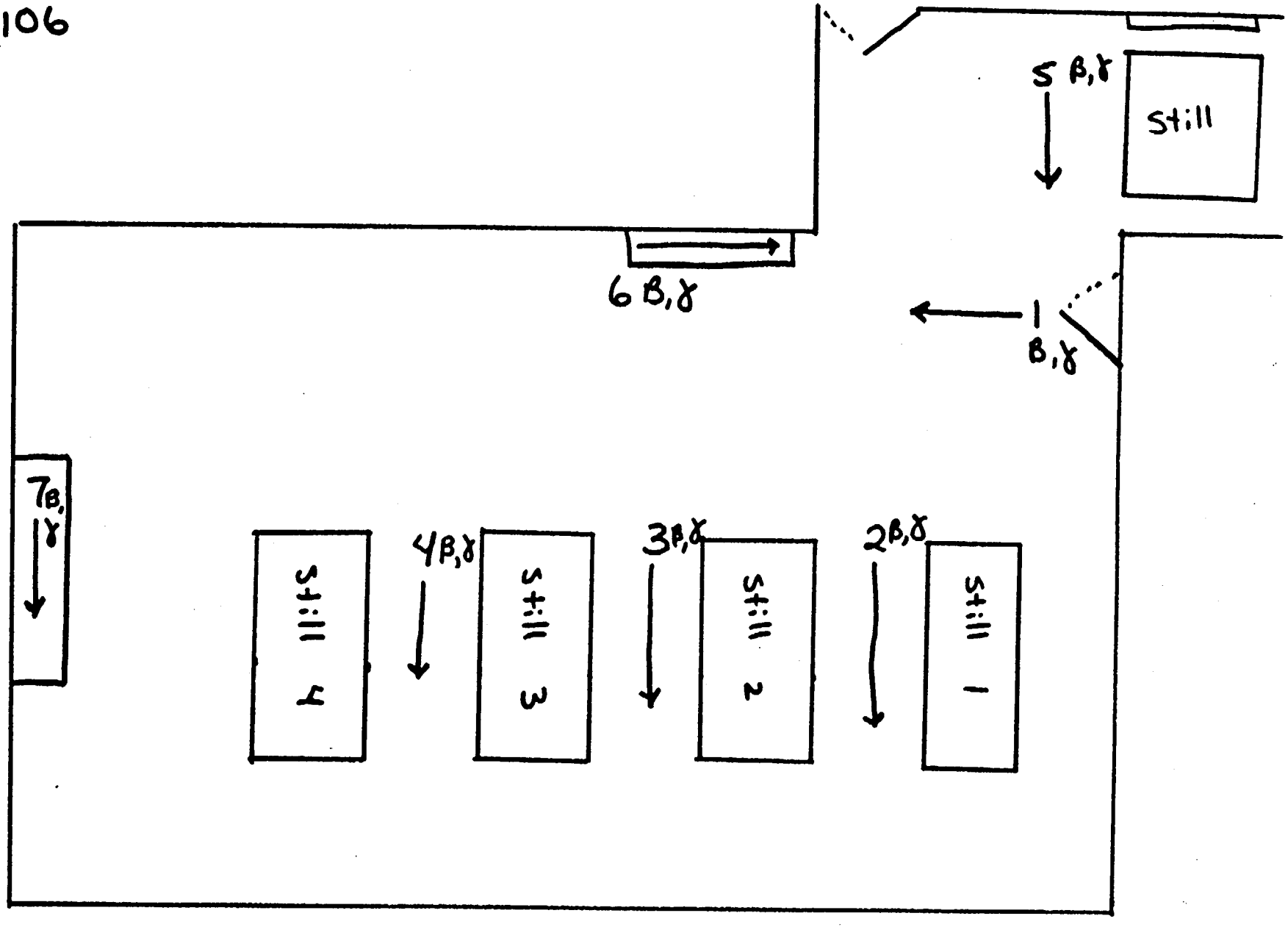
LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 122
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	121	0		0
2	140	18		22
3	106	0		0
4	116	0		0
5	139	17		20
6	127	5		6
7	124	2		2

