

A-107

HEALTH PHYSICS REPORT

for

W. R. GRACE COMPANY
Wayne, New Jersey

Radiological Survey Following
Decontamination of Facilities

June 18, 1974

Prepared by

Maryanne McClosky
Maryanne McClosky
Health Physicist

PART I

INTRODUCTION

W. R. Grace Company engaged Applied Health Physics, Inc. of Bethel Park, Pennsylvania to carry out decontamination of their Davison Chemical Division facilities located at Pompton Plains, New Jersey. An earlier survey conducted by Applied Health Physics, Inc. personnel revealed contamination of buildings and the property by various thorium - containing materials. See Part II. Decontamination at the site began on March 11, 1974 and continued through July 18, 1974.

The goal of the decontamination work was to attain certain limits and conditions prior to the release of these premises for unrestricted use. Appendix A presents these guidelines for unrestricted use.

A qualified consultant, Mr. Paul B. Klevin, was engaged by W. R. Grace Company to provide an expert's opinion on the progress and course of the decontamination, as well as to assure compliance with the state of New Jersey and United States Atomic Energy Commission regulations.

The overall ground area of the W. R. Grace Plant at Wayne, New Jersey is 6.4 acres. The frontage is on Black Oak Ridge Road with chain link fence boundaries north and south, as shown on Figure 1. A small brook runs east and north of the area, providing the eastern property line.

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RESULTS of RADIOLOGICAL EVALUATION

of

THORIUM ORE WASTE DISPOSAL PROBLEM

Prepared by

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Health Physicist

PART II

(Survey prior to Decontamination)

RESULTS OF RADIOLOGICAL EVALUATION of THORIUM ORE WASTE DISPOSAL PROBLEM

INTRODUCTION

W. R. Grace Company has operated a plant in Wayne, New Jersey for a number of years. The plant is located on Black Oak Ridge Road and has been non-operative for the past few years. Currently, the plant lies empty, except for a few pieces of equipment and materials left onsite. Optical polishing compounds were manufactured at this plant. Some of this raw material contained natural thorium and various rare earths, especially cerium. Possession and use of these naturally occurring radioactive materials (e.g., natural thorium) necessitated that W. R. Grace obtain a source material license from the U. S. Atomic Energy Commission and comply with US-AEC regulations.

This survey was conducted as a prelude to decontamination, which must be carried out since W. R. Grace Company plans to sell this property. Federal and state regulations specify the conditions and limits which must be achieved prior to release of facilities and equipment for unrestricted use by non-licensed parties. See Appendix A. W. R. Grace has engaged the services of a qualified consultant, Mr. Paul B. Klevin, to advise them as to the procedures they must follow in order to assure compliance with the applicable regulations and safety standards.

RADIATION SURVEY

On December 11, 1973, Applied Health Physics, Inc. was informed by Mr. Klevin and Mr. B. L. Mobley of W. R. Grace Company that the plant contained thorium at various locations within the buildings and had been buried on the site.

Applied Health Physics was requested to survey the buildings and grounds, and to report their findings.

The radiation monitoring started December 12, 1973, with the preliminary survey for alpha and gamma radiation. Instrumentation used by our health physics personnel consisted of a calibrated gas proportional alpha survey meter (Eberline Model PAC-3G) and a portable gamma scintillation spectrometer (Eberline Model PRM 5-3).

The contamination consisted primarily of fine dusts scattered through the buildings, and various isolated pockets of activity; e.g., as in trenches. On-site burial accounted for outdoor activity in varying degrees. A complete outdoor survey could not be accomplished due to inclement weather.

Besides using the forementioned radiation survey meters, our surveys also included the collection of smears to evaluate removable contamination; liquid and sludge samples of various materials were collected for estimates of removable and fixed activities. Maps and drawings made at the time of the sampling indicate precisely where various measurements and samplings of materials were obtained. Results of alpha-gamma radiation survey are summarized for certain locations on Table 1.

Gamma and alpha measurements were taken at surface level. These data are presented in Figures 6 and 7. As indicated in Table 1, surface alpha measurements range from 0 to 88,000 disintegrations per minute. The area of the alpha survey meter probe is 68 cm². This data can only estimate the "fixed" activity, since alpha radiation cannot penetrate even a thin covering of dust or other non-radioactive materials. The actual amount of radionuclides in terms of dpm per gram of contaminated surface may be significantly greater than that measured and reported. Figures 1-5 show conditions at the time of our initial survey, December 12, 1973. Additional photographs were taken January 21, 1974, during the course of our site survey. These photos will be retained on file.

Results of the alpha content of sample are listed in Tables 2 and 3. The highest reading for removable contamination was found to be 1,948 d/m/100 cm², while other values averaged 500 d/m/100 cm². The liquid and sludge samples gave estimates of concentrations of contamination ranging from 2,000 to 10,000 d/m/gram of material. The isotopic content of these samples was determined and found primarily to be natural thorium with traces of radium (0.6 ± 1 nano-Ci per gram). This was done by gamma spectroscopy; the thorium content of settled dusts inside the plant is 20.0 ± 1.0 mg Th/g sample.

On January 21, 1974, an employee was seen vacuuming these dust laden areas without respiratory protection and using a bag-type industrial vacuum cleaner which created significant airborne dusts. Mr. Klevin requested the termination of this operation, and the results are shown on Figure 7.

CONCLUSIONS

Waste slags and ores containing thorium are buried at various areas of the plant site. See Figure 6. These locations could not be determined precisely due to lack of sufficient information concerning burial. Furthermore, during January, 1974, earth moving equipment was used to level certain portions of the plant property where source material had been buried. These areas were surveyed January 21 and 22, 1974, and the results are shown in Figure 7. Certain deposits were found to be only partially buried. These locations were detected by gamma scintillation and a few samples were collected. The results of the various radiological surveys are the basis for the following conclusions:

1. The maximum amount of removable alpha radioactivity exceeds within certain portions of the plant as well as on the plant property the recommended limit of 1,000 dpm per 100 cm². Radioactive source materials should be removed, so that acceptable limits are met at these locations. Appendix A contains radioactivity limits for un-

restricted release of facilities and equipment.

2. Clothing, equipment, and fixtures are now in place which harbors radioactive contamination. For example, fans, coveralls, benches etc. which no longer serve a useful purpose should be disposed of in a manner that results in minimal contamination to clean areas and complies with applicable regulations.
3. The ground floor of the main building, as well as the floors of smaller places have buildup of thorium concentration due to seepage and deposition over the years. These surfaces should be thoroughly cleansed, or removed, depending on the economics of decontamination, versus feasibility of disposal. The floor conditions in certain areas are so bad as to necessitate disposal.
4. Drain lines and trenches were found to have high (10^4 dpm/gram) concentrations of licensed material. These and other water routes are to be areas of attention when clean-up takes place.
5. All removal, repackaging or transfer of licensed radioactive materials must be done under the direct supervision of health physics personnel who are experienced in this type of decontamination and waste disposal work.

TABLE 1

RESULTS OF ALPHA-GAMMA RADIATION SURVEYS

<u>Location</u>	<u>Alpha</u> <u>DPM/100 cm²</u>	<u>Gamma</u> <u>DPM/100 cm²</u>	<u>mr/hr</u>
Storage area - 2nd. Level	660	1.55×10^6	0.15
Press room wall - 2nd Level	2.64×10^4	5.18×10^6	0.6
7-K Blending & Storage - 2nd Level	1.93×10^3	3.11×10^6	0.3
Drying Room - 2nd Level	3.08×10^3	2.07×10^6	0.2
Sulfonation, 1&2 Tank Rooms	1.76×10^4	5.18×10^6	0.6
Open Storage area, wall	8.80×10^4	1.04×10^7	1.1
Storage area, drain	2.20×10^4	6.21×10^6	0.8
Waste Treatment Room	1.93×10^4	1.04×10^6	0.15
Background (outdoors)	None	6.21×10^5	<0.1

TABLE 2

RESULTS OF ALPHA RADIATION ANALYSES
OF THORIUM BOTTLE SAMPLES

<u>Sample Number</u>	<u>Area*</u>	<u>Weight (gram)</u>	<u>Total Alpha Activity (d/m/gram)</u>
529	1-0-1	0.3843	1.2×10^4
514	1-J	0.4626	7.0×10^3
522	1-M-1	0.2938	1.6×10^4
504	1-F	0.3304	1.22×10^4
502	1-B	1.0586	280
512	1-J	0.4935	3.66×10^3
505	1-F	0.0877	8.22×10^3
511	1-J	0.3001	6.50×10^3
513	1-J	0.4882	1.43×10^3
527	1-0-1	0.7708	7.36×10^3
528	1-0-1	0.0638	2.23×10^4
532	1-Q-1	0.1215	3.47×10^3
526	1-0-1	0.0262	1.04×10^4
506	1-F	0.0224	5.14×10^3
531	1-Q-1	0.0679	8.20×10^3
521	1-M-1	0.0916	2.42×10^3
523	1-M-1	0.1792	1.95×10^3
501	1-B	0.0771	6.38×10^3
510	1-G	0.1095	1.105×10^4
503	1-B	0.0078	7.24×10^3
530	1-Q-1	0.0538	2.19×10^3
525	1-0-1	0.4199	119
508	1-G	0.1856	4.69×10^3
507	1-G	0.0942	5.43×10^3
509	1-G	0.1995	1.05×10^4
524	1-M-1	0.8390	1.18×10^3
537	2-E	1.3249	348
520	2-B	0.0846	7.44×10^4
546	2-F	0.0423	1.81×10^4
539	2-E	0.0925	1.15×10^4
547	2-H	0.0596	1.48×10^3
515	2-C	0.1076	1.89×10^3
545	2-F	0.0670	2.76×10^3
541	2-E	1.1860	84
543	2-F	0.0929	1.15×10^3
549	2-I	0.0380	3.75×10^4
518	2-C	0.0306	2.83×10^3
548	2-I	0.0581	2.13×10^3
533	2-D	0.1035	610
536	2-E	1.1921	519
544	2-F	0.1916	30.5
535	2-D	0.0276	2.44×10^3
516	2-C	0.0352	1.14×10^3
542	2-F	2.0742	463

TABLE 2, Continued

<u>Sample Number</u>	<u>Area*</u>	<u>Weight (gram)</u>	<u>Total Alpha Activity (d/m/gram)</u>
534	2-D	0.0145 ²	4.85x10 ³
538	2-E	0.8977	5.05x10 ³
462	SOIL-2K	0.0465	1.35x10 ³
554	SOIL-2K	0.2396	198
552	SOIL-2K	0.0127	1.80x10 ³
551	SOIL-2K	0.0711	1.03x10 ⁵
461	SOIL-2K	0.1337	0
519	2-C	1.3668	115
517	2-C	1.3013	2.14x10 ³
555	SOIL-2K	0.5752	925

- NOTES:
- 1) The areas can be found on the individual drawings.
 - 2) The standard deviations of the activities are within 2 sigma.

TABLE 3

RESULTS OF ALPHA RADIATION ANALYSES
OF THORIUM SMEAR SAMPLES

<u>Sample Number</u>	<u>Area*</u>	<u>Total Alpha Activity (d/m/100cm²)</u>
285	BLANK	1.9
287	1-A	17.1
289	1-A	3.8
291	1-B	0
292	1-B	22.8
293	1-B	22.8
295	1-B	11.4
297	1-B	15.2
299	1-B	26.5
301	1-B	9.5
303	1-B	13.3
305	1-B	17.1
307	1-B	22.8
309	1-C	19.0
311	1-C	17.1
313	1-D	9.5
315	1-D	9.5
317	1-D	24.7
319	1-F	9.5
321	1-F	9.5
323	1-F	9.5
325	1-G	81.5
326	1-G	157
327	1-G	165
328	1-G	150
329	1-G	74
330	1-G	72.1
331	1-G	302
332	1-H	32.4
334	1-H	24.7
336	1-H	28.5
338	1-I	17.1
340	1-I	9.5
342	1-J	74
343	1-J	17.1
344	1-J	74
345	1-J	28.5
346	1-J	26.5
347	1-J	74
348	1-J	26.5
349	1-J	30.5
350	1-J	20.9
351	1-J	19
352	1-J	30.5
353	1-J	28.5
359	1-K	64.7
360	1-K	60.8

TABLE 3, Continued

<u>Sample Number</u>	<u>Area*</u>	<u>Total Alpha Activity (d/m/100cm²)</u>
361	1-K	53.2
362	1-K	49.5
364	1-L	156
365	1-L	160
366	1-L	47.5
367	1-L	13.3
368	1-L	9.5
369	1-L	11.4
370	1-l	62.7
371	1-M-1	57.2
372	1-M-1	57.2
373	1-M-1	57.2
374	1-M-1	38.0
375	1-M-1	34.2
376	1-M-1	36.1
377	1-M-1	49.5
378	1-M-1	45.5
379	1-M-1	45.5
380	1-M-1	45.5
381	1-M-1	37.6
382	1-M-1	30.5
383	1-M-1	38.0
384	1-N-1	24.7
385	1-N-1	15.2
386	1-N-1	3.8
388	1-N-1	11.4
389	1-N-1	15.2
391	1-O-1	30.5
394	1-O-1	28.5
395	1-O-1	30.5
396	1-O-1	30.5
397	1-O-1	34.2
398	1-O-1	15.2
399	1-O-1	11.4
400	1-O-1	15.2
402	1-O-1	30.5
403	1-P-1	20.9
404	1-P-1	26.5
405	1-P-1	47.5
409	1-Q-1	77.9
410	1-Q-1	34.2
411	1-Q-1	41.8
412	1-Q-1	34.2
413	1-Q-1	224
414	1-Q-1	116
415	1-Q-1	169
416	1-Q-1	98.6
417	1-R-1	24.7
418	1-R-1	9.5
419	1-R-1	15.2

TABLE 3, Continued

<u>Sample Number</u>	<u>Area*</u>	<u>Total Alpha Activity (d/m/100cm²)</u>
420	1-R-1	24.7
421	1-R-1	30.5
422	1-R-1	93
423	1-R-1	176
424	1-R-1	76
425	1-R-1	123.5
426	1-R-1	43.8
427	1-R-1	39.9
428	1-R-1	15.2
429	1-R-1	24.7
430	1-R-1	13.3
431	1-R-1	17.1
432	1-R-1	17.1
439	2-A	358
440	2-A	103
441	2-A	224
449	2-B	795
450	2-B	1,948
451	2-B	402
452	2-B	64.7
445	2-C	65.7
446	2-C	74
447	2-C	38
448	2-C	19
454	2-D	30.5
456	2-J	3.8
459	2-J	3.8
460	2-J	9.5
463	2-K	13.3
464	2-K	15.2
465	2-K	11.4
466	2-K	13.3

TABLE 4

ANALYSIS OF SAMPLES TAKEN FROM W. R. GRACE COMPANY
(The collection points are noted on Figure 6)

<u>Sample</u>	<u>Dry Weight(grams)</u>	<u>Net CPM</u>	<u>DPM/GRAM</u>	<u>uCuries/GRAM</u>
#1 Dump Sump	2.3243	1,851.1	1.50×10^3	6.8×10^{-4}
#2 Ball Mill Sump	3.2258	1,609.6	949	4.2×10^{-4}
#3 Driveway Sump	1.4697	1,479.6	1.89×10^3	9.3×10^{-4}
#4 Well Sump	1.1283	658.1	1.14×10^3	5.2×10^{-4}

APPENDIX A

RADIOACTIVITY LIMITS FOR UNRESTRICTED RELEASE

of

FACILITIES and EQUIPMENT

2

1. The maximum amount of fixed alpha radioactivity in disintegrations per minute per 100 square centimeters on buildings or equipment should not exceed 25,000 dpm.
2. The average amount of fixed alpha radioactivity in disintegrations per minute per 100 square centimeters on buildings or equipment should not exceed 5,000 dpm.
3. The maximum amount of removable (capable of being removed by wiping the surface with a filter paper or soft absorbent paper) alpha radioactivity in disintegrations per minute per 100 square centimeters on buildings or equipment should not exceed 1,000 dpm.
4. (a) The maximum level at one centimeter from the most highly contaminated surface of a building or piece of equipment measured with an open-window beta-gamma survey meter through a tissue equivalent absorber of not more than seven milligrams per square centimeter should not exceed 1.0 millirad per hour.