ARCO
"N" Bldg
Roof

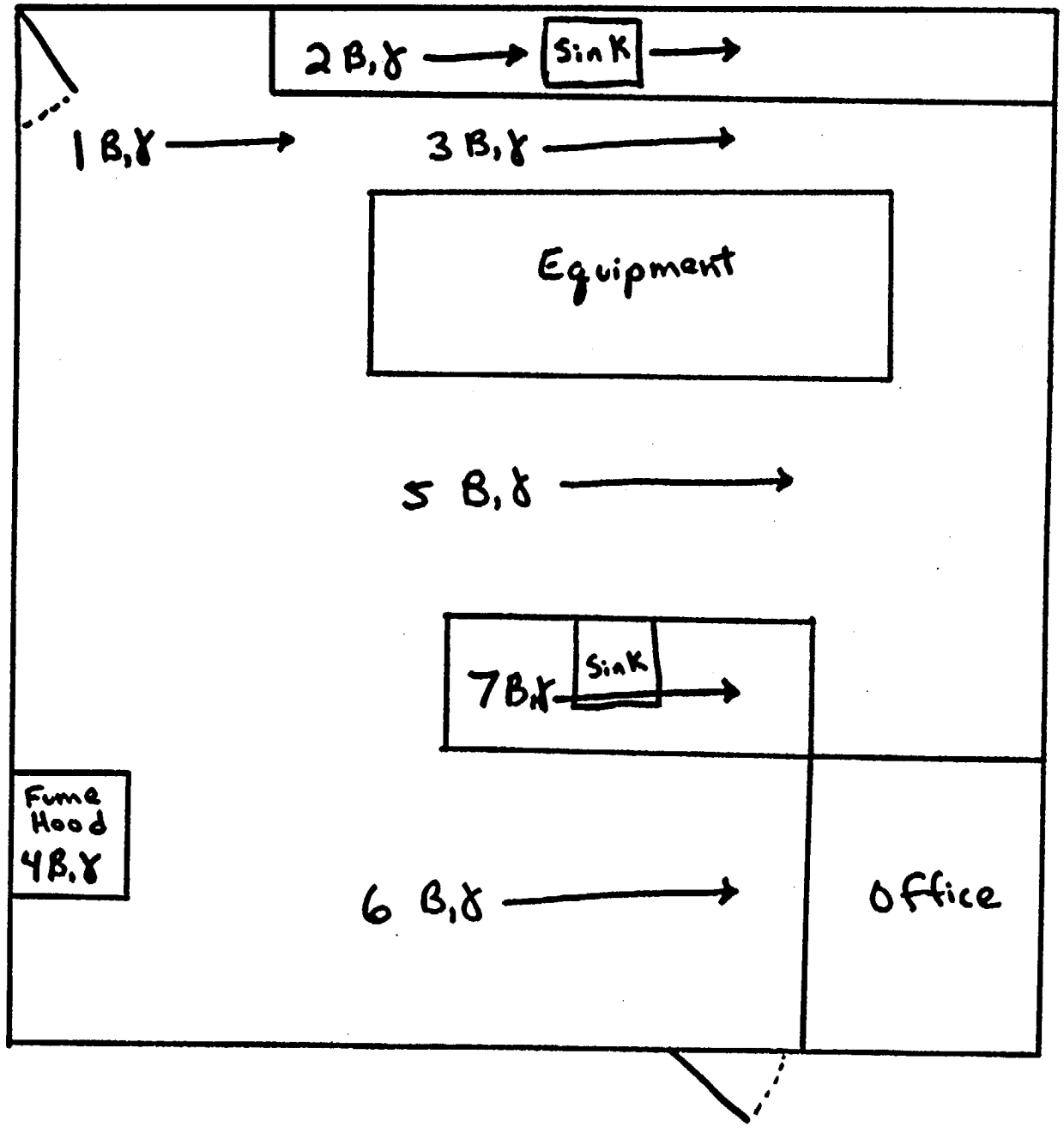


F RCO
Isotherm LAB
"H"-106

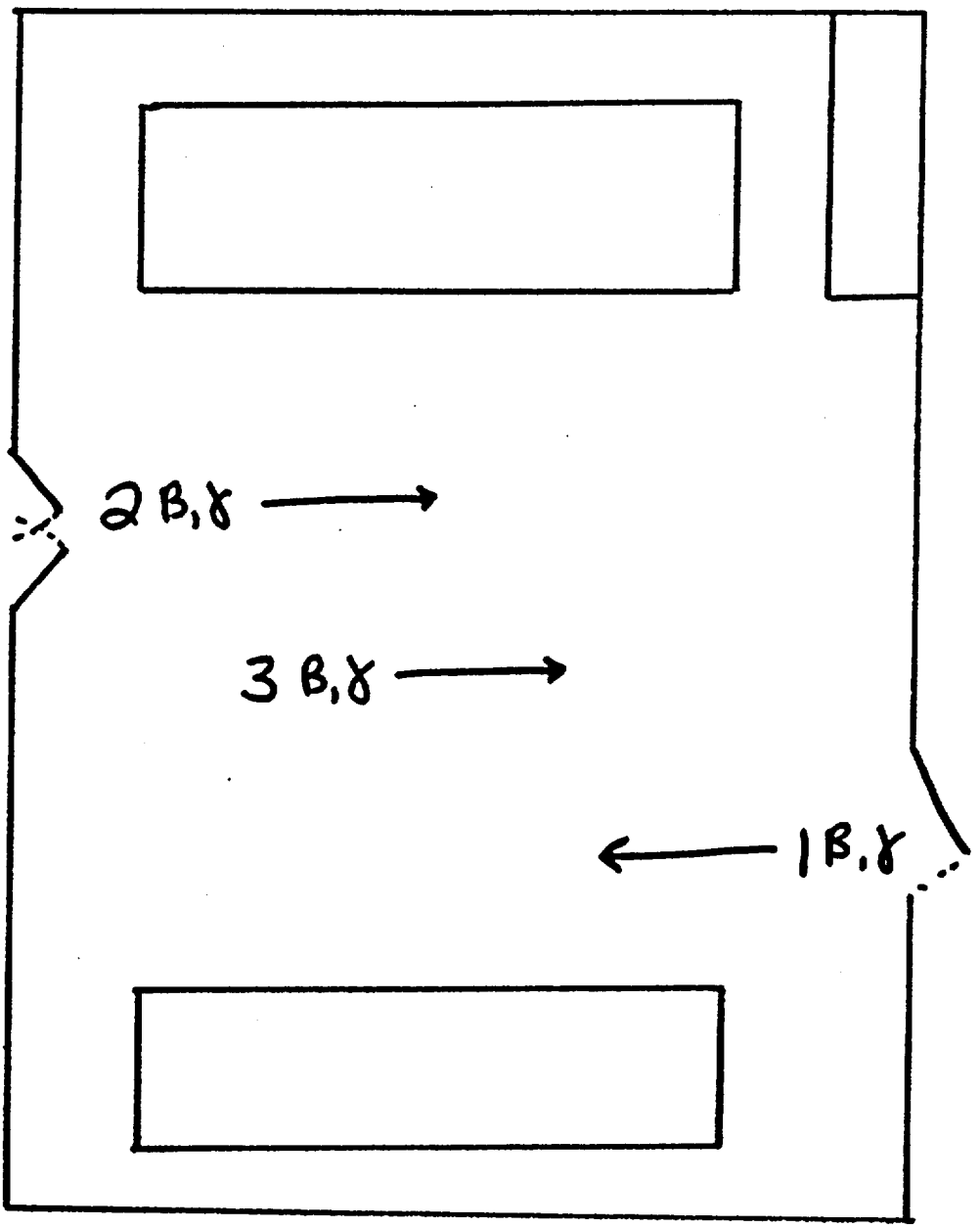


CONTROL NO. 7 2 4 5 3

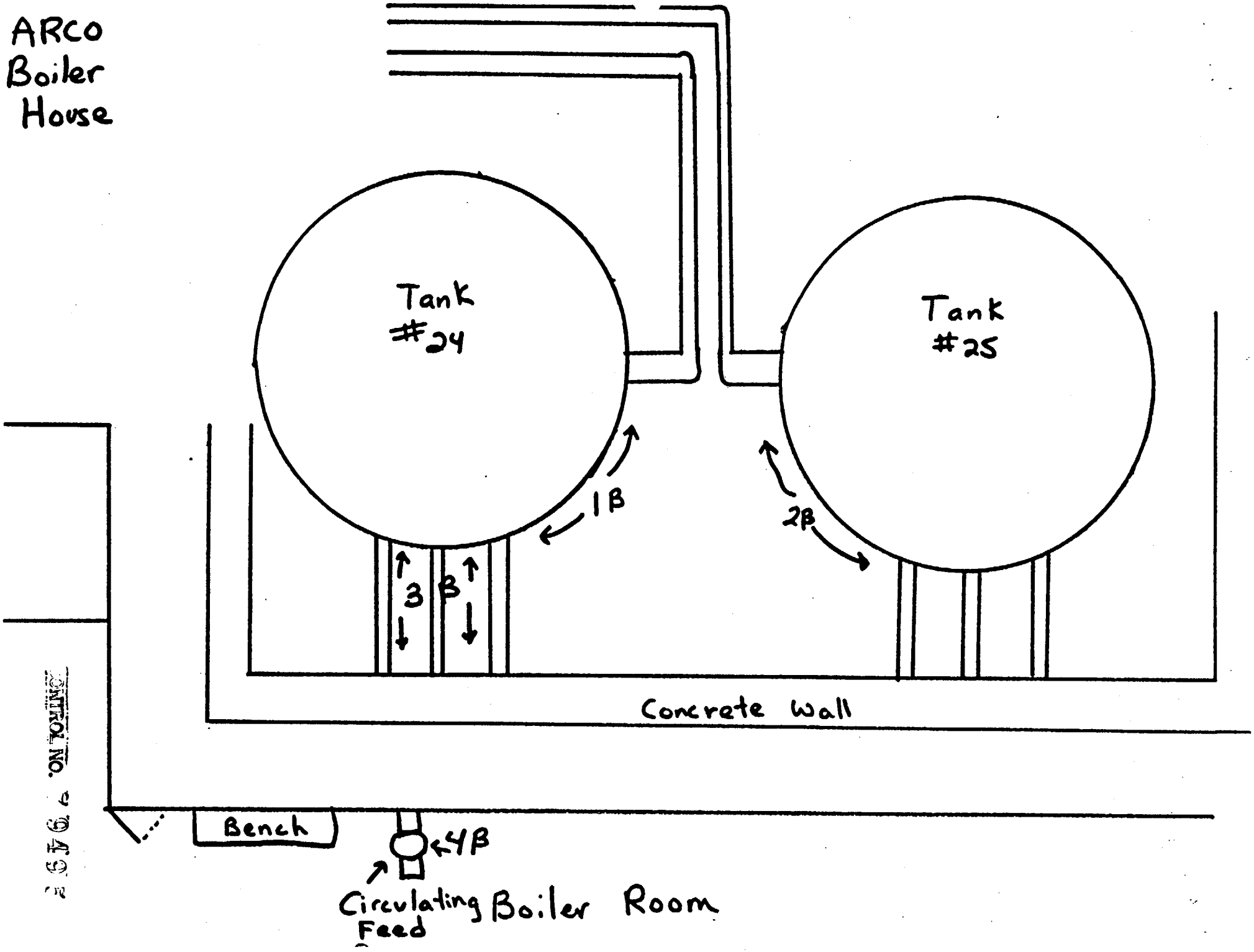
ARC
Catalyst
Lab
"H" - 111



ARCO
"H"-101



ARCO
Boiler
House



CONTROL NO. 9 0 4 9 2

ARCO Petroleum Products
Harvey Technical Center
400 East Sibley Boulevard
Harvey, Illinois 60426

NRC License # 12-00140-04

Attachment D "N" Building Analysis

Contents

1. Tracer Lab and Counting Room Wipes β (Beta) 7 pages
2. Tracer Lab Rewipes After Decontamination β (Beta) 2 Pages
3. Tracer Lab Wipes γ (Gamma) 9 pages
4. Counting Room Wipes γ (Gamma) 3 pages
5. Sketches of Tracer Lab and Counting Room 2 pages
6. ARCO Darkroom Wipes β (Beta) 2 pages
7. ARCO Darkroom Wipes γ (Gamma) 2 pages
8. Sketch of Darkroom
9. Office, Bathroom, and Locker Room Wipes 2 pages
10. Office, Bathroom, and Locker Room Wipes γ (Gamma) 5 pages
11. Sketch of Office, Bathroom, and Locker Room
12. Hot Cell Lab and Doorway Wipes β (Beta) 5 pages
13. Hot Cell Lab Wipes γ (Gamma) 8 pages
14. Doorway Wipes γ (Gamma) 2 pages
15. Sketches of Hot Cell Lab and Doorway 2 pages
16. ARCO Attic Wipes β (Beta) 2 pages
17. ARCO Attic Wipes γ (Gamma) 2 pages
18. Cave Wipes β (Beta) 2 pages
19. Cave Rewipes β (Beta) 2 pages
20. Cave Wipes γ (Gamma) 4 pages
21. Cave Rewipes γ (Gamma) 2 pages
22. Sketch of Cave

CONTROL NO. 7 9 4 9 5

KEY

Tracer Lab Wipes β (Beta)
7-1-85
Counting Room Wipes β (Beta)

1. H^3 Standard
2. C^{14} Standard
3. H_2^3O Standard
4. Background - β

WIPES

1. Old Fume Hood Floor
2. Old Case A Floor
3. Case B Tope three shelves
4. Case B Middle two shelves
5. Case B Bottom two shelves
6. Case C Top three shelves
7. Case C Middle two shelves
8. Case C Bottom two shelves
9. Floor wipe #9
10. Floor Wipe #10
11. Floor wipe #11
12. Floor Wipe #12 and Floor vault
13. Concrete Pigs
14. Floor wipe #14
15. Floor Wipe #15
16. Floor wipe #16
17. Floor wipe #17
18. Floor Wipe #18
19. Floor wipe #19
20. Floor wipe #20
21. Floor wipe #21
22. Floor wipe #22
23. Floor wipe #23
24. Radioactive Materials Disposal sink
25. Floor wipe #25
26. Floor wipe #26
27. Floor wipe #27
28. Floor Wipe #28
29. Floor Wipe #29

30. Floor Wipe #30
31. " " #31
32. " " #32
33. Concrete Floor wipe #33
34. Floor wipe #34
35. " " #35
36. Old fume hood wipe #36
37. Floor wipe #37
38. Floor wipe #38
39. Old Lab Bench wipe #39
40. Floor wipe #40
41. Floor wipe #41
42. Concrete Floor wipe #42
43. Floor wipe #43
44. " " #44
45. " " #45
46. " " #46
47. " " #47
48. " " #48
49. " " #49
50. " " #50
51. Concrete Floor wipe #51
52. Floor wipe #52
53. Floor wipe #53
54. Floor wipe #54
55. Floor wipe #55
56. " " #56
57. " " #57
58. " " #58
59. " " #59
60. Concrete Floor wipe #60
61. Floor wipe #61
62. Floor wipe #62
63. Floor wipe #63
64. Floor wipe #64
65. Concrete Floor wipe #65
66. Section A Bench Top
67. " " Sink
68. " " Silver shelf
69. Cabinet under Section A sink
70. Section A 2nd set of drawers

71. Section B Bench Top
72. " " Silver Shelf
73. " " Bottom Black Shelf
74. " " Middle Black Shelf
75. " " Top Black Shelf
76. Section C Bottom Black Shelf
77. " " Middle Black Shelf
78. " " Top Black Shelf
79. East Wall where chipped away
80. East Exposed pipes
81. Middle Lab Bench, cement floor under old sink
82. Northwest wall where chipped away
83. Northwest hood exposed pipes
84. Shelf under west window
85. West Wall Heater

COUNTING ROOM

91. Floor wipe #1
92. " " #2
93. " " #3
94. " " #4
95. " " #5
96. Section A Lab Bench wipe #6
97. Section B Lab Bench wipe #7
98. Floor wipe #8
99. Floor wipe #9
100. Floor wipe #10
101. Floor wipe #11
102. Floor wipe #12
103. Shelf under south window wipe #13
104. Floor wipe #14
105. Floor wipe #15
106. Floor wipe #16
107. Floor wipe #17
108. Floor wipe #18
109. Shelf under west window wipe #19

"Efficiency Check"

```
PROGRAM #=    12                                                    21/05/85   10:28
REGION A:     LL-UL=     0-  12  LCR=     0  BKG=     .00  % 2 SIGMA=     .0
REGION B:     LL-UL=    12- 156  LCR=     0  BKG=     .00  % 2 SIGMA=     .0
REGION C:     LL-UL=     0-2000  LCR=     0  BKG=     .00  % 2 SIGMA=     .0
TIME=    1.00   K= 1.000 QIP=SIE
```

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	16979.0	1.53	35.00	33.8	17040.0	1.53	592.	12.145		2

H_2^3O standard w/swab 41780 dpm on 7-3-85

$$\text{Efficiency} = \frac{16979 \text{ cpm}}{41780 \text{ dpm}} = .41 \text{ or } 41\%$$

7/3/85

CONTROL NO. 79495

7-1-85

β (Beta)

Tracer Lab Wipes β (Beta)
Counting Room Wipes β (Beta)

PROGRAM #= 12

19/05/85 13:34

R ION A:	LL-UL=	0- 12	LCR=	0	BKG=	.00	% 2 SIGMA=	.0
REGION B:	LL-UL=	12- 156	LCR=	0	BKG=	.00	% 2 SIGMA=	.0
REGION C:	LL-UL=	0-2000	LCR=	0	BKG=	.00	% 2 SIGMA=	.0

TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	•183.00	14.7	32.00	35.3	238.00	12.9	495.	7.260		2
12	2	1.00	•333.00	10.9	55.00	26.9	406.00	9.93	430.	8.583		4
12	3	1.00	•264.00	12.3	20.00	44.7	304.00	11.4	572.	7.519		6
12	4	1.00	•195.00	14.3	44.00	30.1	254.00	12.5	368.	10.702		8
12	5	1.00	•148.00	16.4	22.00	42.6	181.00	14.8	536.	8.405		10
12	6	1.00	•168.00	15.4	34.00	34.3	227.00	13.2	497.	9.045		12
12	7	1.00	•127.00	17.7	32.00	35.3	181.00	14.8	530.	10.009		14
12	8	1.00	75.00	23.0	21.00	43.6	116.00	18.5	593.	6.913		16
12	9	1.00	•93.00	20.7	17.00	48.5	127.00	17.7	554.	7.917		18
12	10	1.00	•118.00	18.4	20.00	44.7	161.00	15.7	461.	8.569		20
12	11	1.00	•208.00	13.8	20.00	44.7	244.00	12.8	348.	6.521		22
12	12	1.00	•135.00	17.2	26.00	39.2	185.00	14.7	570.	10.488		24
12	13	1.00	81.00	22.2	25.00	40.0	132.00	17.4	524.	9.905		26
12	14	1.00	•100.00	20.0	30.00	36.5	154.00	16.1	520.	10.871		28
12	15	1.00	81.00	22.2	21.00	43.6	122.00	18.1	485.	6.629		30
2	16	1.00	73.00	23.4	27.00	38.4	129.00	17.6	557.	8.737		32
2	17	1.00	•83.00	21.9	32.00	35.3	133.00	17.3	491.	9.148		33
2	18	1.00	76.00	22.9	43.00	30.5	135.00	17.2	545.	11.544		35
2	19	1.00	74.00	23.2	15.00	51.6	110.00	19.0	511.	7.169		37
2	20	1.00	54.00	27.2	22.00	42.6	99.00	20.1	520.	8.618		39
2	21	1.00	73.00	23.4	15.00	51.6	98.00	20.2	475.	7.958		41
2	22	1.00	•94.00	20.6	22.00	42.6	137.00	17.0	459.	9.188		43
2	23	1.00	71.00	23.7	27.00	38.4	116.00	18.5	508.	8.329		45
2	24	1.00	65.00	24.8	19.00	45.8	104.00	19.6	560.	10.729		47
2	25	1.00	•94.00	20.6	26.00	39.2	135.00	17.2	564.	11.850		49
2	26	1.00	•92.00	20.8	25.00	40.0	140.00	16.9	520.	9.651		51
2	27	1.00	•95.00	20.5	21.00	43.6	137.00	17.0	572.	12.571		53
2	28	1.00	80.00	22.3	16.00	50.0	119.00	18.3	508.	12.183		55
2	29	1.00	•93.00	20.7	11.00	60.3	123.00	18.0	486.	8.000		57
2	30	1.00	77.00	22.7	25.00	40.0	122.00	18.1	566.	11.848		59
2	31	1.00	38.00	32.4	24.00	40.8	73.00	23.4	381.	8.760		61
2	32	1.00	68.00	24.2	17.00	48.5	103.00	19.7	428.	9.555		63
2	33	1.00	72.00	23.5	20.00	44.7	116.00	18.5	605.	11.008		65
2	34	1.00	59.00	26.0	20.00	44.7	105.00	19.5	557.	10.413		67
2	35	1.00	67.00	24.4	17.00	48.5	107.00	19.3	515.	11.634		69
2	36	1.00	51.00	28.0	26.00	39.2	96.00	20.4	511.	10.074		71
2	37	1.00	66.00	24.6	26.00	39.2	107.00	19.3	547.	9.206		73
2	38	1.00	•92.00	20.8	20.00	44.7	127.00	17.7	565.	10.621		75
2	39	1.00	54.00	27.2	31.00	35.9	103.00	19.7	453.	12.660		77
2	40	1.00	66.00	24.6	23.00	41.7	103.00	19.7	513.	10.226		79
2	41	1.00	79.00	22.5	15.00	51.6	109.00	19.1	499.	10.430		81
2	42	1.00	81.00	22.2	17.00	48.5	129.00	17.6	599.	10.583		83
2	43	1.00	63.00	25.2	18.00	47.1	97.00	20.3	577.	10.708		85
2	44	1.00	79.00	22.5	19.00	45.8	114.00	18.7	567.	12.180		87
2	45	1.00	•90.00	21.0	19.00	45.8	127.00	17.7	558.	10.426		89
2	46	1.00	69.00	24.0	27.00	38.4	124.00	17.9	545.	11.089		91

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	47	1.00	67.00	24.4	26.00	39.2	118.00	18.4	532.	10.674		93
12	48	1.00	49.00	28.5	28.00	37.8	92.00	20.8	535.	11.200		95
12	49	1.00	38.00	32.4	21.00	43.6	78.00	22.6	528.	9.800		97
12	50	1.00	45.00	29.8	21.00	43.6	81.00	22.2	492.	12.187		98
12	51	1.00	43.00	30.5	34.00	34.3	98.00	20.2	535.	10.909		101
12	52	1.00	75.00	23.0	16.00	50.0	107.00	19.3	575.	10.892		103
12	53	1.00	59.00	26.0	24.00	40.8	97.00	20.3	538.	10.065		105
12	54	1.00	57.00	26.4	15.00	51.6	89.00	21.2	500.	8.597		106
12	55	1.00	65.00	24.8	16.00	50.0	94.00	20.6	535.	8.753		108
12	56	1.00	56.00	26.7	22.00	42.6	93.00	20.7	532.	11.284		110
12	57	1.00	61.00	25.6	20.00	44.7	98.00	20.2	544.	10.997		112
12	58	1.00	54.00	27.2	22.00	42.6	100.00	20.0	544.	9.740		114
12	59	1.00	72.00	23.5	19.00	45.8	110.00	19.0	492.	9.297		116
12	60	1.00	69.00	24.0	12.00	57.7	97.00	20.3	516.	11.311		118
12	61	1.00	81.00	22.2	21.00	43.6	118.00	18.4	565.	10.990		120
12	62	1.00	69.00	24.0	23.00	41.7	111.00	18.9	524.	11.687		122
12	63	1.00	55.00	26.9	23.00	41.7	95.00	20.5	533.	11.829		124
12	64	1.00	66.00	24.6	23.00	41.7	98.00	20.2	510.	10.388		126
12	65	1.00	87.00	21.4	16.00	50.0	117.00	18.4	504.	11.573		128
12	66	1.00	66.00	24.6	18.00	47.1	105.00	19.5	577.	11.826		130
1[illegible]	67	1.00	70.00	23.9	19.00	45.8	114.00	18.7	603.	11.814		132
1[illegible]	68	1.00	67.00	24.4	19.00	45.8	108.00	19.2	640.	13.012		134
12	69	1.00	69.00	24.0	27.00	38.4	125.00	17.8	602.	11.110		136
12	70	1.00	44.00	30.1	18.00	47.1	82.00	22.0	533.	13.395		138
12	71	1.00	36.00	33.3	17.00	48.5	77.00	22.7	625.	14.063		140
12	72	1.00	40.00	31.6	27.00	38.4	85.00	21.6	636.	11.619		142
12	73	1.00	28.00	37.8	22.00	42.6	67.00	24.4	658.	8.662		144
12	74	1.00	26.00	39.2	23.00	41.7	57.00	26.4	638.	10.252		146
12	75	1.00	47.00	29.1	16.00	50.0	82.00	22.0	603.	13.551		148
12	76	1.00	84.00	21.8	24.00	40.8	125.00	17.8	612.	11.479		150
12	77	1.00	85.00	21.6	30.00	36.5	130.00	17.5	612.	11.800		152
12	78	1.00	41.00	31.2	19.00	45.8	75.00	23.0	604.	10.362		154
12	79	1.00	67.00	24.4	26.00	39.2	117.00	18.4	557.	11.634		156
12	80	1.00	54.00	27.2	24.00	40.8	96.00	20.4	528.	12.463		158
12	81	1.00	49.00	28.5	20.00	44.7	93.00	20.7	624.	12.392		160
12	82	1.00	74.00	23.2	26.00	39.2	129.00	17.6	542.	10.307		162
12	83	1.00	73.00	23.4	29.00	37.1	126.00	17.8	606.	10.645		164
12	84	1.00	70.00	23.9	20.00	44.7	112.00	18.9	606.	11.814		166
12	85	1.00	74.00	23.2	11.00	60.3	104.00	19.6	608.	10.701		168
12	91	1.00	47.00	29.1	28.00	37.8	92.00	20.8	614.	10.416		170
12	92	1.00	46.00	29.4	15.00	51.6	75.00	23.0	560.	10.500		172
12	93	1.00	38.00	32.4	21.00	43.6	83.00	21.9	492.	11.528		174
12	94	1.00	52.00	27.7	20.00	44.7	92.00	20.8	586.	12.622		176
1	95	1.00	62.00	25.4	21.00	43.6	105.00	19.5	616.	11.102		178
12	96	1.00	74.00	23.2	21.00	43.6	115.00	18.6	645.	12.421		180
12	97	1.00	64.00	25.0	22.00	42.6	112.00	18.9	615.	8.645		182
12	98	1.00	63.00	25.2	18.00	47.1	96.00	20.4	587.	12.364		184
12	99	1.00	45.00	29.8	22.00	42.6	89.00	21.2	615.	10.852		186
12	100	1.00	47.00	29.1	22.00	42.6	81.00	22.2	602.	7.869		188

7-1-85

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	102	1.00	62.00	25.4	16.00	50.0	100.00	20.0	560.	10.450		192
12	103	1.00	56.00	26.7	17.00	48.5	94.00	20.6	575.	13.586		194
12	104	1.00	57.00	26.4	18.00	47.1	99.00	20.1	612.	10.133		196
12	105	1.00	44.00	30.1	21.00	43.6	82.00	22.0	583.	12.231		198
12	106	1.00	56.00	26.7	22.00	42.6	94.00	20.6	593.	8.325		200
12	107	1.00	65.00	24.8	25.00	40.0	106.00	19.4	601.	10.824		202
12	108	1.00	52.00	27.7	16.00	50.0	83.00	21.9	568.	11.822		204
12	109	1.00	71.00	23.7	21.00	43.6	110.00	19.0	609.	11.741		206

Tracer Lab rewipes after decontamination
7-3-85

Efficiency 41%
^{3}H background 27 cpm

An efficiency of 41% and a ^{3}H background of 27 cpm allows a maximum count of 111 cpm before the ^{3}H limit of 200 dpm/100 cm^{2} is exceeded.

Rewipes of Hot Spots $>$111 cpm

		REMEDY
1.	Old Fume Hood Floor wipe #1	Radiac Wash
2.	Asbestos insulation wipe #1A	Radiac Wash
3.	Old Case A Floor wipe #2	Piece of plastic removed and disposed of, Radiac wash as rad waste
4.	Case B top Shelf	Radiac wash w/SOS Pad
5.	Case C Top shelf	Radiac Wash w/SOS Pad
6.	Floor Wipe #10	Tiles pulled out and disposed of as rad waste Radiac wash w/SOS Pad
7.	Floor wipe #11	Tiles pulled out and disposed of as rad waste w/SOS pad
8.	Floor wipe #12 (Floor vault)	Wash w/sos pad
9.	Floor vault cover	Radiac wash w/SOS pad
10.	Background	

Case B bottom four shelves removed and disposed of as rad waste.

Case C Middle two shelves removed and disposed of as rad waste

Tracer Lab Rewipes β (Beta)

7-3-85

PROGRAM #= 12

21/05/85 14:10

REGION A:	LL-UL=	0- 12	LCR=	0	BKG=	.00	% 2 SIGMA=	.0
REGION B:	LL-UL=	12- 156	LCR=	0	BKG=	.00	% 2 SIGMA=	.0
REGION C:	LL-UL=	0-2000	LCR=	0	BKG=	.00	% 2 SIGMA=	.0

TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	43.00	30.5	22.00	42.6	84.00	21.8	612.	12.836		2
12	2	1.00	36.00	33.3	24.00	40.8	78.00	22.6	564.	11.762		4
12	3	1.00	26.00	39.2	17.00	48.5	65.00	24.8	601.	8.652		6
12	4	1.00	23.00	41.7	23.00	41.7	56.00	26.7	620.	12.200		8
12	5	1.00	27.00	38.4	14.00	53.4	57.00	26.4	603.	12.629		10
1[illegible]	6	1.00	42.00	30.8	23.00	41.7	89.00	21.2	526.	11.818		12
1[illegible]	7	1.00	32.00	35.3	29.00	37.1	81.00	22.2	539.	9.553		14
12	8	1.00	24.00	40.8	19.00	45.8	61.00	25.6	597.	11.133		16
12	9	1.00	•232.00	13.1	104.00	19.6	356.00	10.6	488.	13.480		18
12	10	1.00	15.00	51.6	26.00	39.2	57.00	26.4	655.	9.029		20

• Floor vault lid disposed of as rad waste

Tracer Lab Wipes γ (Gamma)
7-2-85

1. Old Fume Hood Floor
2. Old Case A Floor
3. Case B Tope three shelves
4. Case B Middle two shelves
5. Case B Bottom two shelves
6. Case C Top three shelves
7. Case C Middle two shelves
8. Case C Bottom two shelves
9. Floor wipe #9
10. Floor Wipe #10
11. Floor wipe #11
12. Floor Wipe #12 and Floor vault
13. Concrete Pigs
14. Floor wipe #14
15. Floor Wipe #15
16. Floor wipe #16
17. Floor wipe #17
18. Floor Wipe #18
19. Floor wipe #19
20. Floor wipe #20
21. Floor wipe #21
22. Floor wipe #22
23. Floor wipe #23
24. Radioactive Materials Disposal sink
25. Floor wipe #25
26. Floor wipe #26
27. Floor wipe #27
28. Floor Wipe #28
29. Floor Wipe #29

30. Floor Wipe #30
31. " " #31
32. " " #32
33. Concrete Floor wipe #33
34. Floor wipe #34
35. " " #35
36. Old fume hood wipe #36
37. Floor wipe #37
38. Floor wipe #38
39. Old Lab Bench wipe #39
40. Floor wipe #40
41. Floor wipe #41
42. Concrete Floor wipe #42
43. Floor wipe #43
44. " " #44
45. " " #45
46. " " #46
47. " " #47
48. " " #48
49. " " #49
50. " " #50
51. Concrete Floor wipe #51
52. Floor wipe #52
53. Floor wipe #53
54. Floor wipe #54
55. Floor wipe #55
56. " " #56
57. " " #57
58. " " #58
59. " " #59
60. Concrete Floor wipe #60
61. Floor wipe #61
62. Floor wipe #62
63. Floor wipe #63
64. Floor wipe #64
65. Concrete Floor wipe #65
66. Section A Bench Top
67. " " " Sink
68. " " Silver shelf
69. Cabinet under Section A sink
70. Section A 2nd set of drawers

71. Section B Bench Top
72. " " Silver Shelf
73. " " Bottom Black Shelf
74. " " Middle Black Shelf
75. " " Top Black Shelf
76. Section C Bottom Black Shelf
77. " " Middle Black Shelf
78. " " Top Black Shelf
79. East Wall where chipped away
80. East Exposed pipes
81. Middle Lab Bench, cement floor under old sink
82. Northwest wall where chipped away
83. Northwest hood exposed pipes
84. Shelf under west window
85. West Wall Heater

07-02-85
ARCO

Tracer Lab Wipes γ (Gamma)
7-2-85

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 122
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835	=	DPM/ 100 SQ.CM
1	130		8			10
2	143		21			25
3	120		0			0
4	113		0			0
5	151		29			35
6	130		8			10
7	157		35			42
8	156		34			41
9	120		0			0
10	124		2			2
11	143		21			25
12	140		18			22
13	143		21			25
14	154		32			38
15	140		18			22
16	139		17			20
17	162		40			48
18	111		0			0
19	127		5			6
20	134		12			14
21	138		16			19
22	133		11			13
23	133		11			13
24	125		3			4
25	138		16			19
26	127		5			6
27	134		12			14
28	105		0			0
29	118		0			0
30	130		8			10
31	126		4			5
32	133		11			13
33	159		37			44
34	149		27			32
35	111		0			0
36	145		23			28
37	124		2			2
38	140		18			22
39	133		11			13
40	113		0			0
41	137		15			18
42	137		15			18
43	122		0			0
44	130		8			10
45	149		27			32
46	127		5			6

48	146	24	29
49	140	18	22
50	164	42	50
51	140	18	22
52	154	32	38
53	174	52	62
54	127	5	6
55	126	4	5
56	155	33	40
57	157	35	42
58	155	33	40
59	125	3	4
60	136	14	17
61	121	0	0
62	144	22	26
63	145	23	28
64	135	13	16
65	139	17	20
66	171	49	59
67	147	25	30
68	130	8	10
69	136	14	17
70	146	24	29
71	119	0	0
72	144	22	26
73	118	0	0
74	119	0	0
75	136	14	17
76	119	0	0
77	137	15	18
78	135	13	16
79	138	16	19
80	147	25	30
81	148	26	31
82	182	60	72
83	119	0	0
84	149	27	32
85	120	0	0

Tracer Lab Wipes γ (Gamma)
7-2-85

07-10-85
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 39
EFFICIENCY 71% (0.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	34		0			0
2	26		0			0
3	33		0			0
4	26		0			0
5	33		0			0
6	30		0			0
7	41		2			3
8	27		0			0
9	32		0			0
10	24		0			0
11	23		0			0
12	34		0			0
13	28		0			0
14	30		0			0
15	20		0			0
16	26		0			0
17	29		0			0
18	37		0			0
19	29		0			0
20	26		0			0
21	26		0			0
22	37		0			0
23	27		0			0
24	32		0			0
25	21		0			0
26	34		0			0
27	23		0			0
28	39		0			0
29	35		0			0
30	35		0			0
31	33		0			0
32	24		0			0
33	41		2			3
34	33		0			0
35	23		0			0
36	39		0			0
37	34		0			0
38	32		0			0
39	31		0			0

40	35	0	0
41	42	3	4
42	42	3	4
43	25	0	0
44	28	0	0
45	18	0	0
46	29	0	0
47	24	0	0
48	28	0	0
49	40	1	1
50	26	0	0
51	32	0	0
52	28	0	0
53	21	0	0
54	26	0	0
55	29	0	0
56	25	0	0
57	28	0	0
58	42	3	4
59	33	0	0
60	43	4	6
61	22	0	0
62	34	0	0
63	31	0	0
64	45	6	8
65	33	0	0
66	36	0	0
67	28	0	0
68	30	0	0
69	37	0	0
70	39	0	0
71	43	4	6
72	36	0	0
73	36	0	0
74	23	0	0
75	25	0	0
76	37	0	0
77	20	0	0
78	27	0	0
79	36	0	0
80	44	5	7
81	35	0	0
82	34	0	0
83	21	0	0
84	37	0	0
85	17	0	0