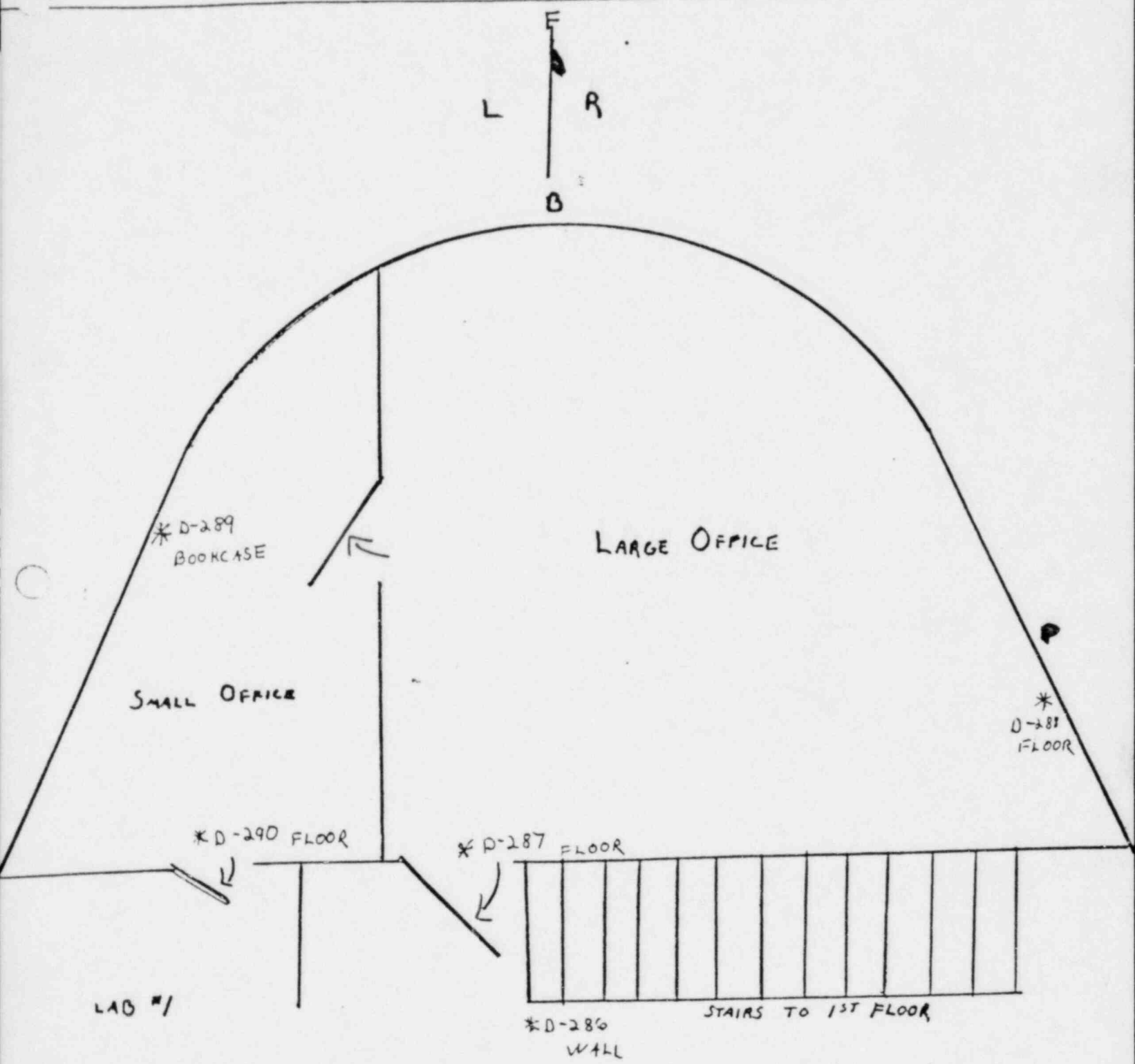
(b) The average radiation level at one centimeter from the contaminated surface of the building or equipment measured in the same manner should not exceed 0.2 millirad per hour.
5. The contamination limits for abandonment of facilities involving U-233 or plutonium should not exceed 1/10 of the limits in items 1, 2 and 3 above.

- NOTES: A. A reasonable effort should be made to minimize the contamination present.
- B. Surfaces of premises, equipment or scrap likely to be contaminated, and of such size, construction, or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the levels specified above.
- C. Premises, equipment or scrap having contaminated surfaces which have been covered by painting, metal plating or other covering material should be presumed to be contaminated in excess of the levels specified above, unless it can be established that the contamination was below the above levels prior to applying the covering.

APPENDIX B

Locations of Various
Samples taken at
W. R. Grace Company

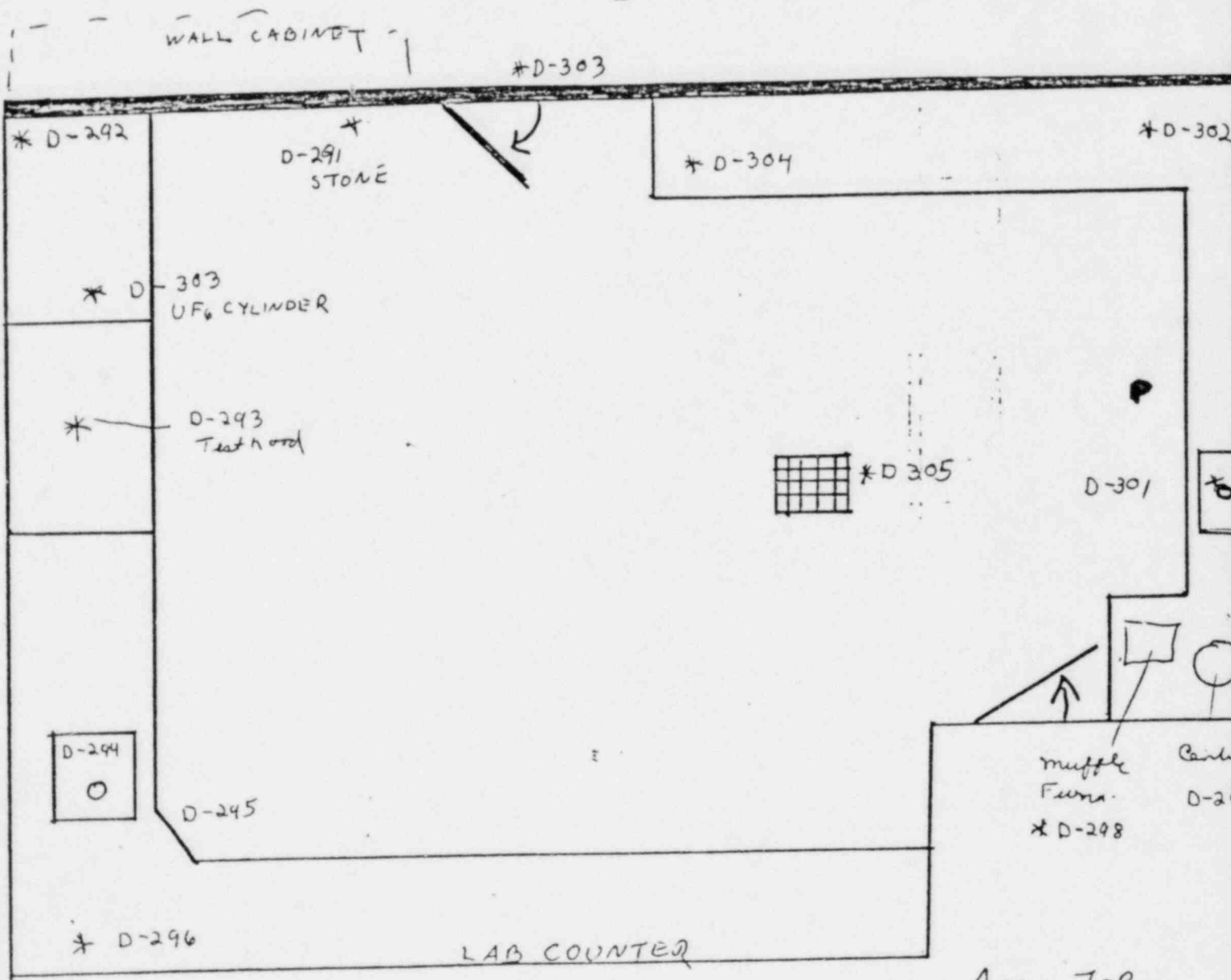
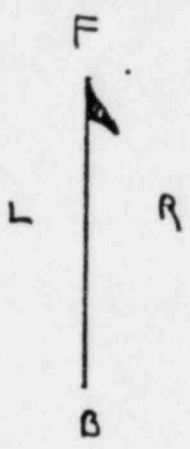
NOTE: These locations can be found on Figure 7



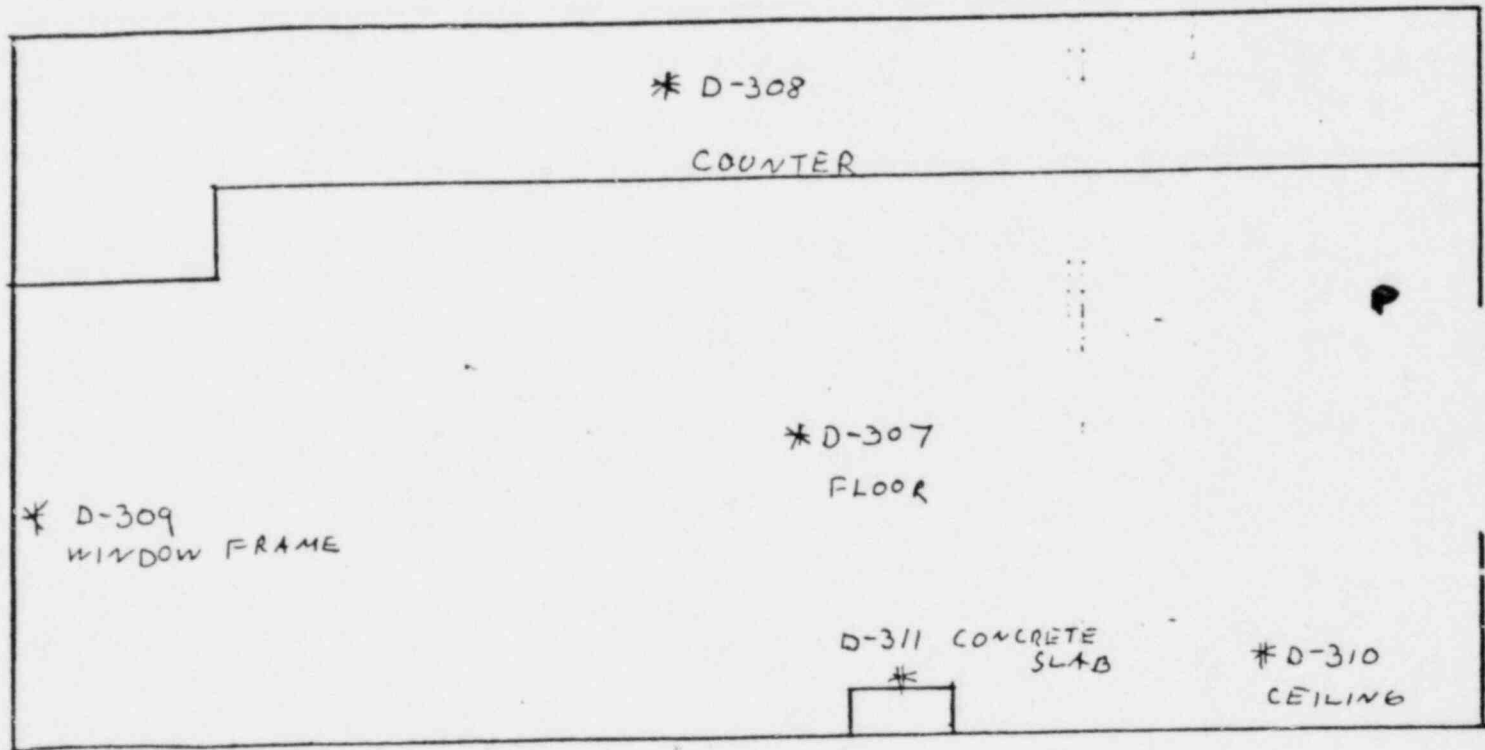
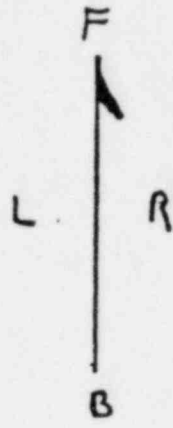
AREA I-A

OFFICES

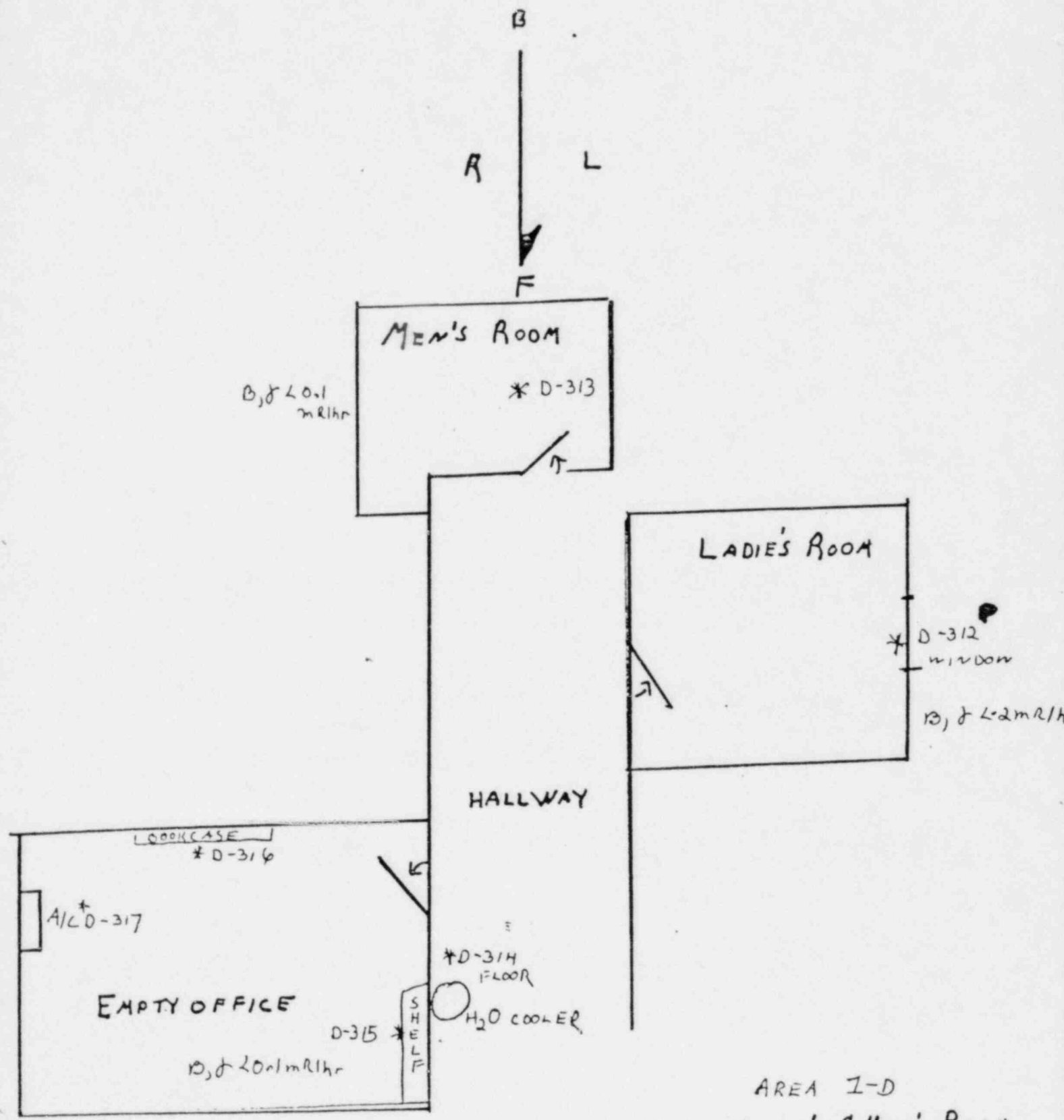
2ND FLOOR, MAIN BLDG



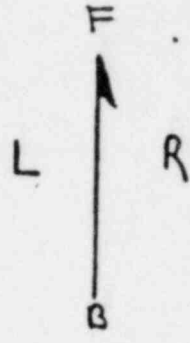
AREA I-B
LAB No. 1
2ND. FLOOR, MAIN BLDG.



AREA 1-C
SAMPLE PREPARATION ROOM
2ND FLOOR, MAIN BLDG.



AREA I-D
 HALL, LADIES & MEN'S ROOM,
 EMPTY OFFICE
 2ND. FLOOR MAIN BLDG.