Tracer Lab Wipes f (Gamma)
7-2-85

07-10-85
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 36
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .29	=	DPM/ 100 SQ.CM
1	35		0			0
2	40		4			14
3	35		0			0
4	35		0			0
5	29		0			0
6	40		4			14
7	28		0			0
8	33		0			0
9	31		0			0
10	41		5			17
11	32		0			0
12	34		0			0
13	33		0			0
14	45		9			31
15	28		0			0
16	29		0			0
17	35		0			0
18	32		0			0
19	43		7			24
20	28		0			0
21	38		2			7
22	26		0			0
23	37		1			3
24	43		7			24
25	24		0			0
26	26		0			0
27	30		0			0
28	39		3			10
29	29		0			0
30	36		0			0
31	36		0			0
32	28		0			0
33	30		0			0
34	37		1			3
35	32		0			0
36	28		0			0
37	43		7			24
38	30		0			0
39	26		0			0

41	37	1	3
42	32	0	0
43	49	13	45
44	34	0	0
45	26	0	0
46	26	0	0
47	47	11	38
48	38	2	7
49	24	0	0
50	47	11	38
51	23	0	0
52	40	4	14
53	37	1	3
54	38	2	7
55	44	8	28
56	38	2	7
57	39	3	10
58	29	0	0
59	45	9	31
60	34	0	0
61	37	1	3
62	41	5	17
63	33	0	0
64	38	2	7
65	31	0	0
66	33	0	0
67	41	5	17
68	33	0	0
69	26	0	0
70	21	0	0
71	25	0	0
72	34	0	0
73	35	0	0
74	38	2	7
75	40	4	14
76	36	0	0
77	42	6	21
78	35	0	0
79	22	0	0
80	30	0	0
81	37	1	3
82	28	0	0
83	39	3	10
84	32	0	0
85	29	0	0

Counting Room Wipes γ (Gamma)

1. Floor wipe #1
2. " " #2
3. " " #3
4. " " #4
5. " " #5
6. Section A Lab Bench Wipe #6
7. Section B Lab Bench Wipe #7
8. Floor wipe #8
9. Floor wipe #9
10. Floor wipe #10
11. Floor wipe #11
12. Floor wipe #12
13. Shelf under South window wipe #13
14. Floor wipe #14
15. Floor wipe #15
16. Floor wipe #16
17. Floor wipe #17
18. Floor wipe #18
19. Shelf under west window wipe #19

Counting Room Wipes γ (Gamma)

07-02-85
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 143
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835	=	DPM/ 100 SQ.CM
1	122		0			0
2	114		0			0
3	119		0			0
4	108		0			0
5	100		0			0
6	133		0			0
7	139		0			0
8	168		25			30
9	134		0			0
10	138		0			0
11	140		0			0
12	120		0			0
13	153		10			12
14	122		0			0
15	120		0			0
16	130		0			0
17	132		0			0
18	124		0			0
19	147		4			5

CONTROL NO. 9435

07-10-85 COUNTING ROOM
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 44
EFFICIENCY 71% (0.71)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .71 =	DPM/ 100 SQ.CM
1	38		0	0
2	33		0	0
3	46		2	3
4	39		0	0
5	25		0	0
6	39		0	0
7	33		0	0
8	24		0	0
9	35		0	0
10	30		0	0
11	33		0	0
12	41		0	0
13	40		0	0
14	50		6	8
15	52		8	11
16	27		0	0
17	30		0	0
18	24		0	0
19	37		0	0

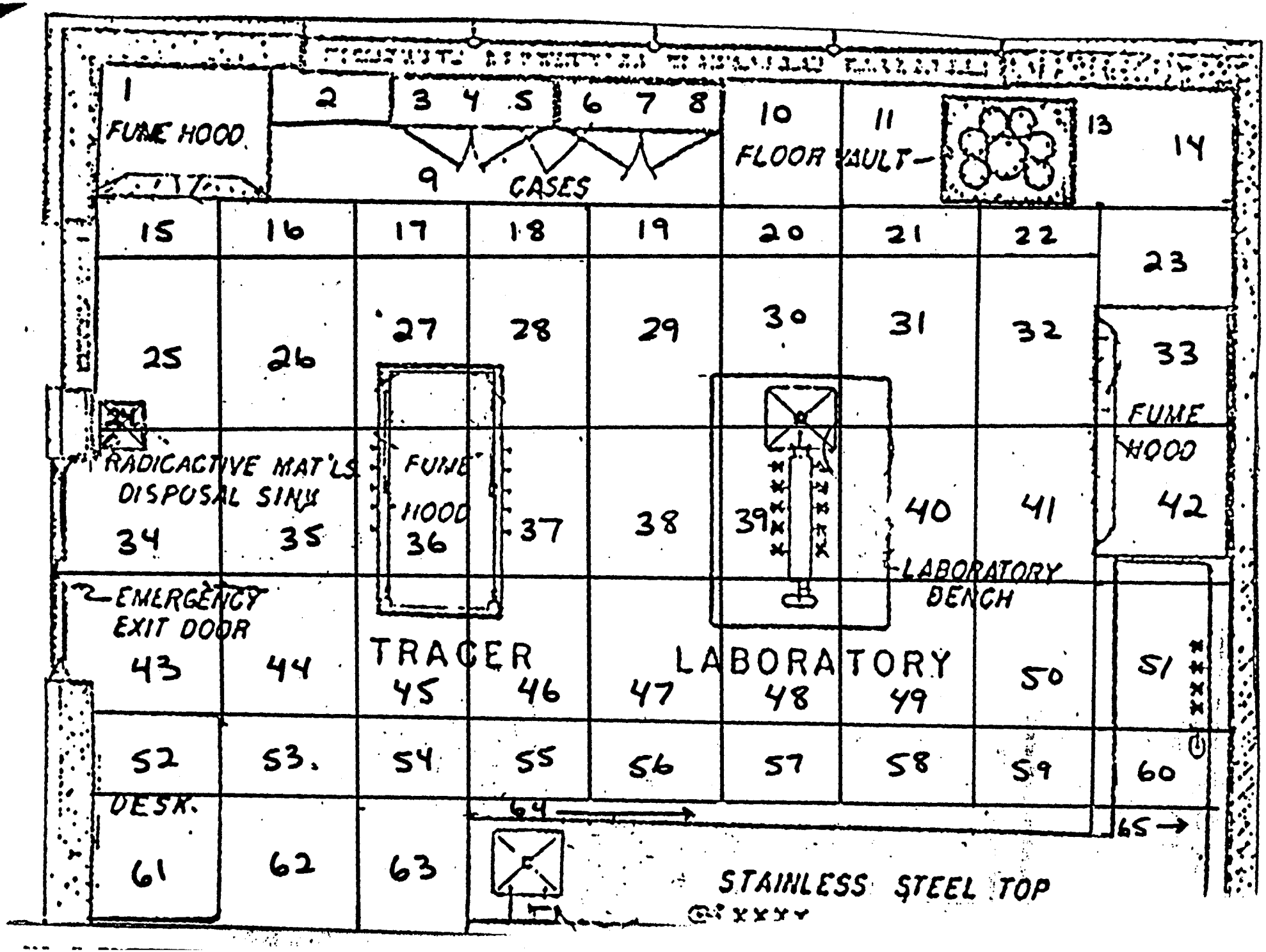
07-10-85 COUNTING ROOM
ARCO

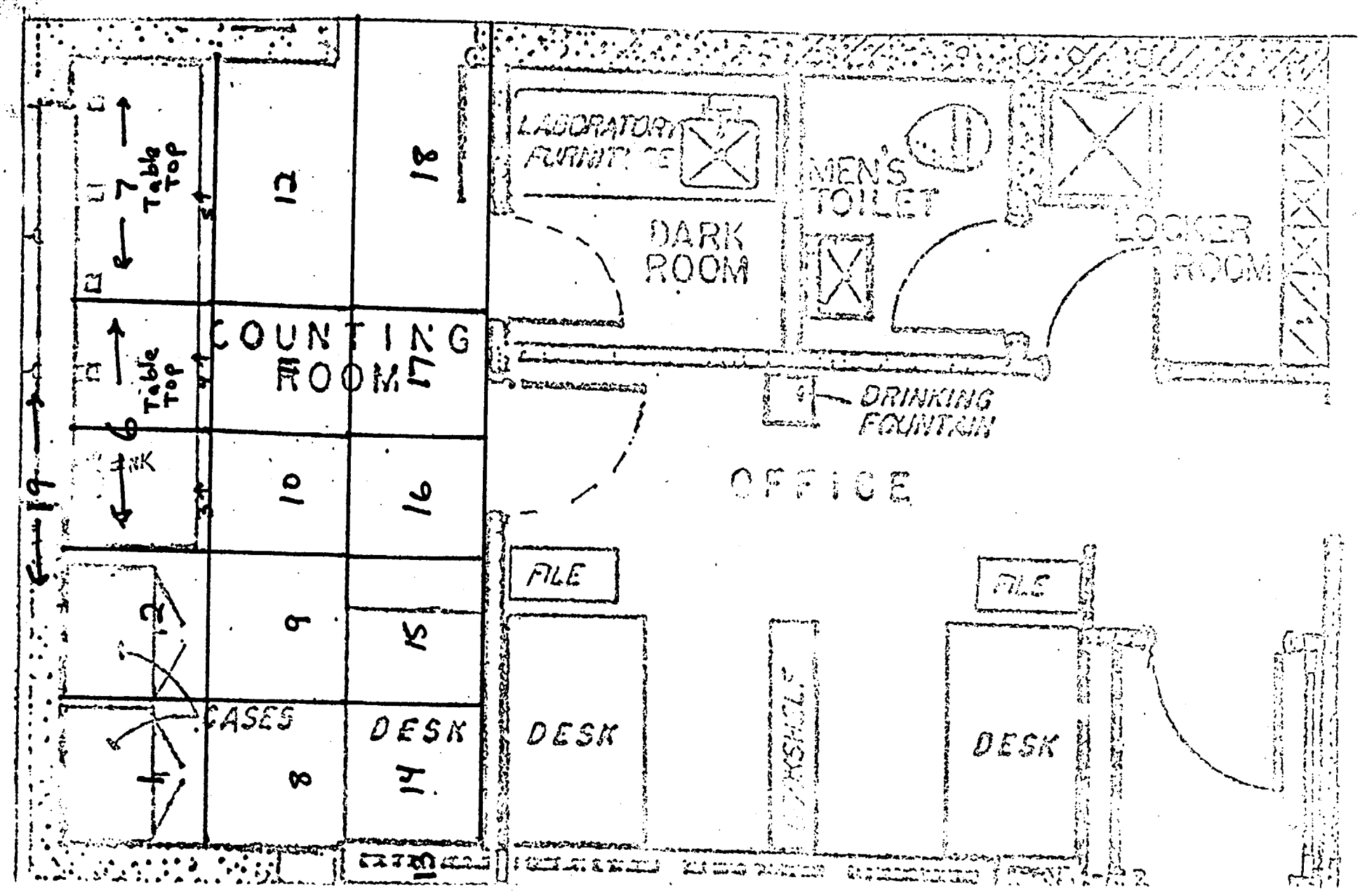
CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 32
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .29 =	DPM/ 100 SQ.CM
1	44		12	41
2	50		18	62
3	52		20	69
4	49		17	59
5	50		18	62
6	40		8	28
7	40		8	28
8	42		10	34
9	49		17	59
10	28		0	0
11	42		10	34
12	38		6	21
13	41		9	31
14	49		17	59
15	47		15	52
16	48		16	55
17	37		5	17
18	35		3	10
19	56		24	83


1
FUME HOOD
2
3 4 5
6 7 8
9
CASES
10
FLOOR VAULT
11
13
14
15
16
17
18
19
20
21
22
23
25
26
27
28
29
30
31
32
33
FUME HOOD
42
24
RADIOACTIVE MAT'LS DISPOSAL SINK
34
35
FUME HOOD
36
37
38
39
40
41
LABORATORY BENCH
EMERGENCY EXIT DOOR
43
44
TRACER
45
46
47
LABORATORY
48
49
50
51
52
53.
54
55
56
57
58
59
60
DESK.
64
65
61
62
63
STAINLESS STEEL TOP


LABORATORY FURNITURE
DARK ROOM
MEN'S TOILET
LOCKER ROOM
DRINKING FOUNTAIN
OFFICE
COUNTING ROOM
Table Top
Table Top
SINK
12
18
17
10
16
9
15
8
14
CASES
DESK
FILE
DESK
FILE
DESK

ARCO DARKROOM WIPES β (Beta)
6-19-85

Packard Tricarb 4530

KEY

1. H_2^3O standard 41,880 dpm on 6-17-85
2. Background
3. Wipe 1B - Darkroom Shelf
4. Wipe 2B - Darkroom shelf
5. Wipe 3B - Darkroom Countertop
6. Wipe 4B - " Countertop
7. Wipe 5B - " Sink
8. Wipe 6B - " Drawers
9. Wipe 7B " Cabinet under sink
10. Wipe 8B " Floor in front of door
11. Wipe 9B " Floor away from door
12. Wipe 10B " West wall
13. Wipe 11B " North wall
14. Wipe 12B " East Wall
15. Wipe 13B " South Wall
16. Wipe 14B " Door inside and outside.

CONTROL NO. 7 9 4 9 5

ARCO Darkroom Wipes β 6/19/85
Key Packard Tricarb 4530

PROGRAM #= 12 07/05/85 13:12
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	17779.0	1.50	37.00	32.8	17841.0	1.50	591.	11.977		2
12	2	1.00	16.00	50.0	21.00	43.6	58.00	26.2	652.	8.100		4
12	3	1.00	55.00	26.9	23.00	41.7	106.00	19.4	617.	13.811		6
12	4	1.00	25.00	40.0	25.00	40.0	69.00	24.0	609.	11.815		8
12	5	1.00	27.00	38.4	21.00	43.6	59.00	26.0	613.	9.143		10
12	6	1.00	41.00	31.2	16.00	50.0	77.00	22.7	605.	13.448		12
12	7	1.00	25.00	40.0	21.00	43.6	62.00	25.4	595.	9.846		14
12	8	1.00	28.00	37.8	19.00	45.8	63.00	25.2	451.	9.422		16
12	9	1.00	37.00	32.8	23.00	41.7	71.00	23.7	450.	9.859		17
12	10	1.00	36.00	33.3	23.00	41.7	80.00	22.3	586.	10.595		19
12	11	1.00	28.00	37.8	24.00	40.8	83.00	21.9	572.	11.143		22
12	12	1.00	40.00	31.6	24.00	40.8	84.00	21.8	560.	10.971		24
12	13	1.00	32.00	35.3	23.00	41.7	64.00	25.0	570.	10.200		26
12	14	1.00	29.00	37.1	31.00	35.9	73.00	23.4	536.	10.080		28
12	15	1.00	33.00	34.8	15.00	51.6	69.00	24.0	543.	11.566		30
12	16	1.00	25.00	40.0	24.00	40.8	70.00	23.9	532.	11.533		32

POWER FAIL

$$\text{Eff.} = \frac{17779\,\text{cpm}}{41{,}880\,\text{dpm}} = .42$$

WER FAIL

ARCO Darkroom wipes γ (Gamma)
6-20-85

KEY

1.	Wipe 1γ	Darkroom	shelf
2.	Wipe 2γ	Darkroom	shelf
3.	Wipe 3γ	Darkroom	countertop
4.	Wipe 4γ	"	"
5.	Wipe 5γ	"	Sink
6.	Wipe 6γ	"	Drawers
7.	Wipe 7γ	"	Cabinet under sink
8.	Wipe 8γ	"	Floor in front of door
9.	Wipe 9γ	"	Floor away from Door
10.	Wipe 10γ	"	West Wall
11.	Wipe 11γ	"	North Wall
12.	Wipe 12γ	"	East Wall
13.	Wipe 13γ	"	South Wall
14.	Wipe 14γ	"	Door inside and outside

06-20-85
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 111
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	116	5		6
2	109	0		0
3	117	6		7
4	144	33		40
5	140	29		35
6	99	0		0
7	97	0		0
8	124	13		16
9	124	13		16
10	124	13		16
11	101	0		0
12	113	2		2
13	106	0		0
14	142	31		37

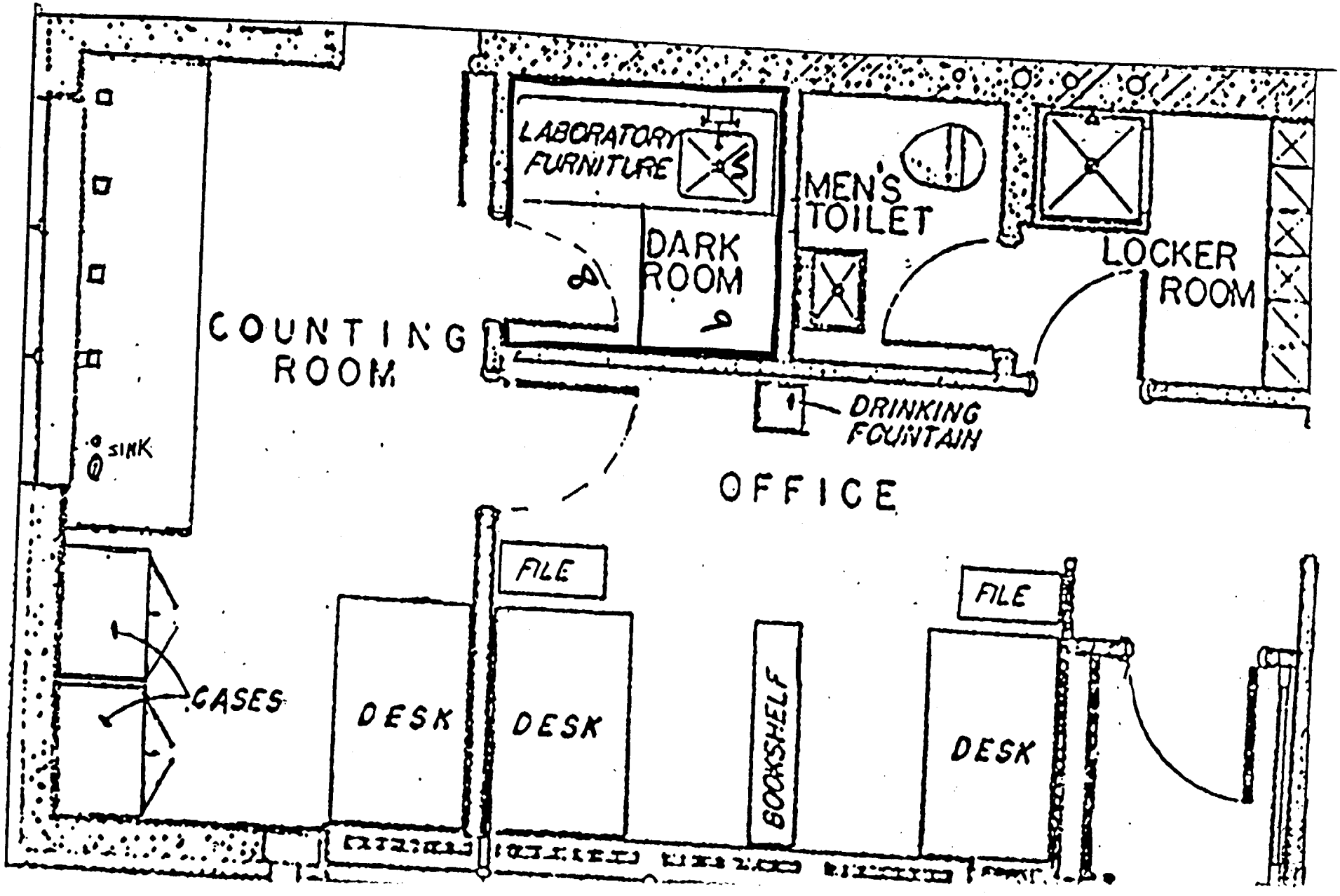
06-20-85
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 103
EFFICIENCY 14% (0.14)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .14 =	DPM/ 100 SQ.CM
1	79	0		0
2	71	0		0
3	89	0		0
4	71	0		0
5	86	0		0
6	82	0		0
7	69	0		0
8	74	0		0
9	73	0		0
10	81	0		0
11	96	0		0
12	79	0		0
13	77	0		0
14	101	0		0



CONTROL NO. 7 9 4 9 5

Office, Bathroom, and Locker Room Wipes (Beta)
7-5-85

1. Office Area Floor Wipe #1
2. " " " Wipe #2
3. " " " Wipe #3
4. " " " Wipe #4
5. " " " Wipe #5
6. " " " Wipe #6
7. " " " Wipe #7
8. " " " Wipe #8
9. " " " Wipe #9
10. " " " Wipe #10
11. Office Area Floor Wipe #11
12. " " " Wipe #12
13. " " Shelf under south window
14. " " Chair
15. " " Phone
16. H^3 Std w/wipe 41,780 dpm on 7-3-85

$$\text{Efficiency} = \frac{18109 \text{ cpm}}{41780 \text{ dpm}} = 43\%$$

21. Bathroom Floor wipe #1
22. Bathroom Floor Wipe #2
23 " Floor Wipe #3
24. " Floor Wipe #4
25. " Sink Wipe #5
26. " Toilet wipe #6

31. Locker Room Floor wipe #1
32. " " Floor wipe #2
33. " " Floor wipe #3
34. " " Shower wipe #4
35. " " Locker wipe #5
36. Background

ARCO
Office Area, Bathroom + Locker Room Wipes - B (Beta
7-5-85

PROGRAM #= 12 23/05/85 13:05
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	53.00	27.4	22.00	42.6	95.00	20.5	544.	9.920		2
12	2	1.00	32.00	35.3	14.00	53.4	63.00	25.2	519.	11.765		4
12	3	1.00	38.00	32.4	27.00	38.4	85.00	21.6	520.	9.347		6
2	4	1.00	36.00	33.3	26.00	39.2	82.00	22.0	476.	11.114		8
12	5	1.00	30.00	36.5	19.00	45.8	74.00	23.2	551.	12.335		10
12	6	1.00	34.00	34.3	21.00	43.6	83.00	21.9	533.	10.933		12
12	7	1.00	34.00	34.3	19.00	45.8	75.00	23.0	504.	7.511		13
12	8	1.00	33.00	34.8	22.00	42.6	74.00	23.2	507.	11.576		15
12	9	1.00	31.00	35.9	16.00	50.0	68.00	24.2	528.	8.500		17
12	10	1.00	36.00	33.3	25.00	40.0	85.00	21.6	509.	9.726		19
12	11	1.00	36.00	33.3	25.00	40.0	79.00	22.5	493.	12.421		21
12	12	1.00	36.00	33.3	29.00	37.1	89.00	21.2	522.	11.114		23
12	13	1.00	36.00	33.3	23.00	41.7	76.00	22.9	567.	12.168		25
12	14	1.00	32.00	35.3	19.00	45.8	66.00	24.6	607.	12.565		27
12	15	1.00	22.00	42.6	16.00	50.0	63.00	25.2	618.	7.861		29
12	16	1.00	18109.0	1.49	45.00	29.8	18177.0	1.48	643.	12.694		31
12	21	1.00	47.00	29.1	29.00	37.1	88.00	21.3	511.	11.298		33
12	22	1.00	37.00	32.8	16.00	50.0	80.00	22.3	726.	10.913		35
12	23	1.00	47.00	29.1	25.00	40.0	86.00	21.5	507.	10.900		37
12	24	1.00	34.00	34.3	22.00	42.6	72.00	23.5	557.	8.667		39
12	25	1.00	56.00	26.7	21.00	43.6	100.00	20.0	583.	14.319		41
12	26	1.00	48.00	28.8	27.00	38.4	97.00	20.3	597.	13.184		43
12	31	1.00	44.00	30.1	25.00	40.0	90.00	21.0	535.	11.270		46
12	32	1.00	20.00	44.7	19.00	45.8	52.00	27.7	567.	10.133		48
12	33	1.00	32.00	35.3	22.00	42.6	70.00	23.9	506.	8.533		50
2	34	1.00	29.00	37.1	26.00	39.2	67.00	24.4	590.	13.067		52
2	35	1.00	29.00	37.1	12.00	57.7	53.00	27.4	615.	14.987		54
12	36	1.00	21.00	43.6	26.00	39.2	68.00	24.2	648.	10.982		56

Office, Bathroom, and Locker Room Wipes γ (Gamma)
July 5, 1985

1.	Office	Area	Floor	Wipe	#1
2.	"	"	Floor	Wipe	#2
3.	"	"	"	"	#3
4.	"	"	"	"	#4
5.	"	"	"	"	#5
6.	"	"	"	"	#6
7.	"	"	"	"	#7
8.	"	"	"	"	#8
9.	"	"	"	"	#9
10.	"	"	"	"	#10
11.	"	"	"	"	#11
12.	"	"	"	"	#12
13.	"	"	Shelf under South window		
14.	"	"	Chair		
15.	"	"	Phone		

BATHROOM

1.	Bathroom	Floor	Wipe	#1
2.	"	"	"	#2
3.	"	"	"	#3
4.	"	"	"	#4
5.	"	Sink wipe		#5
6.	"	Toilet wipe		#6

LOCKER ROOM

1.	Locker	Room	Floor	Wipe #1
2.	"	"	"	Wipe #2
3.	"	"	"	Wipe #3
4.	"	"	Shower Wipe	#4
5.	"	"	Locker Wipe	#5

07-11-85 OFFICE
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 44
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .29 =	DPM/ 100 SQ.CM
1	21	0		0
2	41	0		0
3	42	0		0
4	37	0		0
5	27	0		0
6	61	17		59
7	48	4		14
8	45	1		3
9	41	0		0
10	43	0		0
11	35	0		0
12	51	7		24
13	38	0		0
14	66	22		76
15	34	0		0
16	45	19		66

07-11-85 OFFICE
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 128
EFFICIENCY 83.5% (.835)

CONTROL NO. 79495

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	BY EFF. .835	=	100 SQ.CM
1	112		0			0
2	110		0			0
3	102		0			0
4	151		23			28
5	120		0			0
6	119		0			0
7	136		8			10
8	116		0			0
9	130		2			2
10	118		0			0
11	114		0			0
12	115		0			0
13	132		4			5
14	134		6			7
15	120		0			0

07-11-85 OFFICE
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 60
EFFICIENCY 71% (.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	32		0			0
2	44		0			0
3	39		0			0
4	33		0			0
5	28		0			0
6	50		0			0
7	42		0			0
8	45		0			0
9	45		0			0
10	44		0			0
11	40		0			0
12	31		0			0
13	28		0			0
14	43		0			0
15	34		0			0

07-11-85
ARCO

BATHROOM

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 133
EFFICIENCY 83.5% (.835)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	122	0		0
2	119	0		0
3	118	0		0
4	119	0		0
5	116	0		0
6	123	0		0

07-11-85
ARCO

BATHROOM

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 26
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .29 =	DPM/ 100 SQ.CM
1	28	2		7
2	32	6		21
3	25	0		0
4	19	0		0
5	32	6		21
6	24	0		0

07-11-85
ARCO

BATHROOM

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 31
EFFICIENCY 71% (.71)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .71 =	DPM/ 100 SQ.CM
1	31	0		0
2	27	0		0
3	26	0		0
4	22	0		0
5	21	0		0
6	[illegible]			0