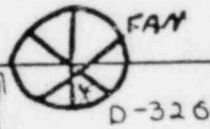


* D-318
FLOOR

D-323

* D-319 FLOOR

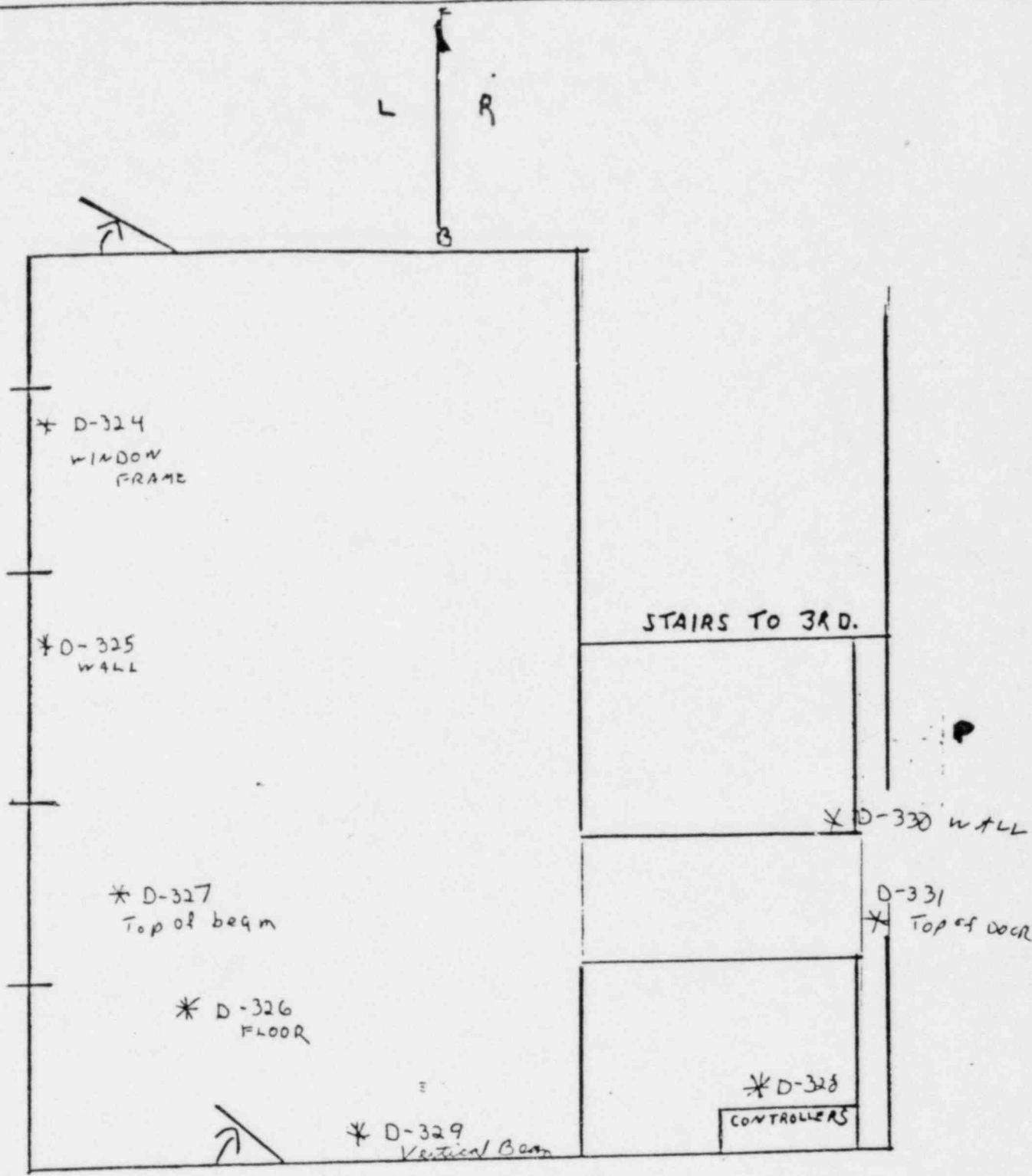
* D-322
BOX



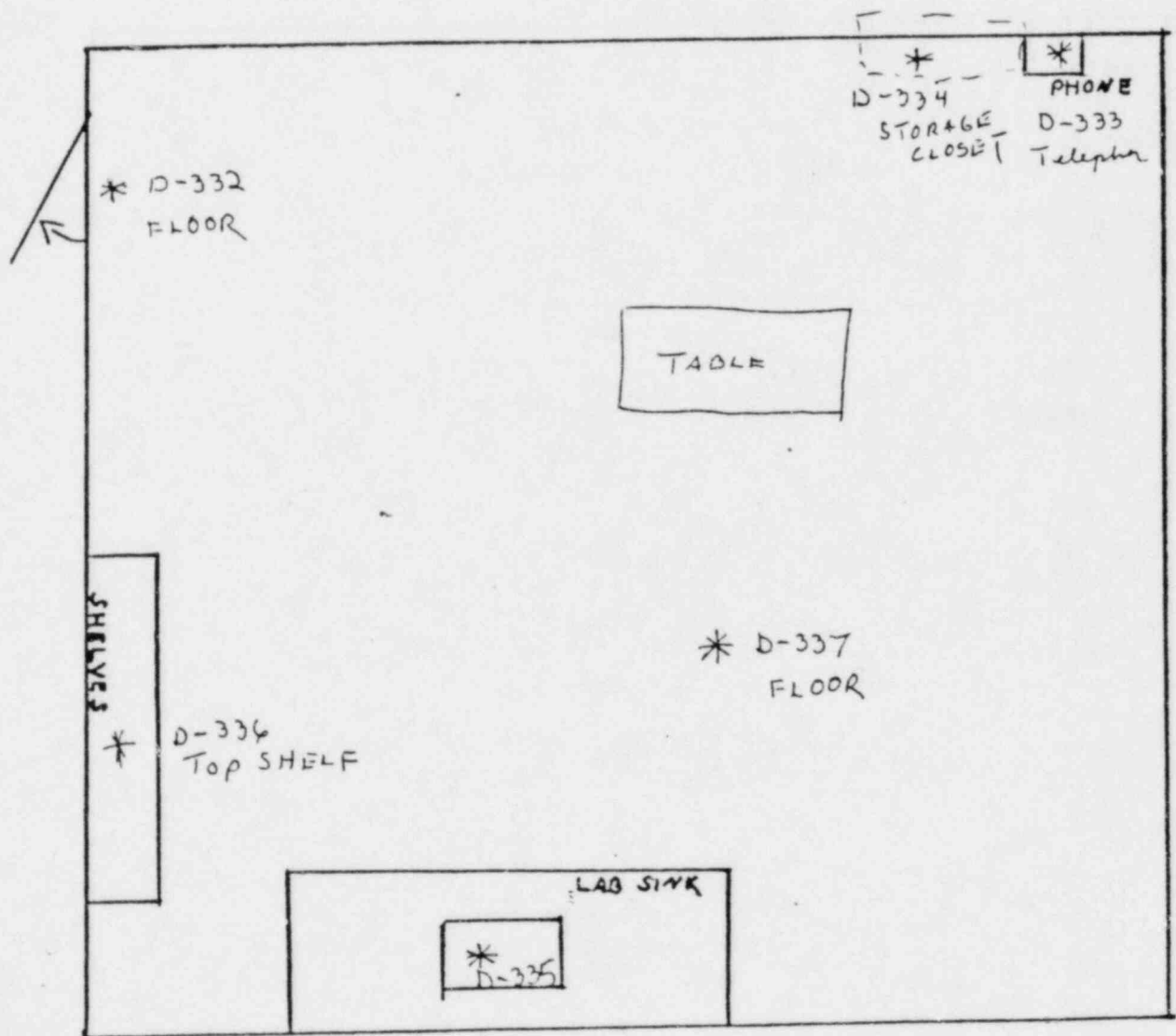
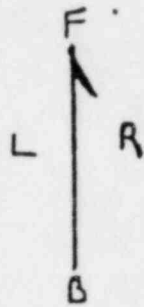
D-321
PIPE INTO FAY

D, Ø-7.5K CPA
AV.

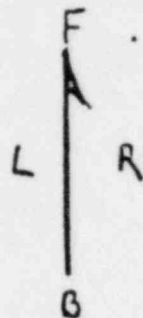
AREA I-F
STORAGE AREA
2ND LEVEL, MAIN BL



AREA I-G
 PRESS ROOM & SULFONATION ROOM
 2ND FLOOR, MAIN BLDG.



AREA I-H
TEST LAB *2
2ND LEVEL, MAIN BL



SHELVES

* D-339

D-340

*
AC

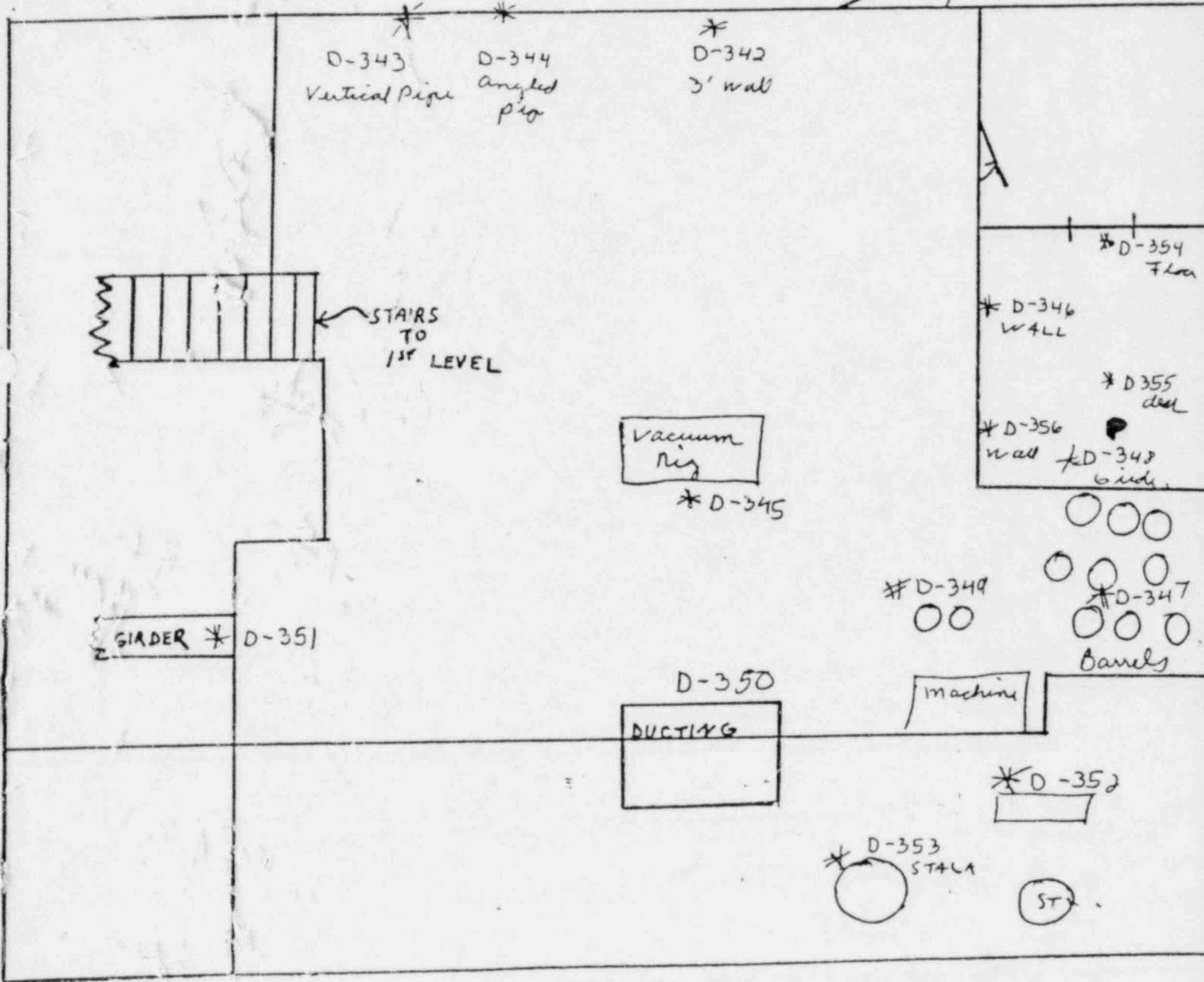
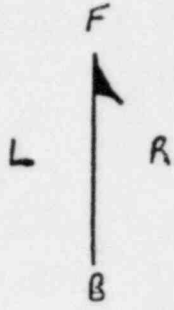
* D-338

* D-341

$\theta, \delta = 5.0 \text{ KcpM}$

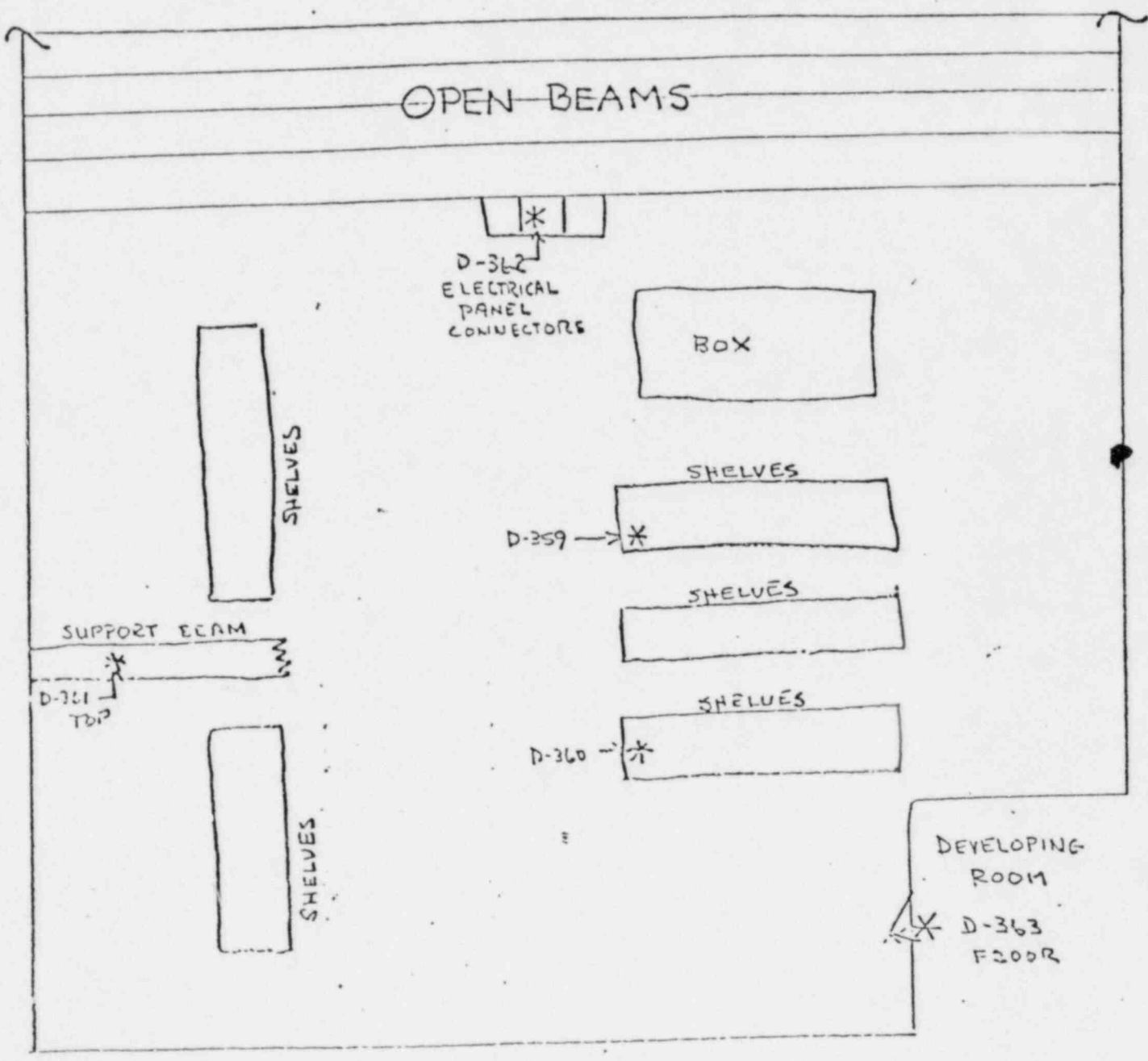
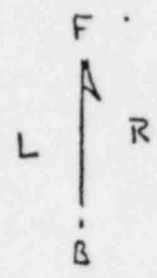
SHELVES

AREA 1-I
CONFERENCE ROOM #1
2ND. FLOOR, MAIN BLDG.