07-11-85 LOCKERROOM
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 26
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .29 =	DPM/ 100 SQ.CM
1	30		4		14
2	36		10		34
3	48		22		76
4	28		2		7
5	30		4		14

07-11-85 LOCKERROOM
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 133
EFFICIENCY 83.5% (.835)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	105		0		0
2	115		0		0
3	128		0		0
4	102		0		0
5	92		0		0

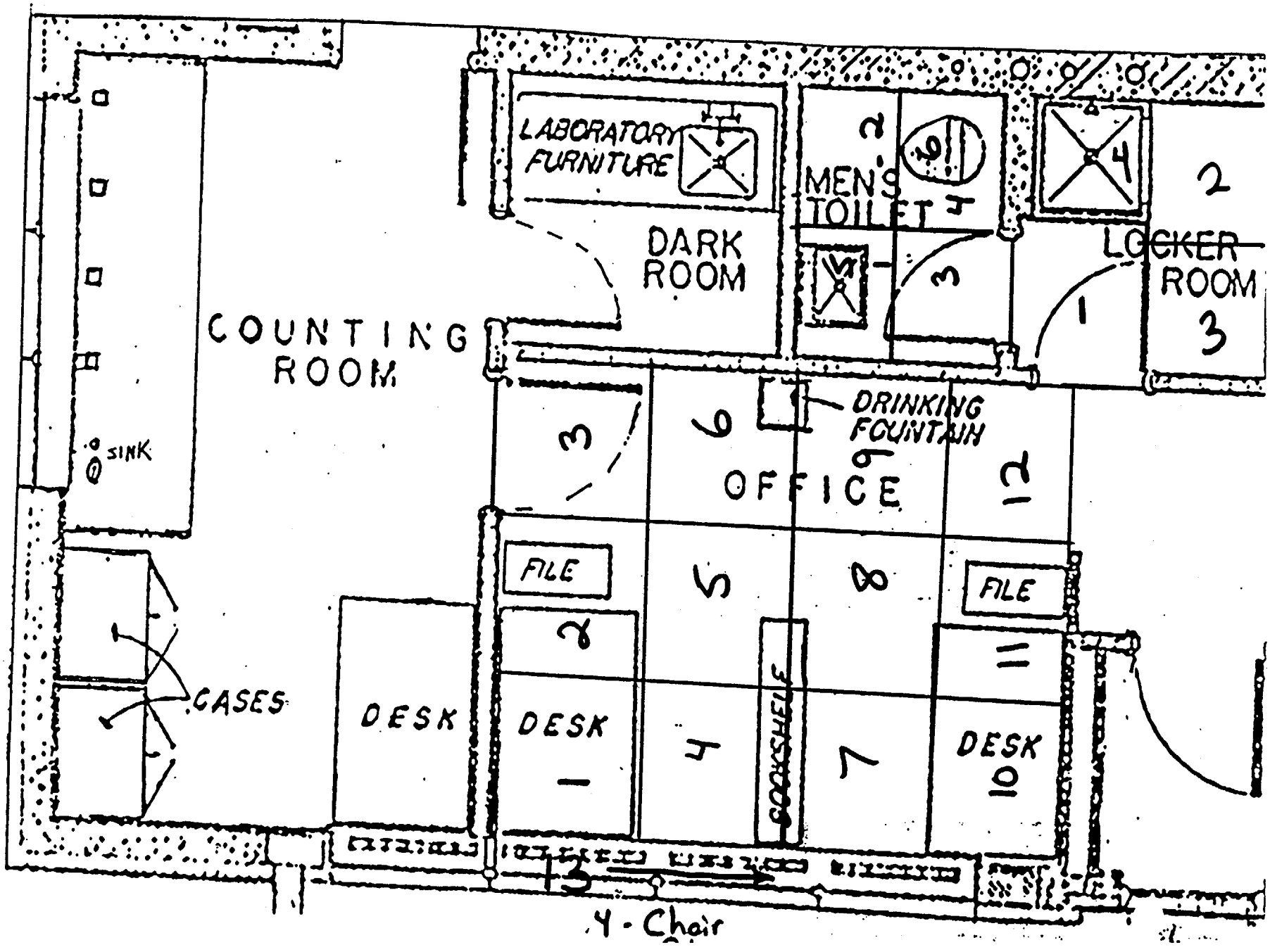
07-11-85 LOCKERROOM
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 31
EFFICIENCY 71% (.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71 =	DPM/ 100 SQ.CM
1	36		5		7
2	29		0		0
3	33		2		3
4	36		5		7
5	33		2		3



CONTROL NO. 9493

Hot Cell Lab and Doorway Wipes β (Beta)
7-5-85

1.	Hot	Cell	Lab	Floor	Wipe	#1
2.	"	"	"	"	"	#2
3.	"	"	"	"	"	#3
4.	"	"	"	"	"	#4
5.	"	"	"	"	"	#5
6.	"	"	"	"	"	#6
7.	"	"	"	"	"	#7
8.	"	"	"	Steel shelves (Top four shelves) #8		
9.	"	"	"	Steel shelves (bottom three sheves) #9		
10.	"	"	"	Floor wipe #10		
11.	"	"	"	Floor wipe #11		
12.	"	"	"	Floor wipe #12		
13.	"	"	"	"	"	#13
14.	"	"	"	"	"	#14
15.	"	"	"	"	"	#15
16.	"	"	"	Top of Concrete vault #16		
17.	"	"	"	Door of concrete vault #17		
18.	"	"	"	Concrete floor under Lab Bench #18		
19.	"	"	"	Floor wipe #19		
20.	"	"	"	Floor wipe #20		
21.	"	"	"	"	"	#21
22.	"	"	"	"	"	#22
23.	"	"	"	"	"	#23
24.	"	"	"	"	"	#24
25.	"	"	"	"	"	#25
26.	"	"	"	"	"	#26
27.	"	"	"	"	"	#27
28.	"	"	"	"	"	#28
29.	"	"	"	"	"	#29
30.	"	"	"	"	"	#30
31.	"	"	"	"	"	#31
32.	"	"	"	"	"	#32
33.	"	"	"	"	"	#33
34.	"	"	"	"	"	#34
35.	"	"	"	"	"	#35
36.	"	"	"	"	"	#36

37.	Hot	Cell	Lab	Floor wipe #37
38.	"	"	"	Robot arm control Box #38
39.	"	"	"	Robotic Arms #39
40.	"	"	"	Floor wipe #40
41.	"	"	"	" " #41
42	"	"	"	" " #42
43.	"	"	"	" " #43
44.	"	"	"	" " #44
45.	"	"	"	" " #45
46.	"	"	"	Southeast hood Right Section #46
47.	"	"	"	Southeast Hood left Section #47
48.	"	"	"	Southeast hood right cabinet #48
49.	"	"	"	Southeast hood left cabinet #49
50.	"	"	"	Floor wipe #50
51.	"	"	"	" " #51
52.	"	"	"	" " #52
53.	"	"	"	" " #53
54.	"	"	"	" " #54
55.	"	"	"	" " #55
56.	"	"	"	" " #56
57.	"	"	"	" " #57
58.	"	"	"	" " #58
59.	"	"	"	" " #59
60.	"	"	"	" " #60
61.	"	"	"	Fan Box #61
62.	"	"	"	Section A Lab Bench Top #62
63.	"	"	"	Section A Sink #63
64.	"	"	"	Bottom Black Shelf #64
65.	"	"	"	Middle Black Shelf #65
66.	"	"	"	Top Black Shelf #66
67.	"	"	"	Shelf under south window Sec. A #67
68.	"	"	"	Section B Lab Bench Top #68
69	"	"	"	Section B shelf under wouth window #69
70.	"	"	"	Section A Cabinet under sink
71.	"	"	"	Section A 1st set of drawers
72.	"	"	"	Section B 2nd set of drawers
73.	"	"	"	Section B 3rd set of drawers

81. Doorway Floor wipe #1 Carpet

82. " " " #2 Carpet

83. " " " #3

84. " " " #4

85. " " " #5

86. Background

87. H_2^3O std with wipe 41780 dpm on 7-3-85

$$\text{Efficiency} = \frac{17794 \text{ cpm}}{41780 \text{ dpm}}$$

$$= 42.5\%$$

ARCO
Hot Cell Lab + Doorway wipes - β (Beta)
7-5-85

PROGRAM #= 12 23/05/85 14:08
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	55.00	26.9	19.00	45.8	93.00	20.7	558.	8.938		2
12	2	1.00	49.00	28.5	28.00	37.8	100.00	20.0	541.	11.168		4
12	3	1.00	48.00	28.8	24.00	40.8	94.00	20.6	543.	9.829		6
12	4	1.00	36.00	33.3	18.00	47.1	82.00	22.0	556.	10.811		8
12	5	1.00	31.00	35.9	24.00	40.8	72.00	23.5	559.	10.050		10
12	6	1.00	34.00	34.3	20.00	44.7	72.00	23.5	561.	10.743		12
12	7	1.00	40.00	31.6	25.00	40.0	82.00	22.0	487.	8.952		14
12	8	1.00	26.00	39.2	26.00	39.2	73.00	23.4	525.	9.600		16
12	9	1.00	40.00	31.6	20.00	44.7	79.00	22.5	533.	12.240		18
1[illegible]	10	1.00	38.00	32.4	20.00	44.7	75.00	23.0	536.	9.760		20
12	11	1.00	35.00	33.8	20.00	44.7	73.00	23.4	549.	11.719		22
12	12	1.00	32.00	35.3	16.00	50.0	65.00	24.8	546.	11.152		24
12	13	1.00	45.00	29.8	18.00	47.1	82.00	22.0	552.	9.668		26
12	14	1.00	35.00	33.8	17.00	48.5	75.00	23.0	558.	11.719		28
12	15	1.00	37.00	32.8	30.00	36.5	89.00	21.2	549.	12.884		30
12	16	1.00	50.00	28.2	20.00	44.7	87.00	21.4	468.	8.725		32
12	17	1.00	39.00	32.0	21.00	43.6	82.00	22.0	559.	14.283		34
12	18	1.00	32.00	35.3	20.00	44.7	72.00	23.5	471.	11.297		36
12	19	1.00	32.00	35.3	17.00	48.5	72.00	23.5	541.	9.455		38
12	20	1.00	39.00	32.0	27.00	38.4	82.00	22.0	528.	12.120		40
12	21	1.00	38.00	32.4	24.00	40.8	80.00	22.3	544.	11.032		42
12	22	1.00	46.00	29.4	22.00	42.6	86.00	21.5	568.	12.833		44
12	23	1.00	38.00	32.4	28.00	37.8	91.00	20.9	573.	11.400		46
12	24	1.00	36.00	33.3	26.00	39.2	86.00	21.5	569.	12.584		48
12	25	1.00	29.00	37.1	24.00	40.8	69.00	24.0	545.	7.413		50
12	26	1.00	40.00	31.6	16.00	50.0	76.00	22.9	536.	11.619		52
12	27	1.00	21.00	43.6	20.00	44.7	58.00	26.2	559.	10.971		54
12	28	1.00	32.00	35.3	18.00	47.1	71.00	23.7	563.	9.600		56
12	29	1.00	33.00	34.8	25.00	40.0	83.00	21.9	579.	14.165		58
12	30	1.00	25.00	40.0	18.00	47.1	65.00	24.8	563.	11.008		60
12	31	1.00	33.00	34.8	26.00	39.2	87.00	21.4	535.	11.611		62
12	32	1.00	30.00	36.5	19.00	45.8	69.00	24.0	533.	10.116		64
1[illegible]	33	1.00	32.00	35.3	18.00	47.1	62.00	25.4	556.	9.224		65
12	34	1.00	38.00	32.4	18.00	47.1	75.00	23.0	559.	11.200		67
12	35	1.00	40.00	31.6	23.00	41.7	85.00	21.6	533.	11.619		69
12	36	1.00	37.00	32.8	18.00	47.1	71.00	23.7	570.	12.168		71
12	37	1.00	36.00	33.3	23.00	41.7	81.00	22.2	540.	10.551		73
12	38	1.00	40.00	31.6	24.00	40.8	86.00	21.5	559.	8.507		75
	39	1.00	38.00	32.4	12.00	57.7	67.00	24.4	585.	11.160		77

12	41	1.00	44.00	30.1	32.00	35.3	104.00	19.6	544.	10.296			81
12	42	1.00	42.00	30.8	20.00	44.7	78.00	22.6	533.	13.581			83
12	43	1.00	30.00	36.5	16.00	50.0	62.00	25.4	562.	10.632			85
12	44	1.00	41.00	31.2	23.00	41.7	85.00	21.6	578.	11.795			87
[illegible]	45	1.00	28.00	37.8	18.00	47.1	64.00	25.0	565.	10.963			89
12	46	1.00	34.00	34.3	30.00	36.5	94.00	20.6	571.	11.703			91

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	47	1.00	28.00	37.8	26.00	39.2	74.00	23.2	561.	10.317		93
12	48	1.00	25.00	40.0	23.00	41.7	66.00	24.6	541.	11.264		95
12	49	1.00	43.00	30.5	31.00	35.9	89.00	21.2	515.	10.836		97
12	50	1.00	36.00	33.3	14.00	53.4	64.00	25.0	537.	9.305		99
12	51	1.00	36.00	33.3	23.00	41.7	86.00	21.5	535.	11.326		101
12	52	1.00	32.00	35.3	23.00	41.7	77.00	22.7	520.	10.259		103
12	53	1.00	38.00	32.4	16.00	50.0	79.00	22.5	573.	13.320		105
12	54	1.00	24.00	40.8	15.00	51.6	57.00	26.4	578.	9.152		107
12	55	1.00	25.00	40.0	20.00	44.7	70.00	23.9	571.	10.585		109
12	56	1.00	47.00	29.1	15.00	51.6	85.00	21.6	578.	10.208		111
12	57	1.00	19.00	45.8	26.00	39.2	60.00	25.8	559.	9.684		113
12	58	1.00	39.00	32.0	22.00	42.6	79.00	22.5	544.	11.434		115
12	59	1.00	34.00	34.3	35.00	33.8	87.00	21.4	540.	12.267		117
[illegible]	60	1.00	35.00	33.8	29.00	37.1	84.00	21.8	576.	10.984		119
12	61	1.00	27.00	38.4	21.00	43.6	63.00	25.2	562.	9.371		121
12	62	1.00	57.00	26.4	24.00	40.8	101.00	19.9	533.	8.693		123
12	63	1.00	37.00	32.8	22.00	42.6	74.00	23.2	608.	11.579		125
12	64	1.00	43.00	30.5	30.00	36.5	95.00	20.5	564.	12.942		127
12	65	1.00	69.00	24.0	20.00	44.7	113.00	18.8	528.	12.237		129
12	66	1.00	36.00	33.3	23.00	41.7	82.00	22.0	517.	11.326		131
12	67	1.00	41.00	31.2	51.00	28.0	124.00	17.9	522.	10.642		133
12	68	1.00	94.00	20.6	31.00	35.9	149.00	16.3	538.	11.249		135
12	69	1.00	34.00	34.3	22.00	42.6	73.00	23.4	525.	8.978		137
12	70	1.00	30.00	36.5	18.00	47.1	69.00	24.0	451.	13.333		139
12	71	1.00	36.00	33.3	27.00	38.4	78.00	22.6	526.	11.537		141
12	72	1.00	26.00	39.2	24.00	40.8	62.00	25.4	529.	12.369		143
12	73	1.00	49.00	28.5	18.00	47.1	79.00	22.5	509.	12.800		145
12	81	1.00	46.00	29.4	21.00	43.6	84.00	21.8	572.	12.800		147
12	82	1.00	28.00	37.8	15.00	51.6	58.00	26.2	587.	12.544		149
12	83	1.00	34.00	34.3	27.00	38.4	83.00	21.9	558.	12.480		151
12	84	1.00	28.00	37.8	27.00	38.4	73.00	23.4	512.	9.103		153
12	85	1.00	31.00	35.9	28.00	37.8	84.00	21.8	553.	11.253		155
12	86	1.00	24.00	40.8	16.00	50.0	59.00	26.0	644.	10.048		157
12	87	1.00	17794.0	1.50	42.00	30.8	17857.0	1.50	645.	12.706		159

Hot Cell Lab Wipes γ (Gamma)
7-5-85

1.	Hot	Cell	Lab	Floor	Wipe	#1
2.	"	"	"	"	"	#2
3.	"	"	"	"	"	#3
4.	"	"	"	"	"	#4
5.	"	"	"	"	"	#5
6.	"	"	"	"	"	#6
7.	"	"	"	"	"	#7
8.	"	"	"	Steel shelves (Top four shelves) #8		
9.	"	"	"	Steel shelves (bottom three sheves) #9		
10.	"	"	"	Floor wipe #10		
11.	"	"	"	Floor wipe #11		
12.	"	"	"	Floor wipe #12		
13.	"	"	"	"	"	#13
14.	"	"	"	"	"	#14
15.	"	"	"	"	"	#15
16.	"	"	"	Top of Concrete vault #16		
17.	"	"	"	Door of concrete vault #17		
18.	"	"	"	Concrete floor under Lab Bench #18		
19.	"	"	"	Floor wipe #19		
20.	"	"	"	Floor wipe #20		
21.	"	"	"	"	"	#21
22.	"	"	"	"	"	#22
23.	"	"	"	"	"	#23
24.	"	"	"	"	"	#24
25.	"	"	"	"	"	#25
26.	"	"	"	"	"	#26
27.	"	"	"	"	"	#27
28.	"	"	"	"	"	#28
29.	"	"	"	"	"	#29
30.	"	"	"	"	"	#30
31.	"	"	"	"	"	#31
32.	"	"	"	"	"	#32
33.	"	"	"	"	"	#33
34.	"	"	"	"	"	#34
35.	"	"	"	"	"	#35
36.	"	"	"	"	"	#36

37.	Hot	Cell	Lab	Floor wipe #37
38.	"	"	"	Robot arm control Box #38
39.	"	"	"	Robotic Arms #39
40.	"	"	"	Floor wipe #40
41.	"	"	"	" " #41
42	"	"	"	" " #42
43.	"	"	"	" " #43
44.	"	"	"	" " #44
45.	"	"	"	" " #45
46.	"	"	"	Southeast hood Right Section #46
47.	"	"	"	Southeast Hood left Section #47
48.	"	"	"	Southeast hood right cabinet #48
49.	"	"	"	Southeast hood left cabinet #49
50.	"	"	"	Floor wipe #50
51.	"	"	"	" " #51
52.	"	"	"	" " #52
53.	"	"	"	" " #53
54.	"	"	"	" " #54
55.	"	"	"	" " #55
56.	"	"	"	" " #56
57.	"	"	"	" " #57
58.	"	"	"	" " #58
59.	"	"	"	" " #59
60.	"	"	"	" " #60
61.	"	"	"	Fan Box #61
62.	"	"	"	Section A Lab Bench Top #62
63.	"	"	"	Section A Sink #63
64.	"	"	"	Bottom Black Shelf #64
65.	"	"	"	Middle Black Shelf #65
66.	"	"	"	Top Black Shelf #66
67.	"	"	"	Shelf under south window Sec. A #67
68.	"	"	"	Section B Lab Bench Top #68
69	"	"	"	Section B shelf under wouth window #69
70.	"	"	"	Section A Cabinet under sink
71.	"	"	"	Section A 1st set of drawers
72.	"	"	"	Section B 2nd set of drawers
73.	"	"	"	Section B 3rd set of drawers

07-10-85 HOT CELL LAB
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 123
EFFICIENCY 83.5% (.835)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	102		0		0
2	99		0		0
3	111		0		0
4	99		0		0
5	134		11		13
6	145		22		26
7	110		0		0
8	108		0		0
9	141		18		22
10	109		0		0
11	125		2		2
12	123		0		0
13	119		0		0
14	128		5		6
15	125		2		2
16	127		4		5
17	133		10		12
18	115		0		0
19	134		11		13
20	98		0		0
21	112		0		0
22	134		11		13
23	122		0		0
24	125		2		2
25	129		6		7
26	109		0		0
27	112		0		0
28	126		3		4
29	127		4		5
30	94		0		0
31	124		1		1
32	132		9		11
33	114		0		0
34	123		0		0
35	112		4		14
36	138		15		18
37	96		0		0
38	107		0		0
39	134		11		13

40	148	23	30
41	125	2	2
42	113	0	0
43	143	20	24
44	123	0	0
45	151	28	34
46	109	0	0
47	145	22	26
48	116	0	0
49	138	15	18
50	136	13	16
51	139	16	19
52	143	20	24
53	128	5	6
54	106	0	0
55	114	0	0
56	137	14	17
57	103	0	0
58	146	23	28
59	104	0	0
60	115	0	0
61	104	0	0
62	135	12	14
63	122	0	0
64	116	0	0
65	114	0	0
66	124	1	1
67	125	2	2
68	103	0	0
69	108	0	0
70	117	0	0
71	119	0	0
72	125	2	2
73	124	1	1

CONTROL NO. 7 9 4 9 5

07-10-85 HOT CELL LAB
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 24
EFFICIENCY 71% (0.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	25		1			1
2	27		3			4
3	23		0			0
4	23		0			0
5	25		1			1
6	32		8			11
7	30		6			8
8	30		6			8
9	32		8			11
10	40		16			23
11	24		0			0
12	30		6			8
13	39		15			21
14	23		0			0
15	31		7			10
16	32		8			11
17	27		3			4
18	32		8			11
19	26		2			3
20	27		3			4
21	37		13			18
22	37		13			18
23	28		4			6
24	39		15			21
25	30		6			8
26	30		6			8
27	24		0			0
28	26		2			3
29	39		15			21
30	23		0			0
31	24		0			0
32	29		5			7
33	29		5			7
34	31		7			10
35	36		12			17
36	19		0			0
37	28		4			6
38	37		13			18
39	26		2			3

41	41	17	24
42	25	1	1
43	41	17	24
44	32	8	11
45	27	3	4
46	25	1	1
47	30	6	8
48	22	0	0
49	28	4	6
50	34	10	14
51	38	14	20
52	25	1	1
53	36	12	17
54	37	13	18
55	33	9	13
56	24	0	0
57	25	1	1
58	20	0	4
59	37	13	18
60	33	9	13
61	32	8	11
62	32	8	11
63	31	7	10
64	24	0	0
65	40	16	23
66	34	10	14
67	29	5	7
68	26	2	3
69	26	2	3
70	38	14	20
71	30	6	8
72	37	13	18
73	28	4	6

07-10-85 HOT CELL LAB
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 32
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD = NET CPM	DIVIDED BY EFF. .29 =	DPM/ 100 SQ.CM
1	29	0		0
2	28	0		0
3	24	0		0
4	24	0		0
5	35	3		10
6	19	0		0
7	22	0		0
8	22	0		0
9	32	0		0
10	22	0		0
11	19	0		0
12	30	0		0
13	36	4		14
14	24	0		0
15	23	0		0
16	35	3		10
17	24	0		0
18	36	4		14
19	29	0		0
20	37	5		17
21	41	9		31
22	26	0		0
23	33	1		3
24	31	0		0
25	31	0		0
26	26	0		0
27	25	0		0
28	26	0		0
29	28	0		0
30	33	1		3
31	22	0		0
32	32	0		0
33	27	0		0
34	21	0		0
35	36	4		14
36	25	0		0
37	34	2		7
38	26	0		0
39	30	0		0

40	19	0	0
41	28	0	0
42	20	0	0
43	26	0	0
44	35	3	10
45	34	2	7
46	28	0	0
47	30	0	0
48	18	0	0
49	32	0	0
50	34	2	7
51	24	0	0
52	31	0	0
53	24	0	0
54	24	0	0
55	28	0	0
56	21	0	0
57	34	2	7
58	33	1	3
59	29	0	0
60	27	0	0
61	33	1	3
62	25	0	0
63	33	1	3
64	38	6	21
65	32	0	0
66	31	0	0
67	26	0	0
68	35	3	10
69	25	0	0
70	26	0	0
71	20	0	0
72	33	1	3
73	23	0	0

CONTROL NO. 9495

Doorway Wipes γ (Gamma)
7-5-85

1. Doorway Floor Wipe #1 (Carpet)
2. " " Wipe #2 (Carpet
3. " " Wipe #3
4. " " Wipe #4
5. " " Wipe #5

07-10-85 DOORWAY
ARCO

LOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 151
EFFICIENCY 83.5% (.835)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835	=	DPM/ 100 SQ.CM
1	113		0			0
2	123		0			0
3	120		0			0
4	143		0			0
5	114		0			0

07-10-85 DOORWAY
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 36
EFFICIENCY 71% (0.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	34		0			0
2	33		0			0
3	43		7			10
4	36		0			0
5	21		0			0

07-10-85 DOORWAY
ARCO

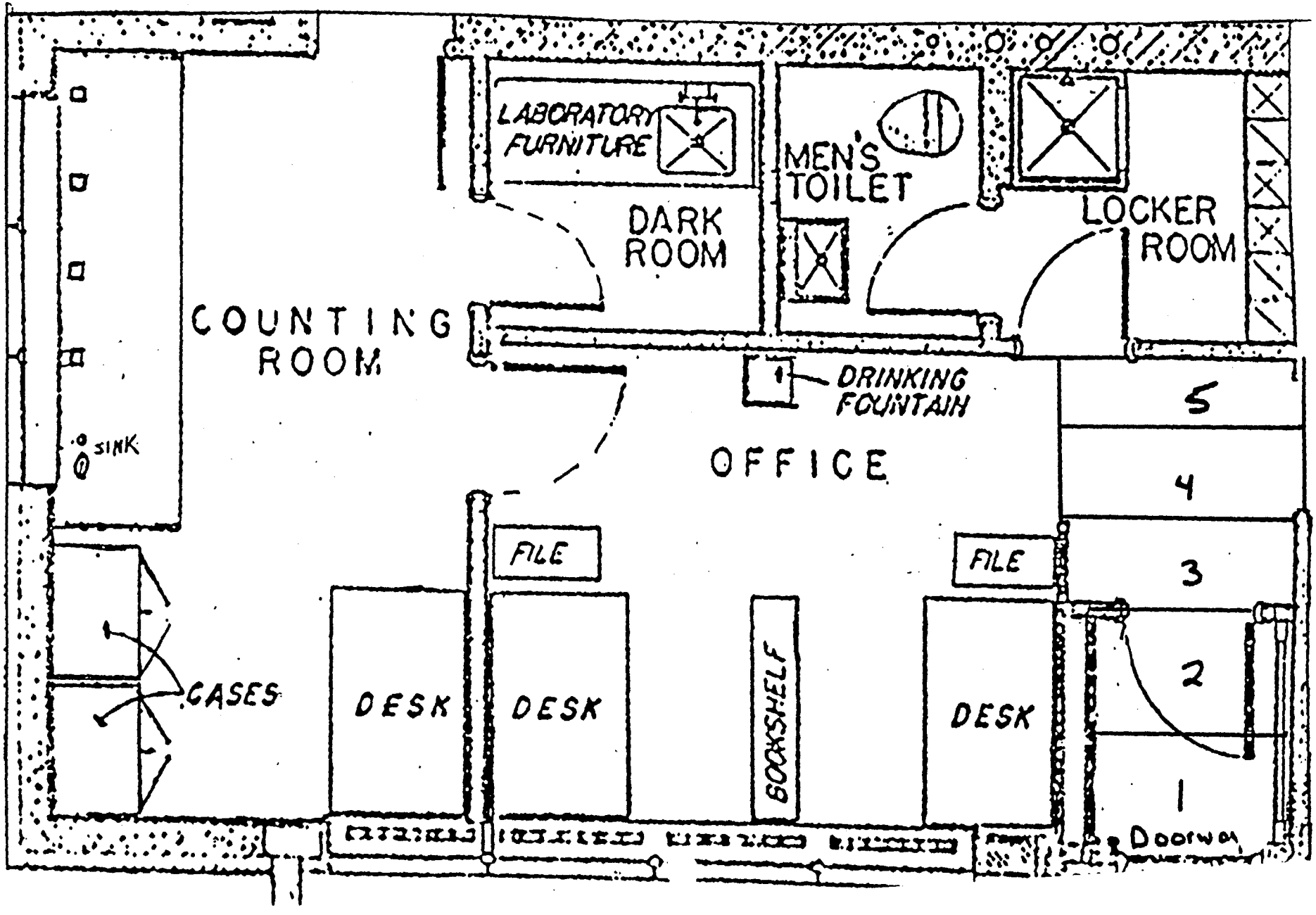
CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 36
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .29	=	DPM/ 100 SQ.CM
1	26		0			0
2	33		0			0
3	25		0			0
4	28		0			0
5	31		0			0