AREA I-J
 7-K BLENDING & STORAGE
 2ND LEVEL, MAIN BLD

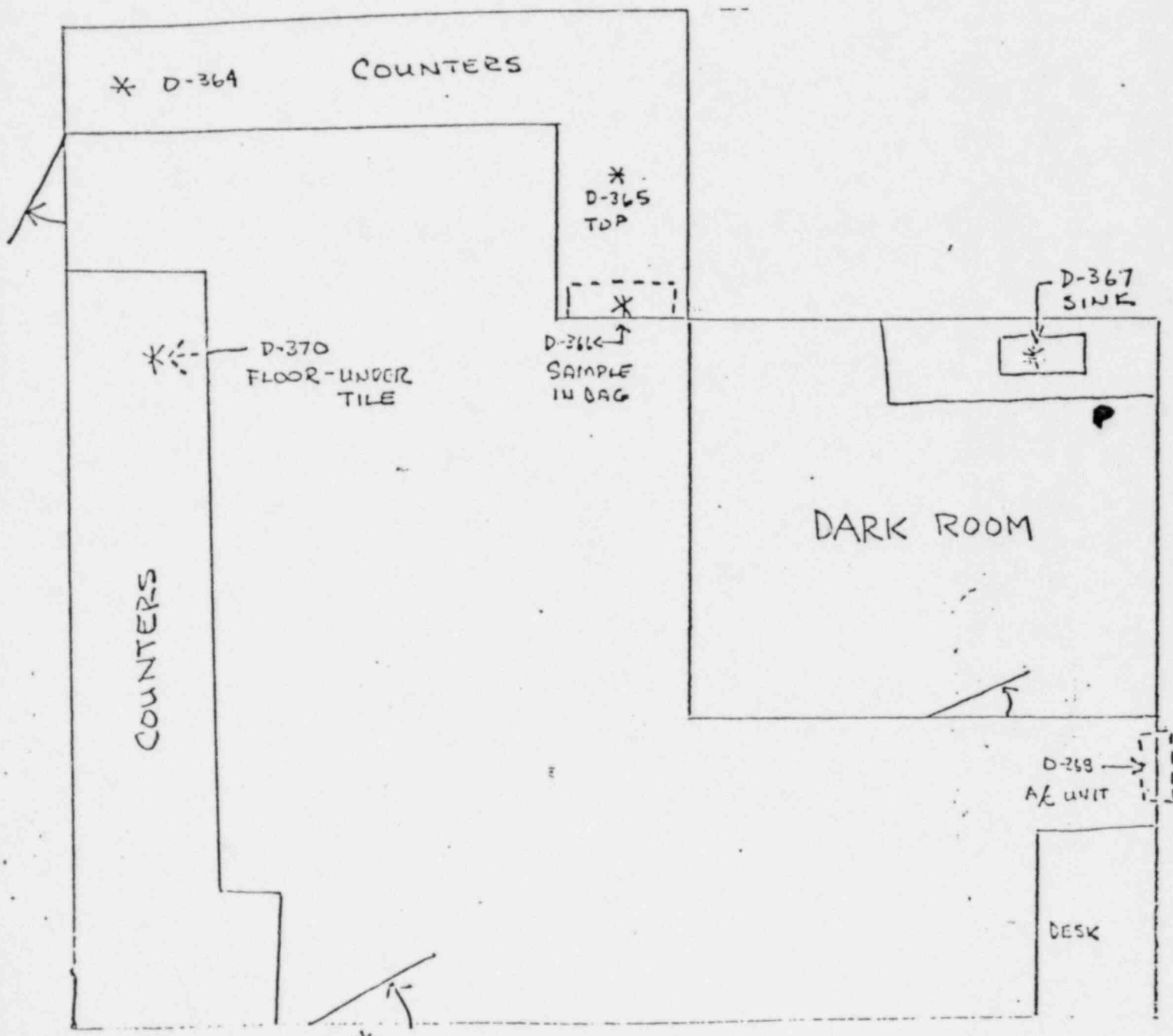
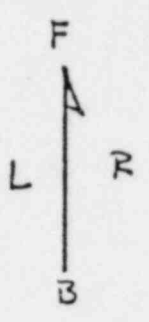
Did not do because of Hay and with stairs!
6-3-74



GENERAL AREA
P. 8 - 12.5 K CM

old AREA # 1-K
DEVELOPING WA

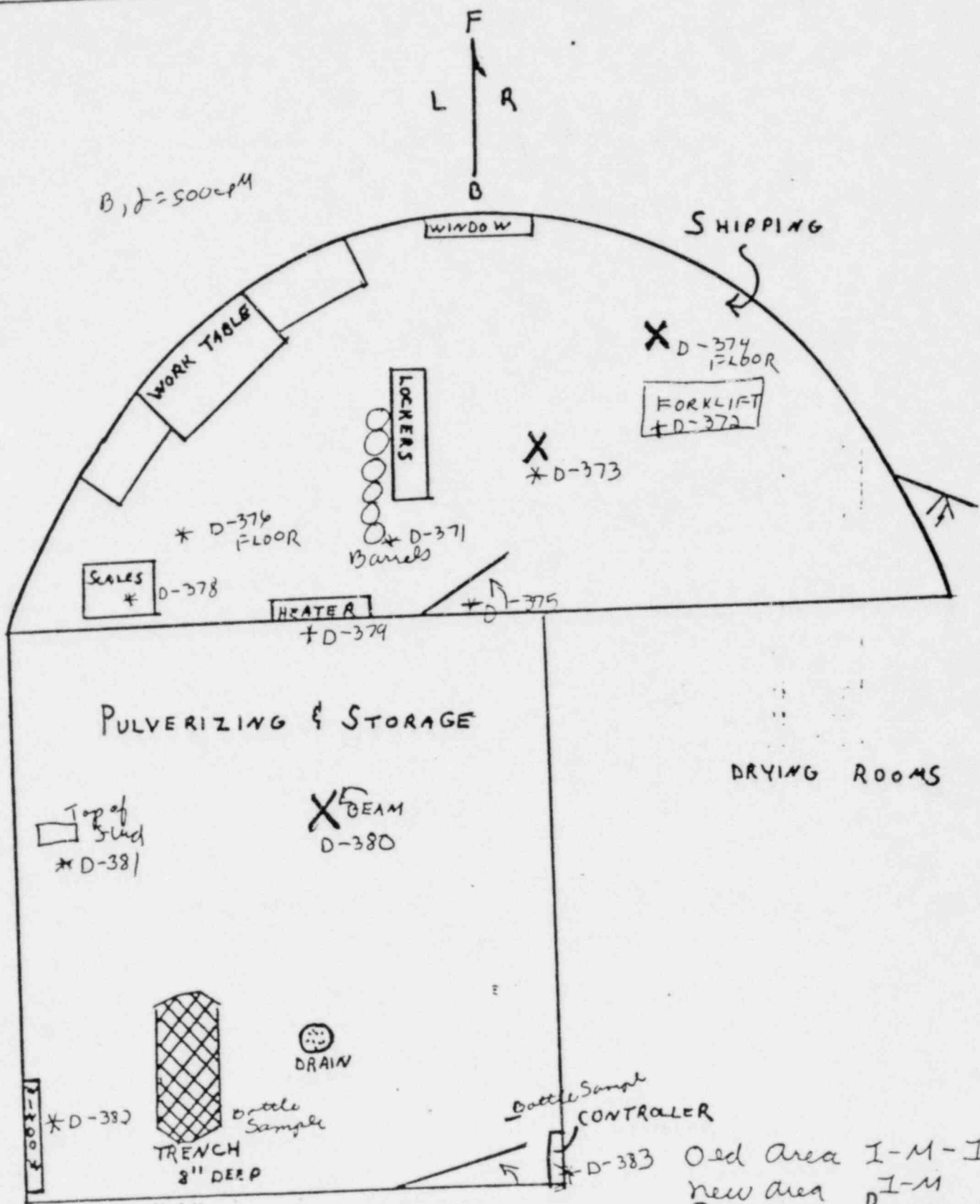
Did not do
because of Hazard
with stairs!
6-3-74



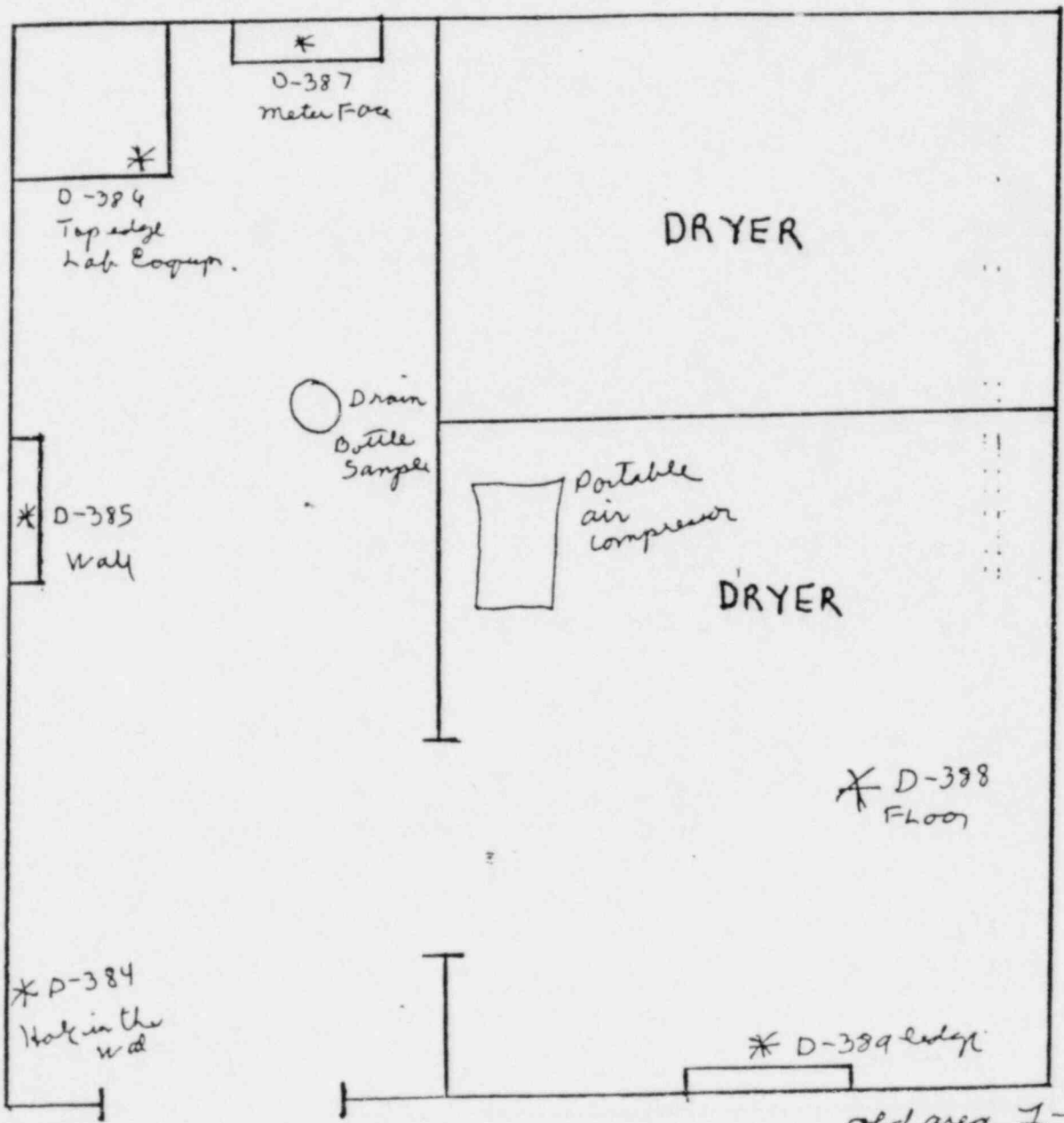
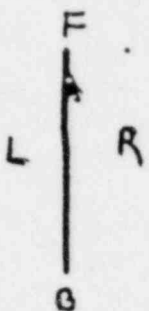
* D-369
TOP OF STAIRS
no landing

old AREA 1-L
DARK & DEVELOPING ROOM
3RD LEVEL

M

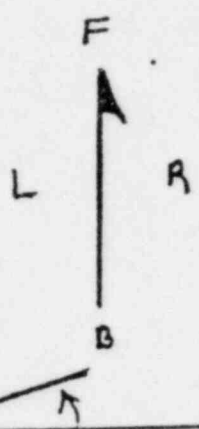


Old Area I-M-1
 new area I-M
 SHIPPING, PULVERIZING
 CERIUM OXIDE STORAGE
 1ST FLOOR, MAIN BLDG.



old area I-N-I
new area I-N
DRYING ROOMS

1ST. FLOOR MAIN BLDG.



* D-393
FLOOR

* D-391
Floor

* D-400
Floor

* D-395
Controls

* D-392

bottle
sample

FAN * D-390
BLOWER

○ Drain
* D-394

□ bottle sample

□ * D-401

○ DRAIN

* D-400
Window
Sill

□ DRAW

* D-396

bottle sample
DRAW TRENCH

bottle sample
DRAW TRENCH * D-399
gains

D-397
* gauges

D-398
* exposed well

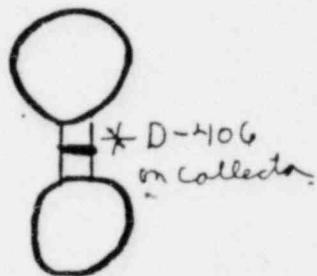
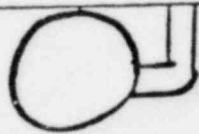
D
B
K.

STAIRS TO
2ND. FLOOR

old area I-0-I
new area I-0
FURNACE & PRESS ROOM
1ST. FLOOR, MAIN BLDG.



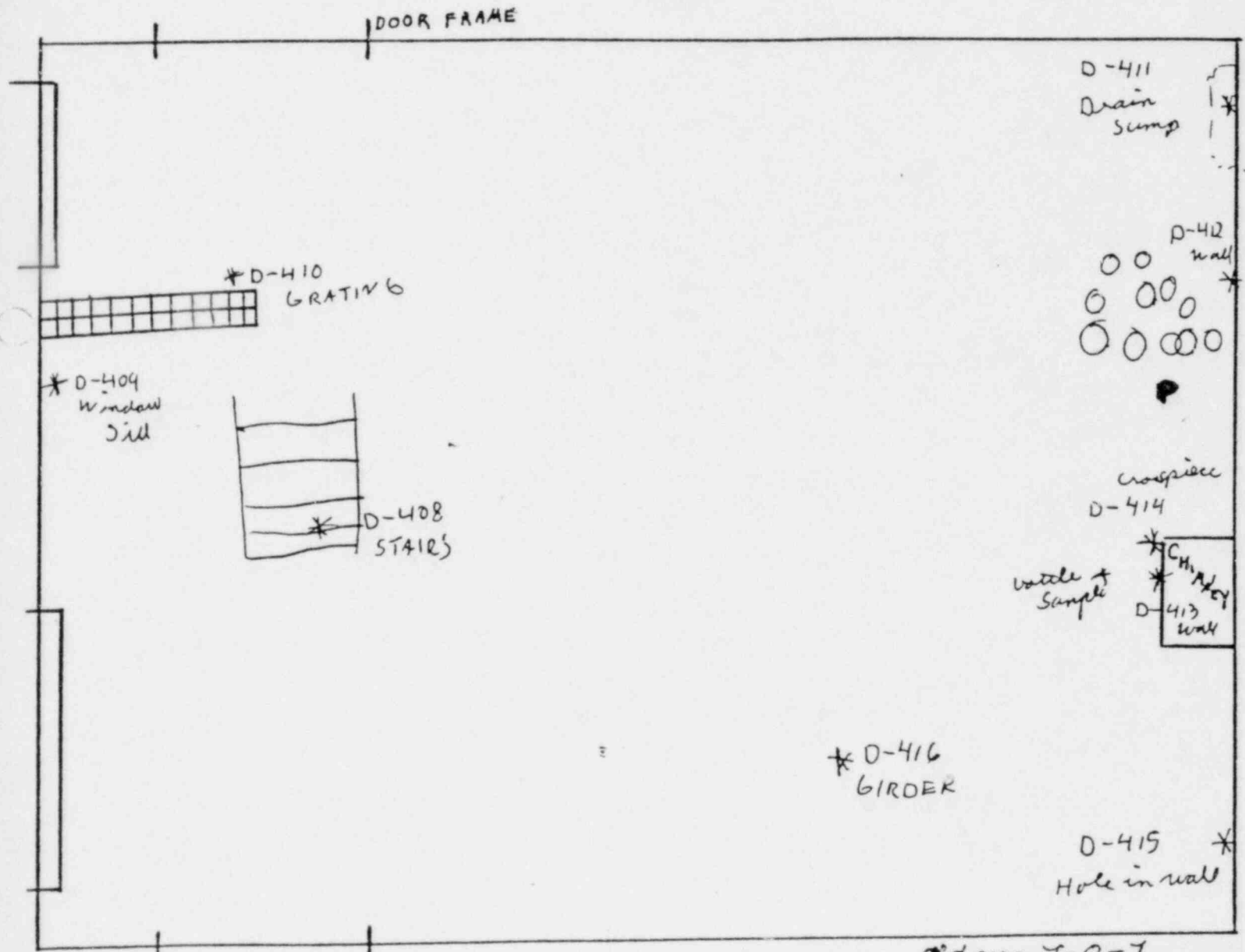
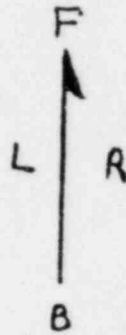
* D-405
on piping



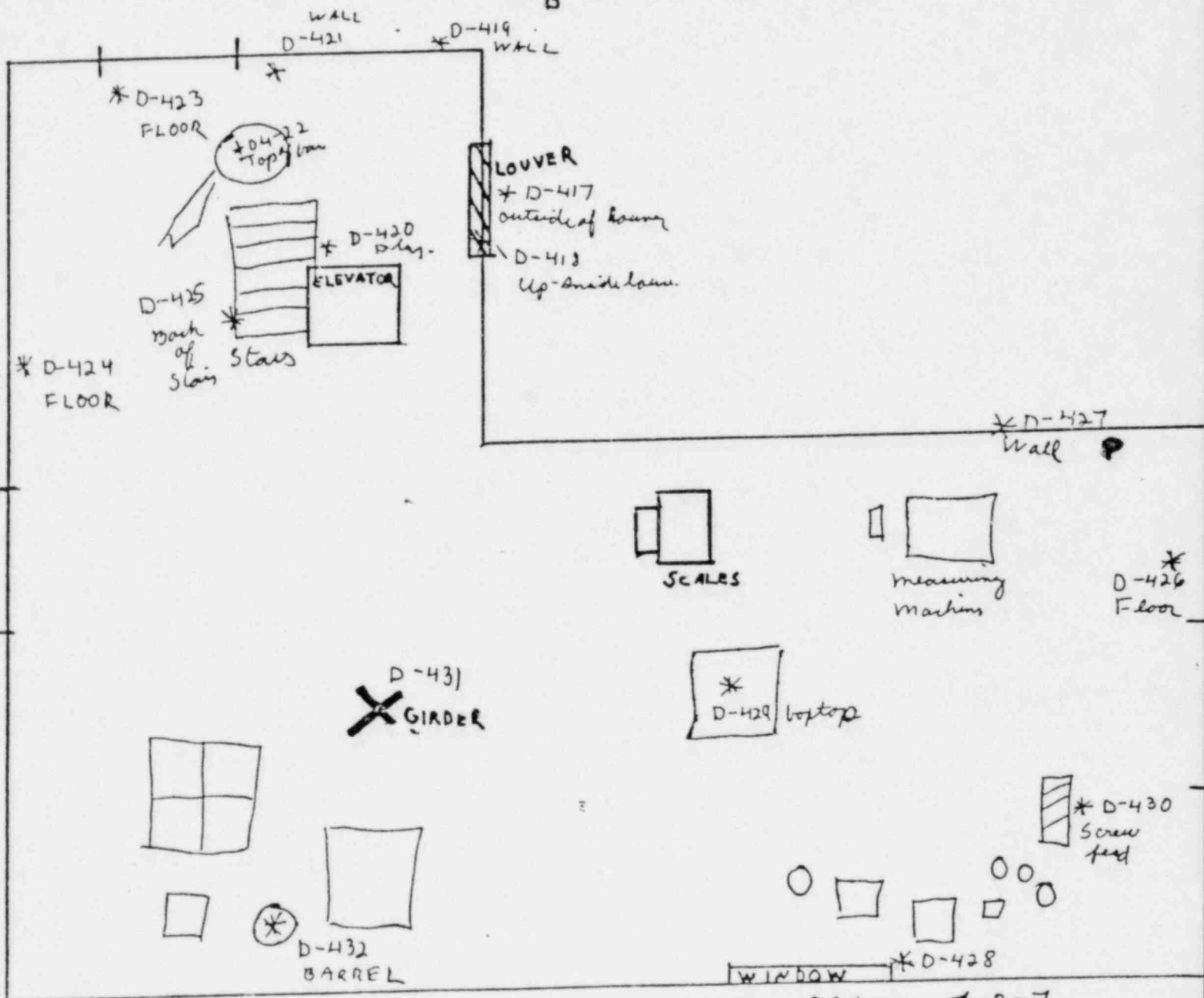
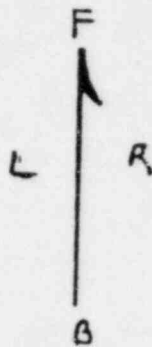
*
D-404
Floor
*
D-403
Wall

* D-407
Door Jamb

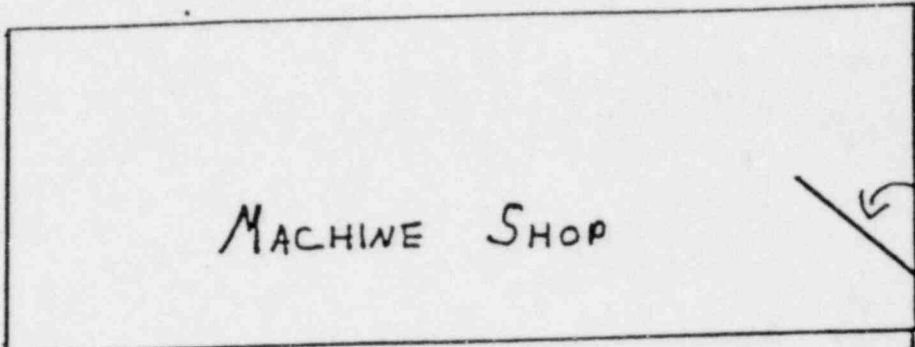
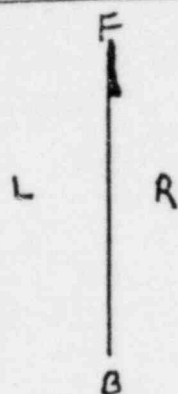
old area I-P-I
new area I-P
SHARPLES COLLECTOR ROOM
1ST FLOOR, MAIN BLDG



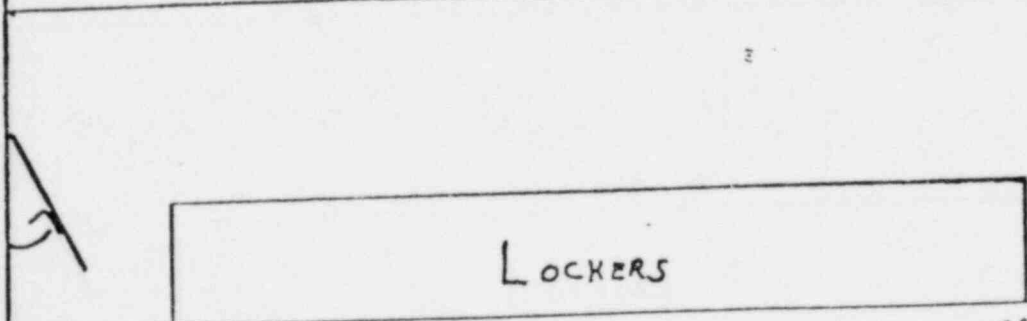
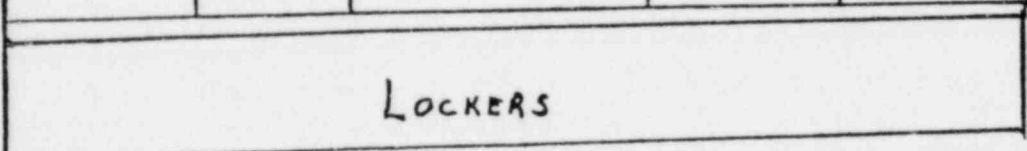
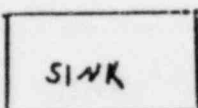
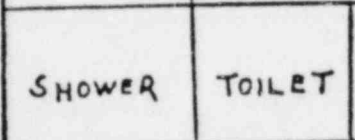
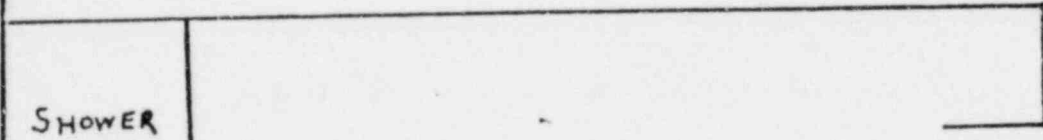
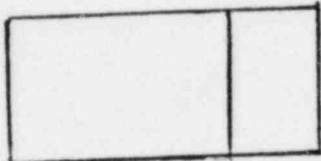
old area I-Q-1
 new area I-Q.
1 & 2 SULFONATION TANK ROOMS
FIRST FLOOR, MAIN BLDG



old area I-R-1
 new area I-R
 7-K BASTACITE ROOM
 1ST LEVEL, MAIN BLDG.



BOILER ROOM



Meter Survey Only

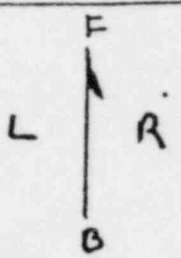


old area I-5-7
new area I-5-7
LOCKER & BOILER ROOMS

MACHINE SHOP
1ST. FLOOR, MAIN BLDG

DOOR

ARMATOR



Tunnel Rock
D-441

D-443

WORK TABLE

SHELVES

PHONE

* D-440
FLOOR

WIRE CAGE

WORK
TABLE

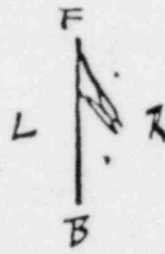
GARAGE DOOR

GARAGE DOOR

* D-439 5'5" wall

#

AREA 2-A
WORKSHOP BUILDING



This area has been demolished

FENCE

D-453 WALL

D452 BARREL TOP

BLENDING AREA

SLIDING DOORS

D-451 FLOOR

DROP CHUTE

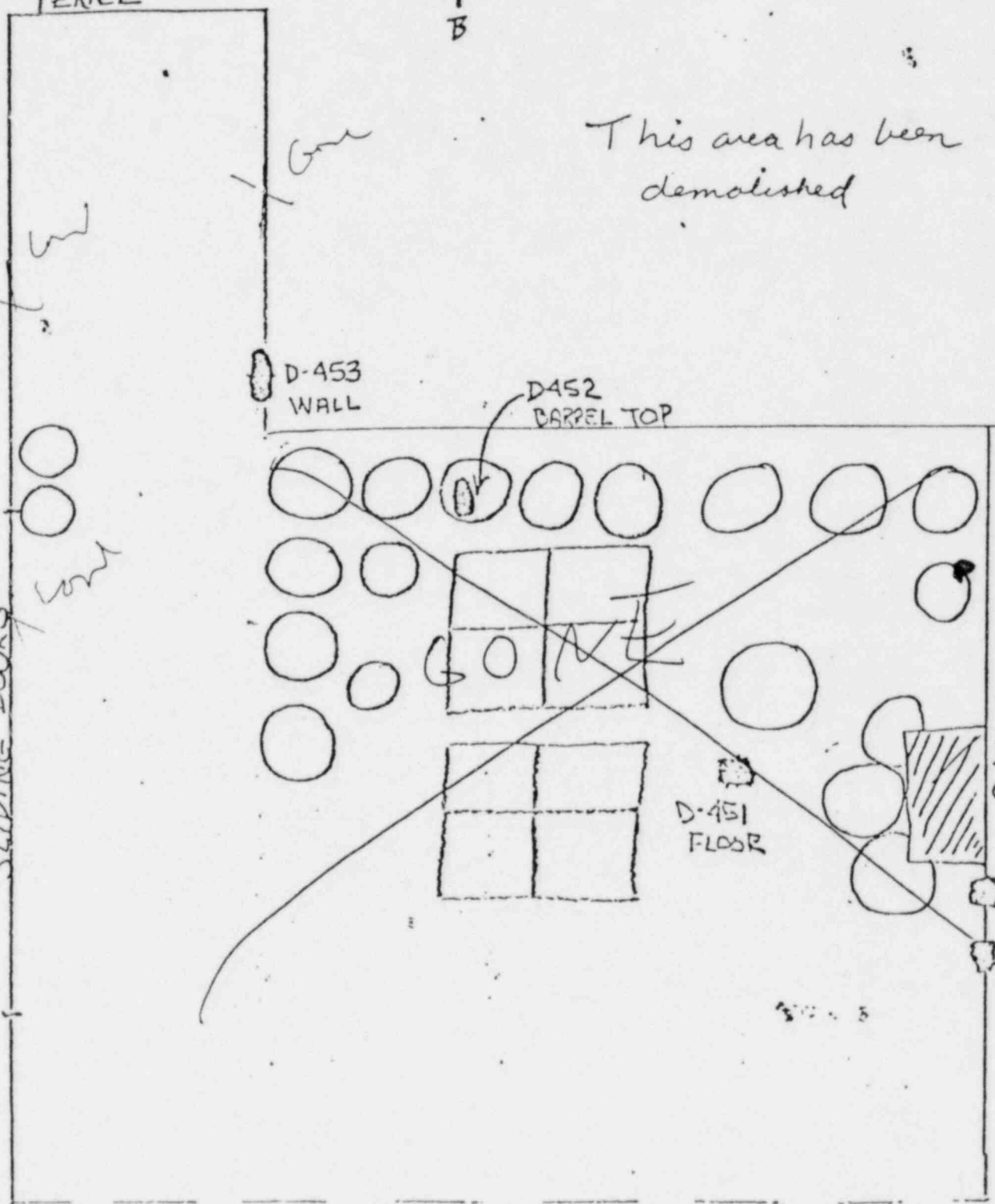
D-45 WALL

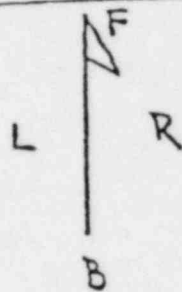
D-45 WALL (BOT)