RADIATION LABORATORY
SINK
Sec A
Sec B
COUNTER TOP
FUME HOOD LH
EMERGENCY EXIT DOOR
DESK
CENTRIFUGE EQUIP.
STRUCTURAL WINDOW
4'8"


LABORATORY FURNITURE
DARK ROOM
MEN'S TOILET
LOCKER ROOM
COUNTING ROOM
SINK
DRINKING FOUNTAIN
OFFICE
5
4
3
2
1
FILE
FILE
CASES
DESK
DESK
BOOKSHELF
DESK
DOORWAY

CONTROL NO

ARCO β (Beta) Wipes
7-15-85
Attic of "N" Building

1. Attic Fllor
2. Attic Ledge
3. Attic Door
4. Floor in Hot Cell Lab
5. Background

ARCO 7-15-85

Efficiency Check

PROGRAM #= 12 02/06/85 12:07
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	18168.0	1.48	40.00	31.6	18224.0	1.48	641.	12.548	.	2

$$\text{Eff} = \frac{18168 \text{ cpm}}{41780 \text{ dpm on } 7\text{-}3\text{-}85} = 43\%$$

Attic β (Beta) Wipes

PROGRAM #= 12 02/06/85 14:25
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	31.00	35.9	15.00	51.6	61.00	25.6	509.	10.219		2
12	2	1.00	35.00	33.8	16.00	50.0	76.00	22.9	571.	9.822		5
12	3	1.00	38.00	32.4	17.00	48.5	66.00	24.6	558.	12.560		6
12	4	1.00	32.00	35.3	13.00	55.4	59.00	26.0	606.	13.788		8
12	5	1.00	16.00	50.0	10.00	63.2	36.00	33.3	654.	11.093		10

ARCO Attic Wipes γ (Gamma)

07-15-85

I-129 low

Co-57 Med

Co-60 High

1. Cave Rewipe 5 γ
2. Cave Rewipe 7 γ
3. Attic Floor γ
4. Attic Ledge γ
5. Attic Door γ

07-15-85
ARCO

ARCO Attic Wipes γ (Gamma)

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 114
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835	=	DPM/ 100 SQ.CM
1	106		0			0
2	130		16			19
3	89		0			0
4	137		23			28
5	157		43			51

07-15-85
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 49
EFFICIENCY 71% (0.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	22		0			0
2	41		0			0
3	25		0			0
4	48		0			0
5	45		0			0

07-15-85
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 49
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .29	=	DPM/ 100 SQ.CM
1	28		0			0
2	29		0			0
3	32		0			0
4	40		0			0
5	38		0			0

CONTROL NO. [illegible]

Cave Wipes β (Beta)
7-8-85

1. Cave Floor Wipe #1
2. " " " #2
3. " " " #3
4. " " " #4
5. " " " #5
6. " " " #6
7. " " " #6A
8. " " " #7
9. " " " #8
10. " Vault door outside and old hot spot #9
11. " Shelf under view window #10
12. " Robot Arm - Right #11
13. " Robot Arm - Left #12
14. " Grid wipe #13
15. " Grid wipe #14
16. " Grid wipe #15
17. " Floor wipe #16
18. " Floor wipe #17
19. " Floor wipe #18
20. " Well Railing #19
21. " Ceiling Beam #20
22. " Wall - Old Hood Duct #21
23. " Source Vaults #22
24. Background
25. H^3_2O Std w/wipe 41780 dpm on 7-3-85
Eff = 18322 cpm /41780 dpm = 43%

Cave Wipes β (Beta)
7-8-85

PROGRAM #= 12 26/05/85 12:03
REGION A: LL-UL= 0- 12 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION B: LL-UL= 12- 156 LCR= 0 BKG= .00 % 2 SIGMA= .0
REGION C: LL-UL= 0-2000 LCR= 0 BKG= .00 % 2 SIGMA= .0
TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	88.00	21.3	36.00	33.3	143.00	16.7	524.	10.110		2
12	2	1.00	-173.00	15.2	108.00	19.2	334.00	10.9	533.	16.019		4
12	3	1.00	-117.00	18.4	85.00	21.6	233.00	13.1	505.	13.728		6
12	4	1.00	88.00	21.3	42.00	30.8	145.00	16.6	517.	11.449		8
12	5	1.00	93.00	20.7	53.00	27.4	178.00	14.9	517.	12.000		10
12	6	1.00	103.00	19.7	68.00	24.2	202.00	14.0	499.	13.017		12
12	7	1.00	-132.00	17.4	57.00	26.4	231.00	13.1	485.	13.077		14
12	8	1.00	76.00	22.9	40.00	31.6	146.00	16.5	526.	11.747		16
12	9	1.00	86.00	21.5	25.00	40.0	138.00	17.0	543.	9.945		17
12	10	1.00	84.00	21.8	35.00	33.8	141.00	16.8	545.	11.016		19
12	11	1.00	94.00	20.6	21.00	43.6	136.00	17.1	604.	11.909		22
12	12	1.00	101.00	19.9	27.00	38.4	155.00	16.0	620.	10.315		24
12	13	1.00	65.00	24.8	29.00	37.1	117.00	18.4	564.	9.365		26
12	14	1.00	94.00	20.6	32.00	35.3	150.00	16.3	583.	9.300		27
12	15	1.00	78.00	22.6	16.00	50.0	117.00	18.4	578.	11.970		29
2	16	1.00	73.00	23.4	20.00	44.7	111.00	18.9	517.	10.688		31
12	17	1.00	61.00	25.6	31.00	35.9	112.00	18.9	502.	11.784		33
12	18	1.00	104.00	19.6	31.00	35.9	161.00	15.7	528.	12.292		35
12	19	1.00	85.00	21.6	24.00	40.8	135.00	17.2	617.	10.336		37
12	20	1.00	93.00	20.7	17.00	48.5	128.00	17.6	628.	12.133		39
12	21	1.00	87.00	21.4	25.00	40.0	146.00	16.5	612.	10.044		41
12	22	1.00	79.00	22.5	20.00	44.7	116.00	18.5	592.	11.161		44
12	23	1.00	54.00	27.2	21.00	43.6	100.00	20.0	508.	10.274		46
12	24	1.00	22.00	42.6	15.00	51.6	49.00	28.5	653.	12.648		48
12	25	1.00	18322.0	1.48	50.00	28.2	18402.0	1.47	641.	12.484		50

$$\text{Efficiency} = \frac{18322\ \text{cpm}}{41780\ \text{dpm}} = .43$$

Cave Rewipes β (Beta)

July 8, 1985

Efficiency 43%

H^3 background 22 cpm

An Efficiency of 43% and a H^3 background of 22 cpm allows a maximum count of 108 cpm before the ^3H limit of 200 dpm/100cm^2 is exceeded.

Beta rewipes	Remedy
1. Floor wipe #2	Radiac + SOS pad
2. Floor wipe #3	Radiac + SOS pad
3. Floor wipe #6A	Radiac + SOS pad
4. Background Count	

Cave Rewipes β (Beta)

7-8-85

PROGRAM #= 12 26/05/85 13:17

REGION A:	LL-UL=	0- 12	LCR=	0	BKG=	.00	% 2 SIGMA=	.0
REGION B:	LL-UL=	12- 156	LCR=	0	BKG=	.00	% 2 SIGMA=	.0
REGION C:	LL-UL=	0-2000	LCR=	0	BKG=	.00	% 2 SIGMA=	.0

TIME= 1.00 K= 1.000 QIP=SIE

P#	S#	TIME	CPMA/K	%DEV	CPMB/K	%DEV	CPMC/K	%DEV	SIE	SIS	FLAGS	MIN
12	1	1.00	65.00	24.8	31.00	35.9	118.00	18.4	566.	11.812		2
12	2	1.00	52.00	27.7	19.00	45.8	90.00	21.0	583.	8.815		4
12	3	1.00	69.00	24.0	25.00	40.0	107.00	19.3	570.	11.044		6
12	4	1.00	27.00	38.4	20.00	44.7	69.00	24.0	657.	11.911		8

CONTROL NO. 79485

Cave Wipes γ (Gamma)
7-8-85

1.	Cave	Floor Wipe #1
2.	"	" " #2
3.	"	" " #3
4.	"	" " #4
5.	"	" " #5
6.	"	" " #6
7.	"	" " #6A
8.	"	" " #7
9.	"	" " #8
10.	"	Vault door outside and old hot spot #9
11.	"	Shelf under view window #10
12.	"	Robot Arm - Right #11
13.	"	Robot Arm - Left #12
14.	"	Grid wipe #13
15.	"	Grid wipe #14
16.	"	Grid wipe #15
17.	"	Floor wipe #16
18.	"	Floor wipe #17
19.	"	Floor wipe #18
20.	"	Well Railing #19
21.	"	Ceiling Beam #20
22.	"	Wall - Old Hood Duct #21
23.	"	Source Vaults #22

07-11-85 CAVE
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 144
EFFICIENCY 83.5% (.835)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835 =	DPM/ 100 SQ.CM
1	122		0		0
2	138		0		0
3	181		37		44
4	146		2		2
5	139		0		0
6	159		15		18
7	145		1		1
8	200		56		67
9	140		0		0
10	145		1		1
11	124		0		0
12	154		10		12
13	108		0		0
14	130		0		0
15	122		0		0
16	116		0		0
17	121		0		0
18	119		0		0
19	127		0		0
20	104		0		0
21	150		6		7
22	125		0		0
23	124		0		0

07-11-85 CAVE
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 38
EFFICIENCY 71% (.71)

CAVE

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	48		10			14
2	33		0			0
3	37		0			0
4	35		0			0
5	42		4			6
6	36		0			0
7	38		0			0
8	36		0			0
9	30		0			0
10	32		0			0
11	20		0			0
12	21		0			0
13	33		0			0
14	33		0			0
15	34		0			0
16	31		0			0
17	32		0			0
18	28		0			0
19	24		0			0
20	24		0			0
21	42		4			6
22	24		0			0
23	26		0			0

07-11-85
ARCO

CAVE

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 26
EFFICIENCY 29% (0.29)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .29	=	DPM/ 100 SQ.CM
1	38		12			41
2	30		4			14
3	40		14			48
4	50		24			83
5	56		30			103
6	48		22			76
7	41		15			52
8	58		32			110
9	26		0			0
10	27		1			3
11	30		4			14
12	29		3			10
13	27		1			3
14	23		0			0
15	30		4			14
16	45		19			66
17	22		0			0
18	32		6			21
19	36		10			34
20	33		7			24
21	37		11			38
22	26		0			0
23	29		3			10

CONTROL NO. 79495

Cave Rewipes γ (Gamma)

ARCO

07-15-85

I-129 low

Co-57 Med

Co-60 High

1. Cave Rewipe 5 γ
2. Cave Rewipe 7 γ
3. Attic Floor γ
4. Attic Ledge γ
5. Attic Door γ

07-15-85
ARCO

Cave Rewipes γ (Gamma)
CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

LOW ENERGY
I-129 STANDARD CT .....
BACKGROUND 114
EFFICIENCY 83.5%

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .835	=	DPM/ 100 SQ.CM
1	106		0			0
2	130		16			19
3	89		0			0
4	137		23			28
5	157		43			51

07-15-85
ARCO

CLOSE OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

MEDIUM ENERGY
I-129 STANDARD CT .....
BACKGROUND 49
EFFICIENCY 71% (0.71)

SAMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .71	=	DPM/ 100 SQ.CM
1	22		0			0
2	41		0			0
3	25		0			0
4	48		0			0
5	45		0			0

07-15-85
ARCO

CLOSE-OUT SURVEY

SAHCI-NUCLEAR CHICAGO
AUTO-GAMMA MODEL 4216

HIGH ENERGY
I-129 STANDARD CT .....
BACKGROUND 49
EFFICIENCY 29% (0.29)

AMPLE #	SAMPLE COUNT	- BKGD =	NET CPM	DIVIDED BY EFF. .29	=	DPM/ 100 SQ.CM
1	28		0			0
2	29		0			0
3	32		0			0
4	40		0			0
[illegible]	[illegible]		[illegible]			[illegible]

CONTROL NO. 7 9 4 9 5