OPEN END

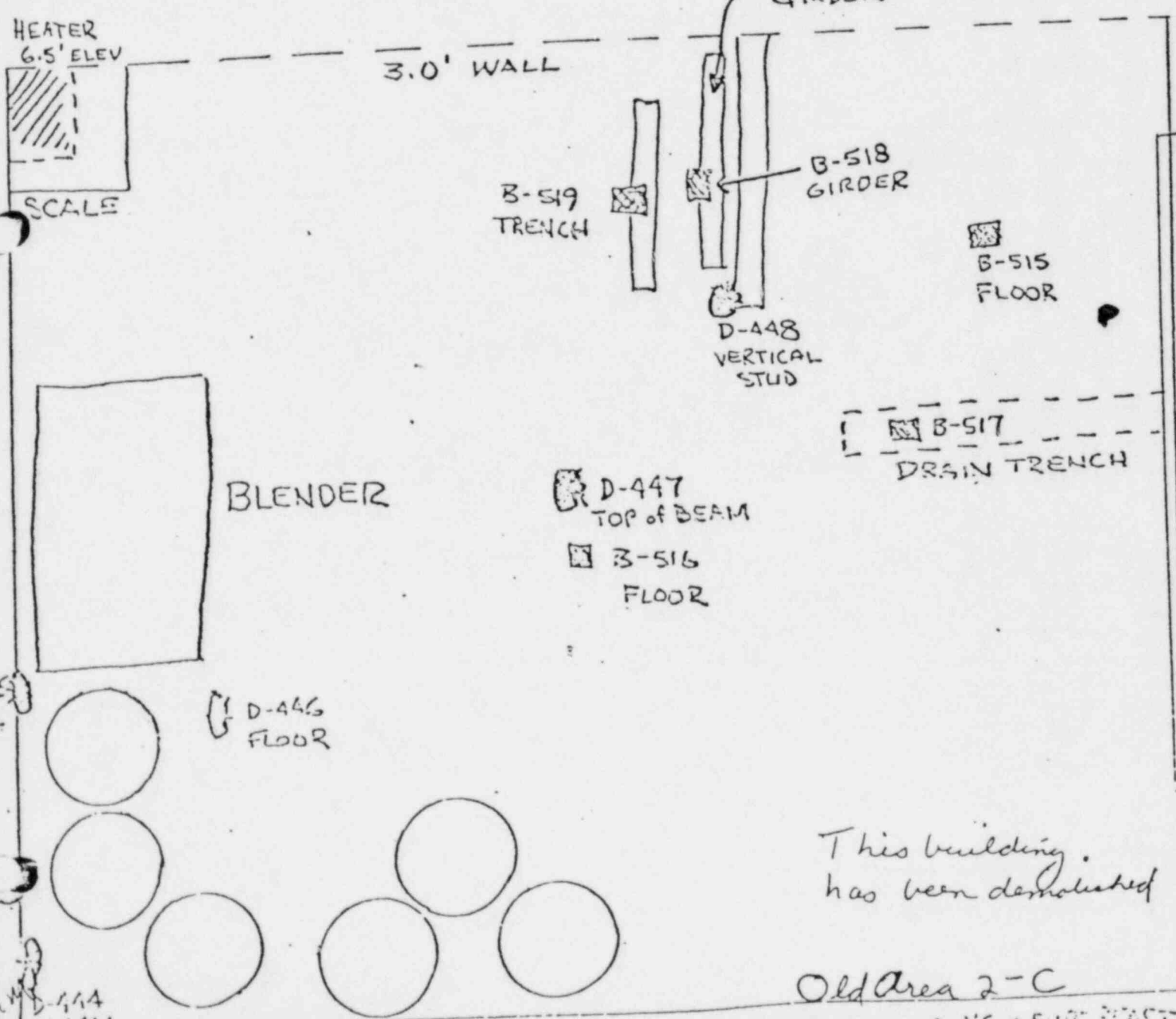
TANK

OPEN STORAGE
OLD AREA = 2B



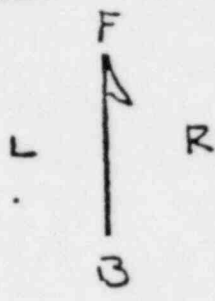


Building demolished,

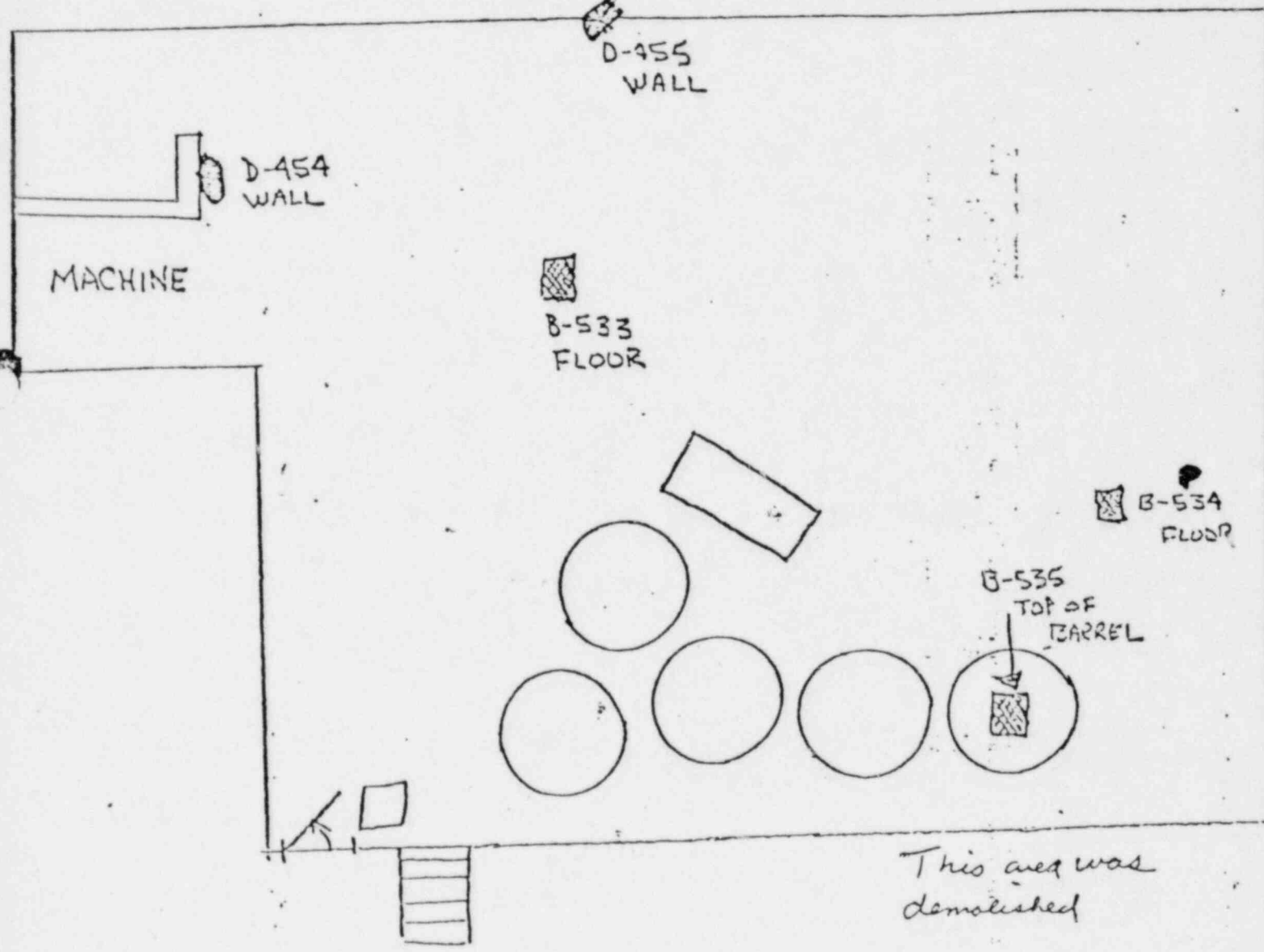


This building has been demolished

*Old Area 2-C
ELEVATIONS + SURVEY DATA*



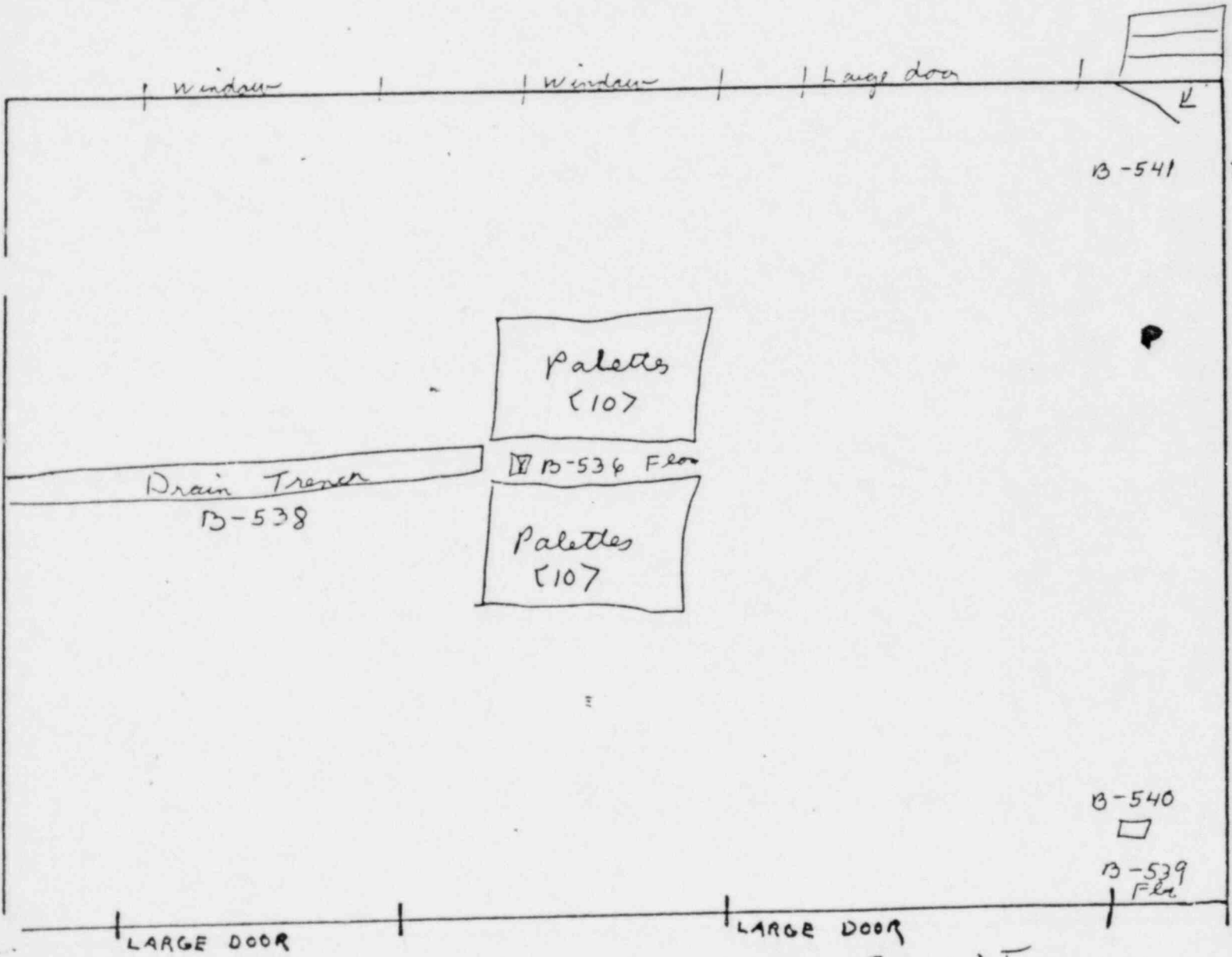
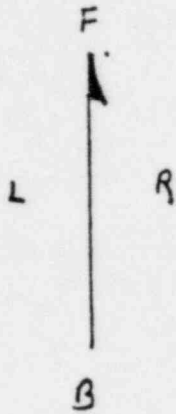
Building Demolition



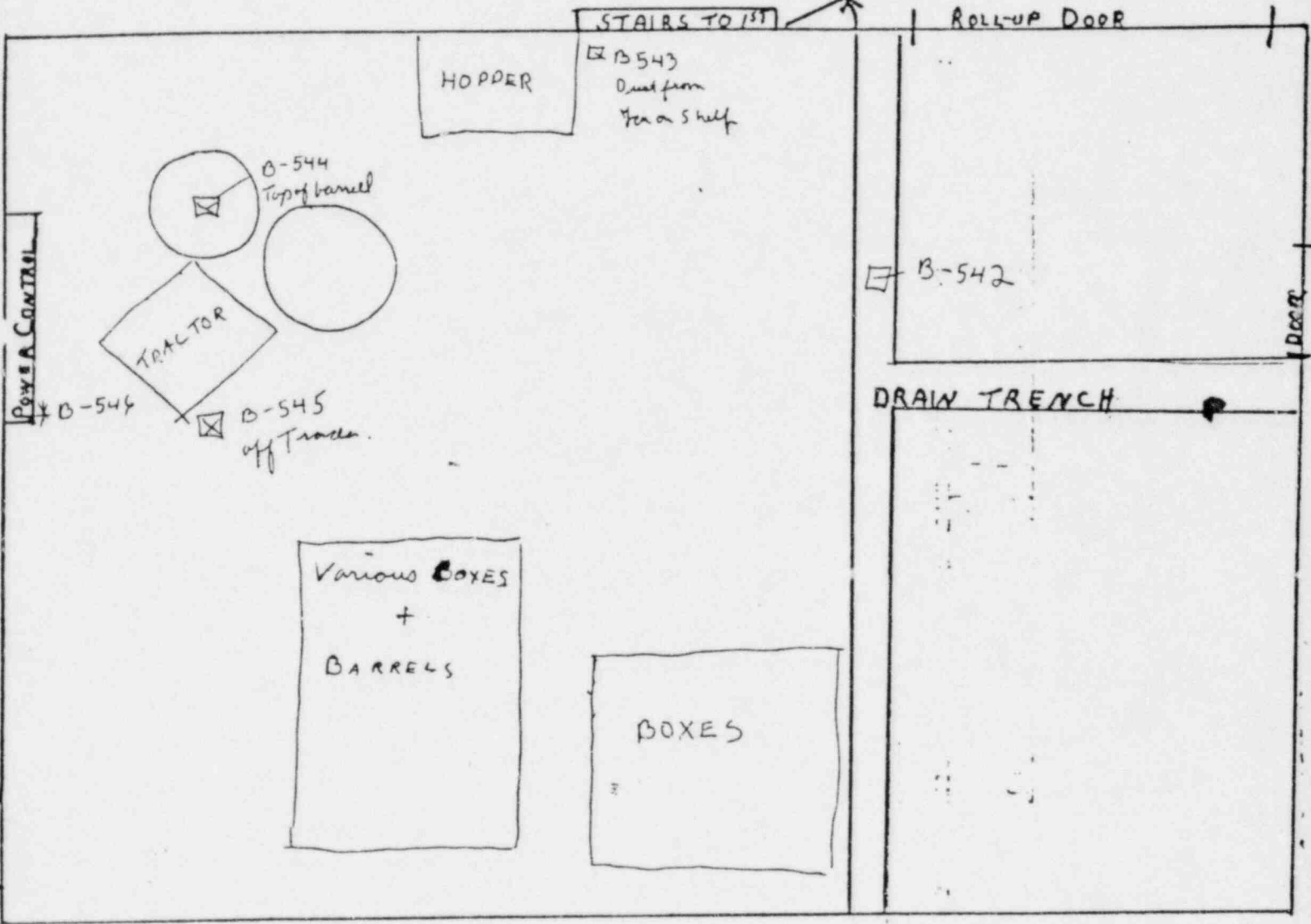
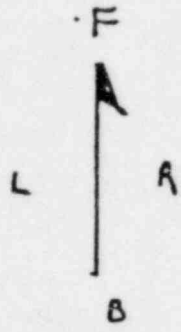
This area was demolished

*Old area #2-D
STORAGE AREA FORMER
OF BUILDING AREA #2*

MM

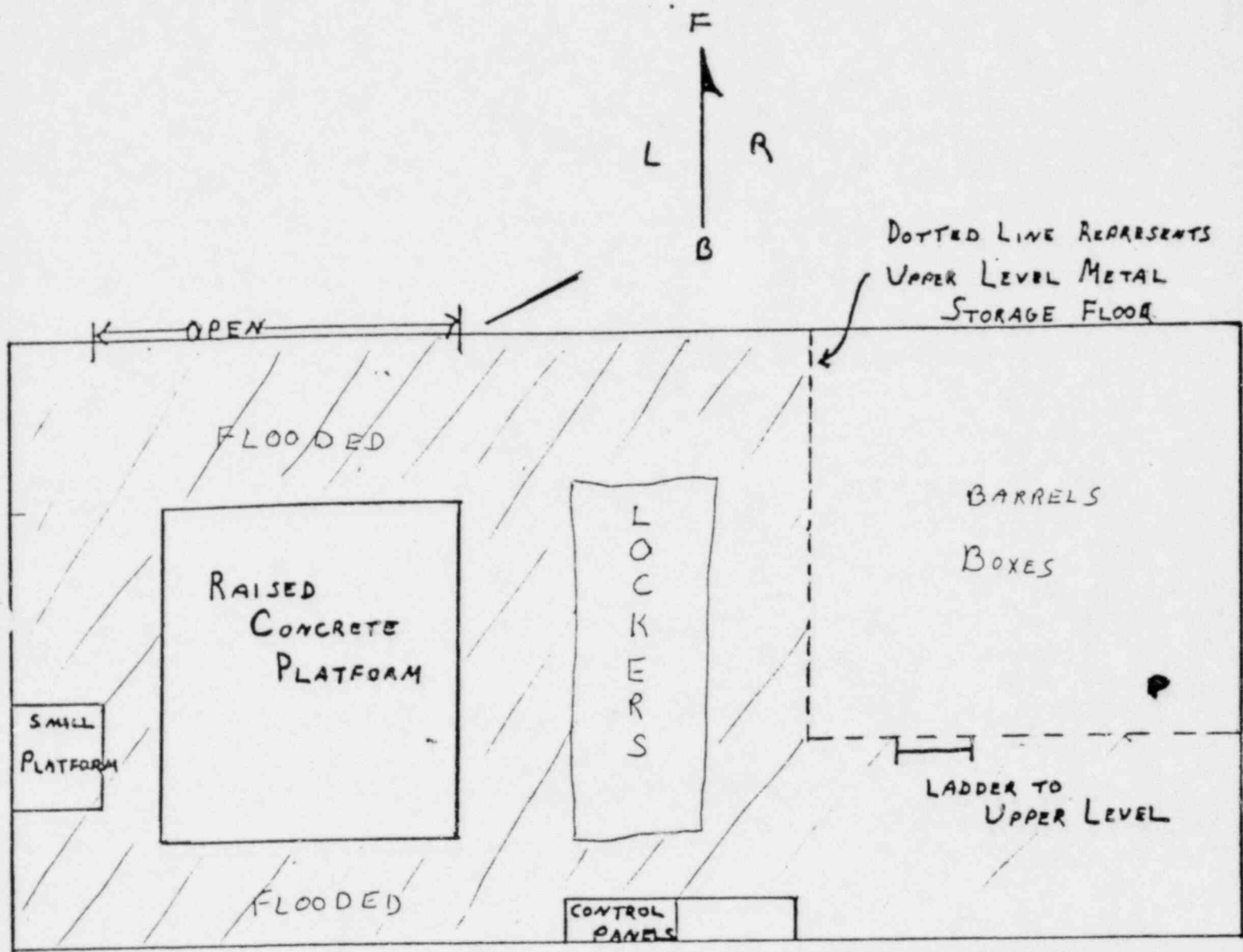


Area-2E
ELECTRONUCLEONICS
STORAGE
LEFT OF BALL MILL

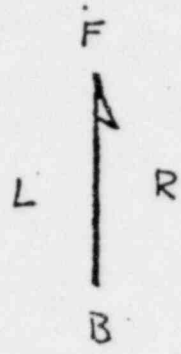


OLD AREA 2F
NEW AREA 2-C

BALL MILL
2ND LEVEL STORA



OLD AREA 2-G
 NEW (LEVEL) 2-D
 AREA
 COMPRESSOR ROOM

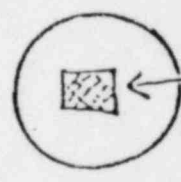
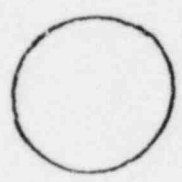


This area has been demolished

Good = no more

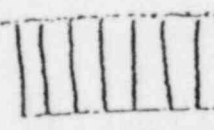
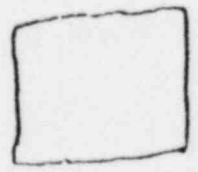
THIS AREA LOCKED AND NAILED SHUT

OPEN AREA TO 1ST LEVEL



B-5A7
TOP OF
BARREL

VENTILATION DUCTING



STAIRS TO 1ST LEVEL

AREA 2H

METER SURVEY:

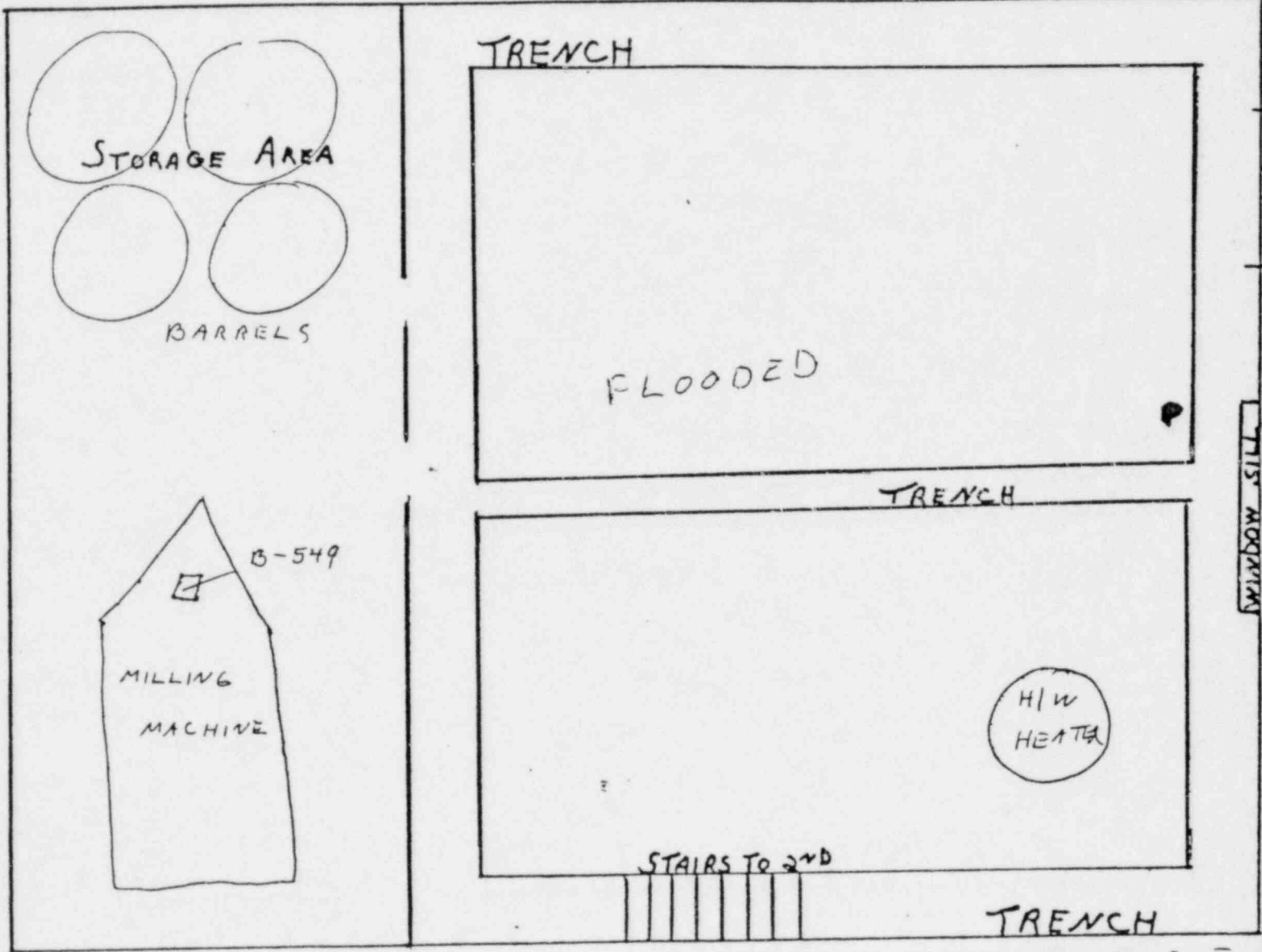
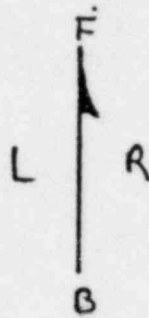
10-15 K OPM P, 8

400 CPM 9

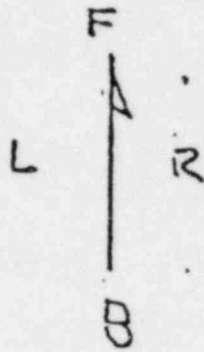
Rad. Mill

and Rad. Detect

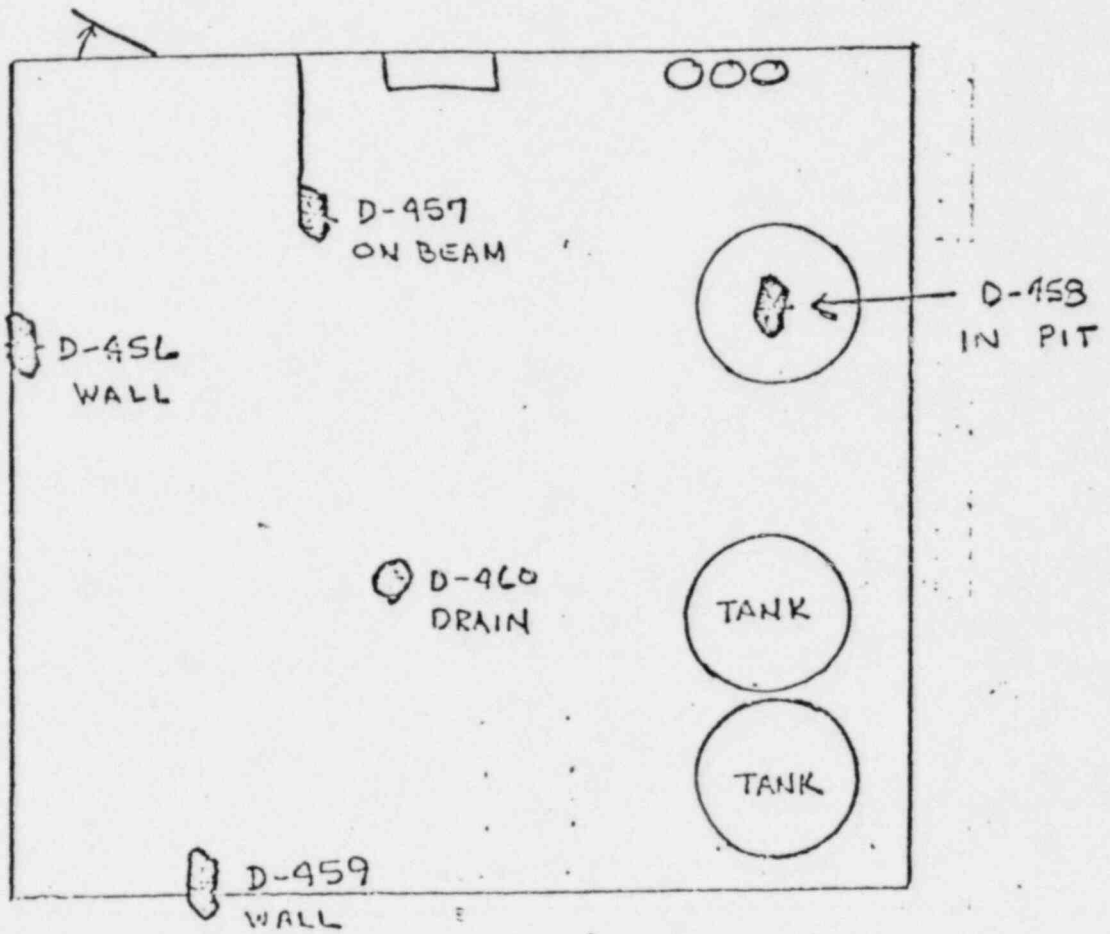
MM



TRENCH
OLD AREA 2-I
NEW AREA 2-C
BALL MILL
LOWER OPERATION



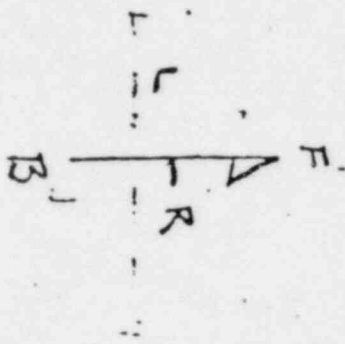
This area has been demolished



AREA-2J

WASTE TREATMENT PLANT
AREA 2-J

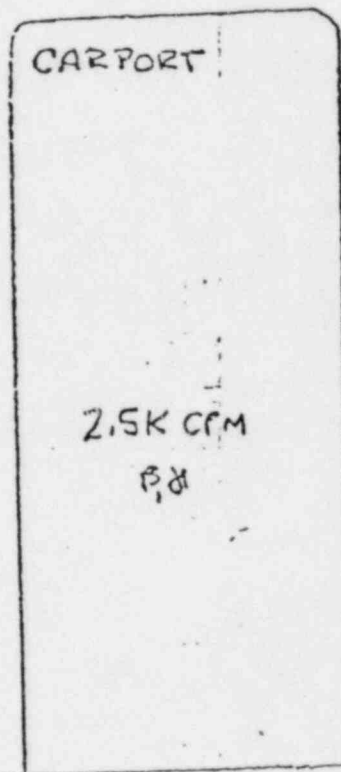
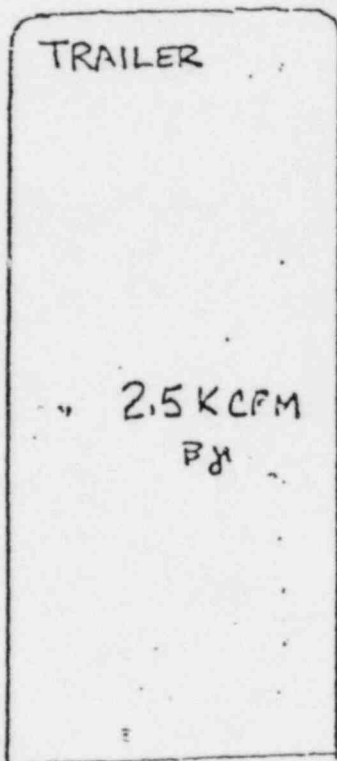
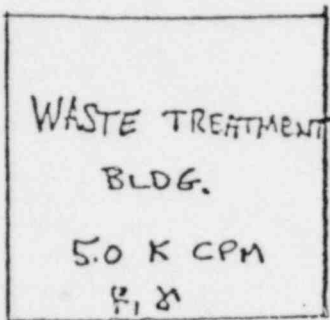
NM
Good



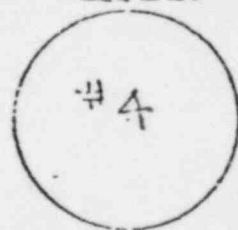
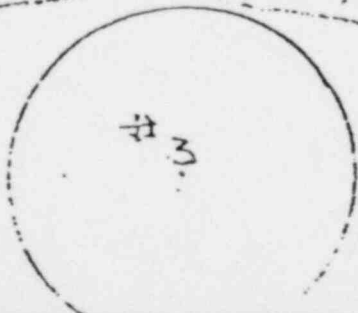
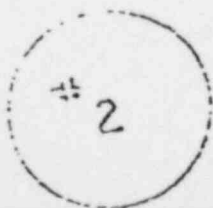
This area was
demolished

PARKING
LOT
2.5K CPM
P, X

not shown



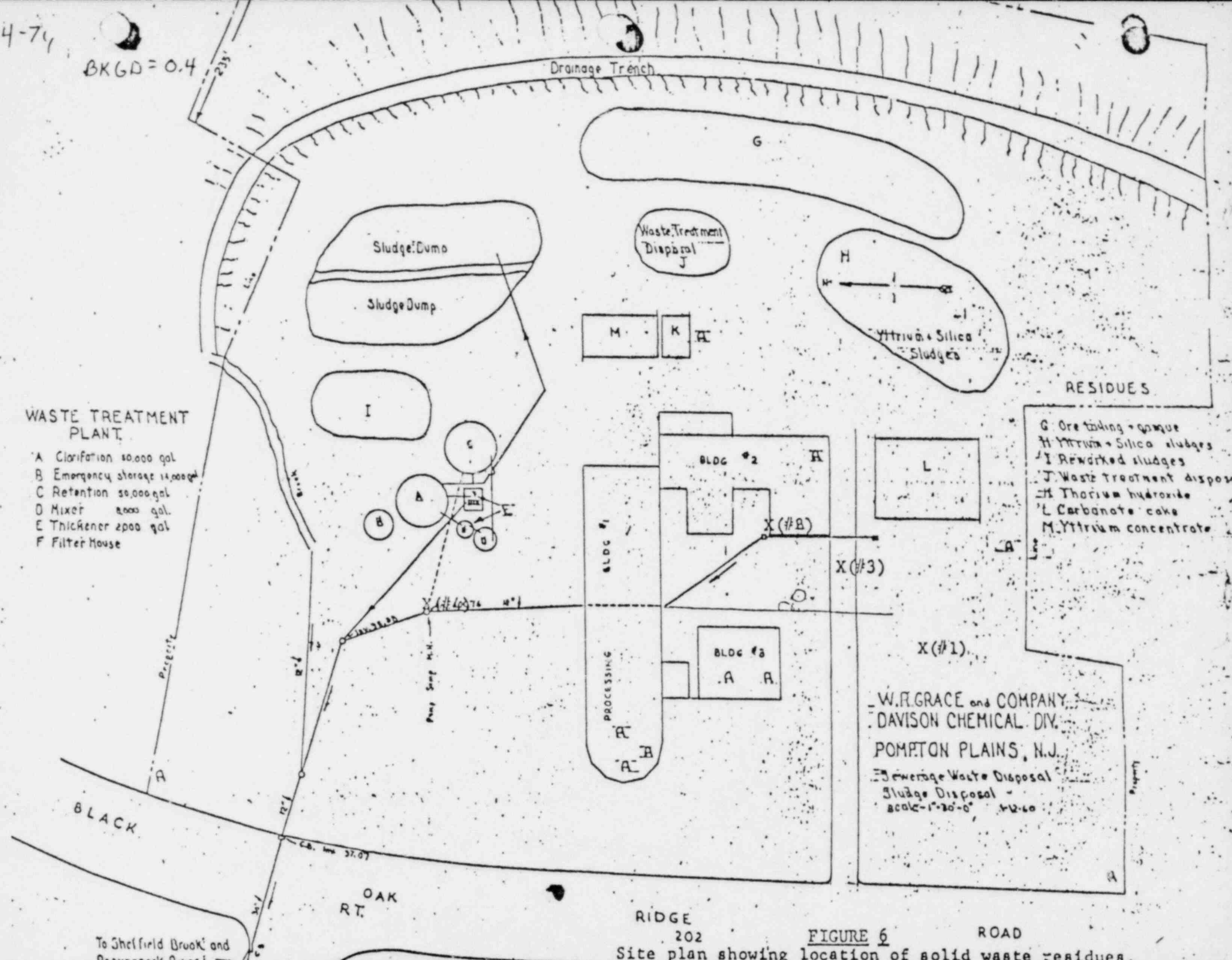
SHADED AREA
10-15 KCP
ALONG
BRUN
TI
P



AREA 2K

6-4-74

BKGD = 0.4



WASTE TREATMENT PLANT

- A Clarification 50,000 gal
- B Emergency storage 14,000 gal
- C Retention 50,000 gal
- D Mixer 2000 gal
- E Thickener 2000 gal
- F Filter House

- G Ore tailing - gangue
- H Yttrium + Silica sludges
- I Rewashed sludges
- J Waste treatment disposal
- K Thorium hydroxide
- L Carbonate cake
- M Yttrium concentrate

W.R. GRACE and COMPANY
 DAVISON CHEMICAL DIV.
 POMPTON PLAINS, N.J.

Average Waste Disposal
 Sludge Disposal
 Scale - 1" = 20'-0" 12-60

FIGURE 6

Site plan showing location of solid waste residues.

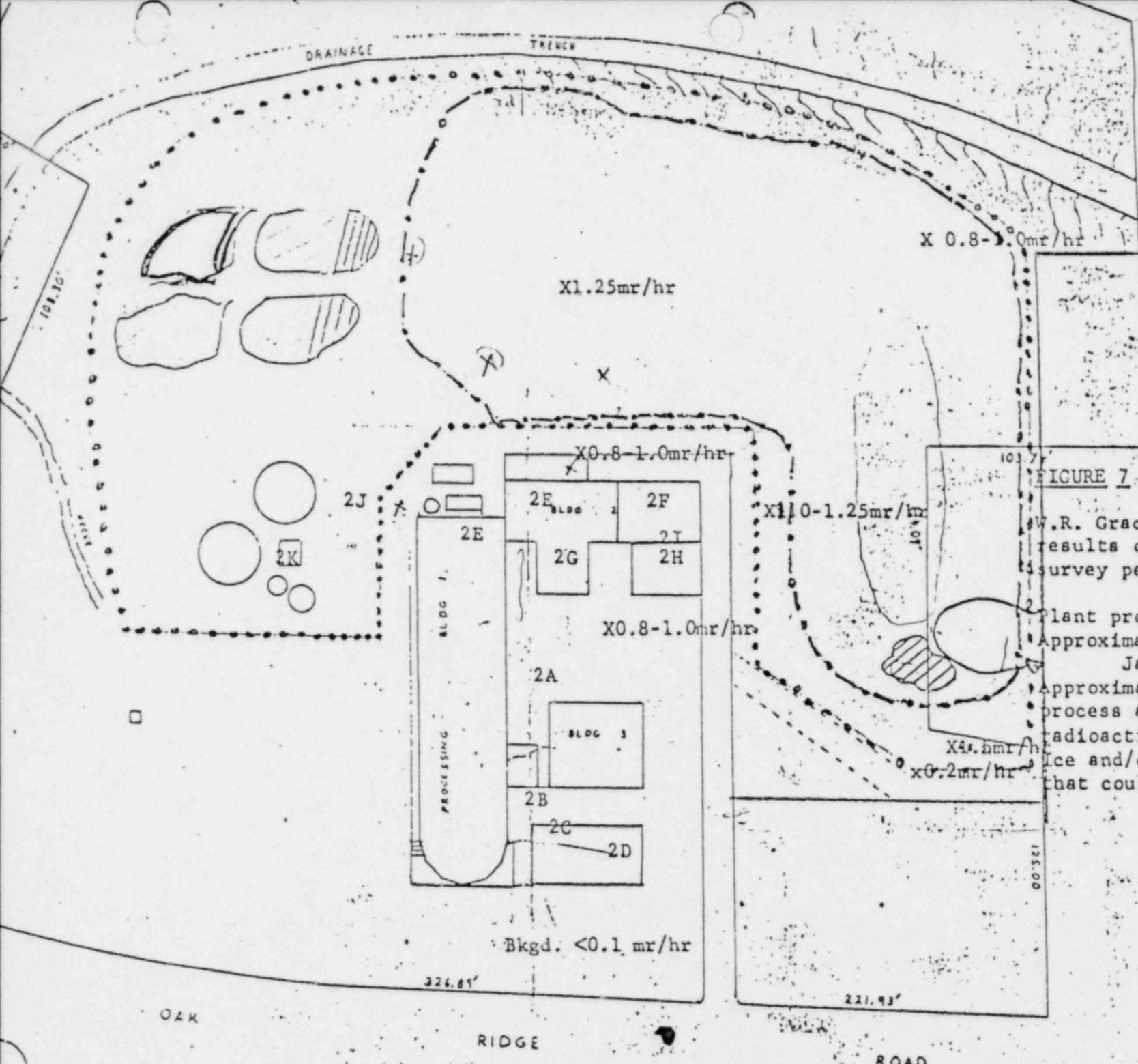


FIGURE 7. SITE PLAN

W.R. Grace plant site showing results of gamma radiation survey performed January 22, 1974.

- Plant property line
- Approximate area bulldozed January, 1974
- Approximate area used to store, process and dispose of radioactive materials
- Ice and/or water covered areas that could not be accurately measured

Key

W R GRACE
DAVISON CHEMICAL DIV.

POMPTON PLAIN
GENERAL PLAN
SCALE = 1" = 30'-0"

PART III

DECONTAMINATION

The various areas at the W. R. Grace Plant are described below in relation to what type of decontamination work was performed on them. The reference to the area, such as 1-A, is in keeping with the nomenclature found later in Part IV of this report. Mr. Stephen M. Sorensen of Applied Health Physics, Inc., supervised work at the site. Respiratory equipment was worn where necessary to insure proper health and safety protection of personnel. Air samples were periodically taken to determine air concentrations of natural thorium.

W. R. Grace's Offices (1-A) - These rooms were vacuumed cleaned of natural thorium with an X-100 absolute filter.

Lab #1 (1-B) - The following were removed from this room: muffle furnace, centrifuge, UF₆ cylinder and a stone. The lab was vacuumed, damp wiped with water, spray detergent and paper towels. The floor was damp mopped with detergent and water.

Sample Preparation Room (1-C) - This room was vacuumed, damp wiped and damp mopped.

Hallway, Restrooms and Office (1-D) - The water cooler in the hallway was removed. The area was then vacuumed, damp wiped and mopped.

Grinding and Polishing Test Lab (1-E) - This lab is still in use and was only vacuumed cleaned.

Storage Level (1-F) - Equipment was removed as part of the decontamination. The first layer of fiberboard flooring on the left side catwalk was removed. The walls, ceiling, and remaining floor were cleaned with a high pressure steam cleaner and detergent.

Press and Sulfonation Rooms (1-G) - The left front floor was removed as indicated on the diagram. Brickwork under the windows was removed. The area was completely steam cleaned and finished with a final high pressure washing.

Test Lab #2 (1-H) - A sink was removed after attempts to clean it failed. The room was damp washed, vacuumed, and wiped.

Conference Room #1 (1-I) - This room was vacuumed, damp wiped and mopped.

7-K Blending and Storage (1-J) - All equipment and furniture were removed from rooms on the right front side. Barrels and equipment were removed from the rest of the area. This area was cleaned with steam and high pressure water before a final wipedown.

Conference Room #2 (1-K) - This room was vacuumed, damp wiped and mopped.

Hallway (1-L) - This area was vacuumed and damp mopped. The stairs to the first level were steam cleaned.

Shipping, Pulverizing, Cerium Oxide Storage (1-M) - These rooms were vacuumed and the shipping room is still in use.

Drying Rooms (1-N) - A catch box from the upstairs labs was removed and buried, along with another box. These rooms were vacuumed cleaned and the hallway was washed.

Furnace and Press Room (1-O) - This room now contains electronucleonics equipment. Other equipment was removed as part of the decontamination. The drain trenches were dug out by hand and flushed with water. A fan blower and piping were removed and sent to South Pittsburg, Tennessee (a W. R. Grace facility). The shaded area on the diagram in Part IV shows where approximately 1/8 to 1/4 inch of concrete was removed with electric chisels. The walls and ceiling were steam cleaned. The floors were cleaned with high pressure water.

Sharples Collection Room (1-P) - Equipment was removed for cleaning, then replaced. The walls and floors were washed with high pressure water.

1&2 Sulfonation Tank Rooms (1-Q) - All equipment, the stairs, and two steel beam crosspieces were removed and buried. Concrete flooring in 7/8 of this area was removed to a level of 34 inches below the building footer. All drains going to the left outside of the area were enlarged with electric chisels. Brickwork on the left wall was removed to a height of 5.5 feet. Brickwork on the backwall was removed to a height of 10 feet. Brickwork on the chimney and backwall was removed up to the second level of the building. The front wall remains intact. The complete area was hydroblitzed after removal of debris. The floor was back-filled with clean soil for safety purposes. Demolition and cleaning in this room lasted approximately 3 weeks due to mashing of the sources of radioactivity.

7-K Bastacite Room (1-R) - All equipment was removed with the exception of the scale and screw feeds. Brickwork on the forward right wall was removed to a height of 3 feet with an electric chisel. Brickwork on the back left wall between the doors was removed to a height of 6 feet. The shaded areas on the diagram in Part IV show where 1/8 inch of concrete was removed with an electric chisel. The screw feed was completely dug out and hydroblitzed.

Locker and Boiler Rooms (1-S) - These rooms were washed with a hydroblitz and the boiler room was vacuum cleaned.

Workshop Building (2-A) - Shelves, a towel rack and cabinet were removed. This building was washed with a hydroblitz. Approximately 1/8 inch of concrete was removed as indicated in Part IV.

Ball-Mill (2-B) - All equipment was removed and anything was buried that was to be discarded by W. R. Grace. The drain trenches were dug and jack-

hammered to a depth of 2 feet. Shaded areas on the figure in Part IV indicate where concrete was chipped. The whole area was vacuumed and washed. Concrete on the wall below the rollup door on the front portion was removed with electric chisels.

Ball Mill (2-C) - All equipment and boxes were removed. The second level was completely taken out. Drain trenches were jackhammered to a depth of 2 feet and widened. All debris in this building was removed. The complete area was hydroblitzed.

Compressor Building (2-D) - Lockers, barrels, boxes, and equipment found in this area were removed. As indicated in Part IV, concrete in the shaded areas was removed a depth of 1/8 to 1/4 inch with electric chisels. The complete area was hydroblitzed.

Attic, Third level of Main Building - All debris, equipment, boxes, barrels, with the exception of metal shelving were removed. All areas were vacuumed clean and damp mopped.

Electronucleonic Storage - This area was jackhammered and hydroblitzed. Material found below the concrete floor was removed.

On-site Waste Disposal

W. R. Grace Company received permission to bury material disposed of in the decontamination onsite. The clearance granted by the State of New Jersey was for the burial to be in eight holes, each containing a maximum of no more than 997 pounds per hole. Figure I of Part III shows where the burial sites are located on the premises of W. R. Grace. All holes are 10 feet in diameter, 20 feet deep and spaced 6 feet apart. As part of burial, the holes are to be covered with 4 feet of topsoil. The tanks and waste treatment building on site were demolished and buried along with all debris and sludge resulting from the decontamination work.

Digging and filling of each hole proceeded as follows:

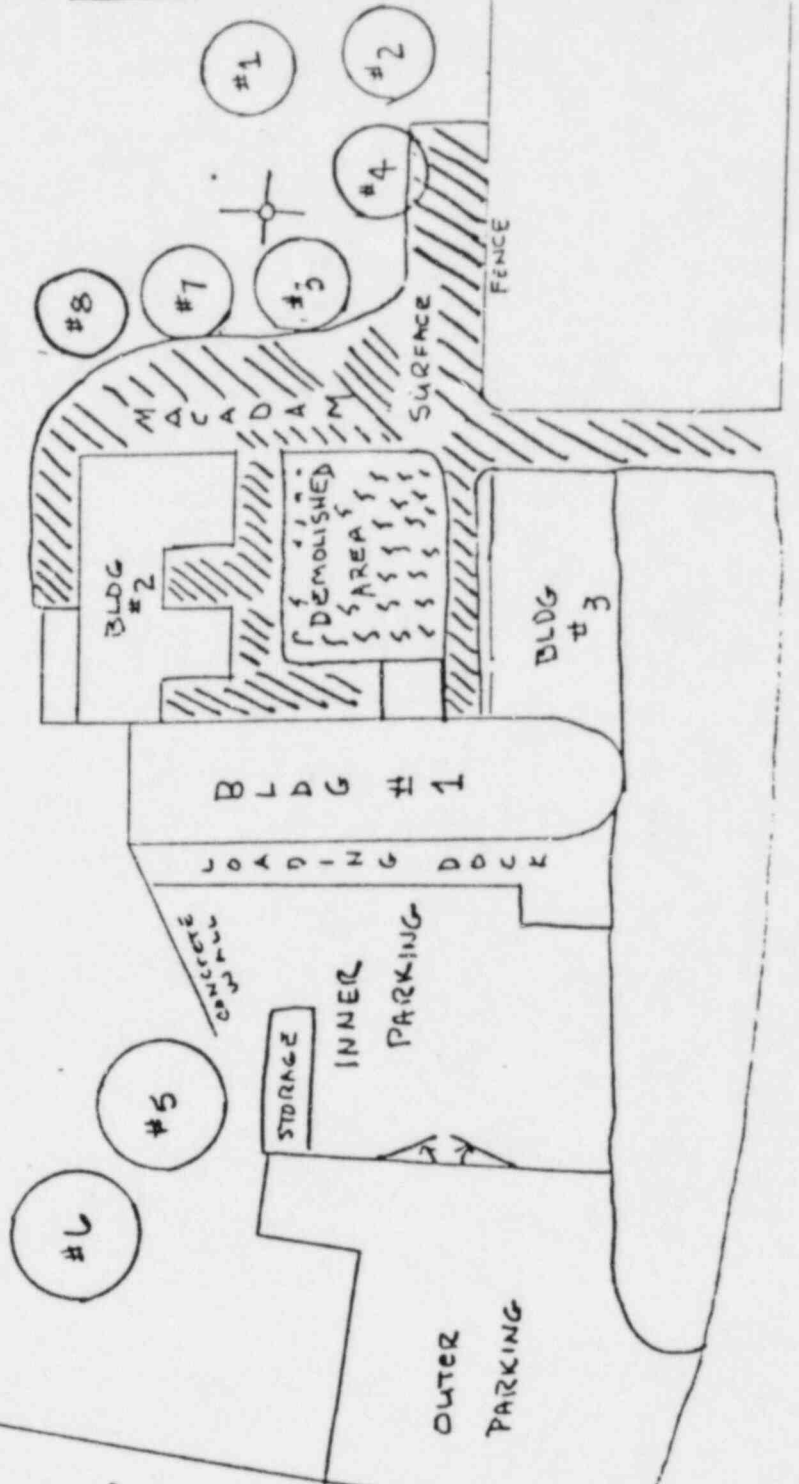
- Hole #1 - dug and filled between April 22-26, 1974 by J. Baum, Inc. with 100 pounds of material.
- Hole #2 - dug and filled between April 22-26, 1974 by V. Ottilio & Sons, Inc. with 75 pounds of material.
- Hole #3 - dug and filled by V. Ottilio & Sons, Inc. between April 22-26, 1974 with 75 pounds of material.
- Hole #4 - dug and filled on May 1, 1974 with 50 pounds of material by J. Baum, Inc.
- Hole #5 - dug and filled by J. Baum, Inc. on May 21, 1974 with 500 pounds of material.
- Hole #6 - dug and filled with 700 pounds of disposal material on May 22, 1974, by J. Baum, Inc.
- Hole #7 - dug and filled June 1 through 10, 1974 by J. Baum, Inc. with 100 pounds of material.
- Hole #8 - dug and filled June 10 through 28, 1974 by J. Baum, Inc. with 100 pounds of material.

DRAINAGE TRENCH

FIGURE I, Part III SITE OF DISPOSAL SITES AT

W. R. GRACE COMPANY

WASTE DISPOSAL NOTES
LISTED IN PART III.



BLACK OAK RIDGE RD.

PART IV

Radiation Survey after Decontamination

On June 3 through 5 and on June 27, 1974 a final radiation survey was performed following decontamination of the W. R. Grace Company plant site at Wayne, New Jersey. The main building, three of the smaller areas, and part of the grounds were ready for inspection by Applied Health Physics, Inc. personnel. Decontamination was still in progress, due to unforeseen developments. This survey was completed on June 27, 1974 when all work was finished. Certain areas found to contain radioactive materials were re-surveyed after further cleaning. These "hot" areas, noted both on Table 1 and certain parts of Figure 1 were cleaned and are now found to be within acceptable limits.

Some of the buildings surveyed prior to decontamination were torn down entirely; this is the result of heavy non-removable thorium-bearing material depositions and ground depositions. The demolished structures are: blending and superfast furnace, open storage, storage off blending area, waste treatment plant, and ball-mill 2nd floor operation. In addition, holding tanks and a trailer were removed. One area which could not be surveyed was the third level of the main building. Part of the stairs and landing were removed which posed a safe access problem. A survey in this area was not critical since the survey prior to decontamination (Part II of this report) showed that radiation and contamination levels were within acceptable limits. The buildings and grounds were monitored with a beta-gamma GM survey meter (Victoreen Model 491; Probe Model 491). All readings were taken at a distance of 1 centimeter from the cleansed surfaces. Background levels were in the range of 0.05 to 0.1 mr/hr inside the buildings and 0.1 to 0.4 mr/hr

outdoors on site.

Smear samples were taken to evaluate removable alpha contamination. These were counted on-site and at the office of Applied Health Physics, Inc., Bethel Park, Pa. with a windowless gas-flow proportional counter (NMC, Model PC-3A). Analysis of these smears appears in Appendix B of Part IV.

The location of the smears and meter readings are located on each individual room diagram, which are collectively known as Figure 1. These results are then summarized in Table I.

Survey Results

On June 3-5, 1974, the beta-gamma radiation levels of the decontaminated surfaces were around the average level of 0.2 mr/hr set for building surfaces and equipment. The places reading 0.8 mr/hr or greater were noted in this report, and the information was relayed to the field supervisor for further decontamination work. The survey conducted on June 27, 1974 showed that the radiation levels in these areas, after cleaning, gave readings of 0.2 mr/hr or less. These corrected readings are in parentheses in Figure 1.

Of the smear samples, the highest found was 107 ± 7.4 dpm/100 cm² in the workshop area. This June 4, 1974 result is approximately a factor of ten below the accepted limits for removable alpha radioactivity as found in Appendix A. All of the smears are far below this limit of 1,000 dpm/100 cm² set for removable alpha activity.

The results of the property survey taken on June 24, 1974 are contained in Figure II. It should be realized that a covering of soil is still needed on some parts of the site in order for this work to be considered finished. A survey is therefore needed when this work is done.

Conclusion

From the results of the decontamination survey, the property is ready for unlimited occupancy, with the exception of some work that is incomplete outdoors. After this work is done, a survey undertaken by Applied Health Physics, Inc., personnel should verify that this property meets all the requirements set forth by the State of New Jersey and the United States Atomic Energy Commission for release of decontaminated facilities.

ADDENDUM

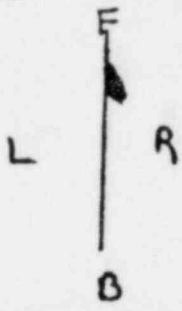
On July 18, 1974, the grounds were surveyed after all soil was put in place over the burial sites and smoothed. Figure III shows the results of this survey. The W. R. Grace Co. property now is within the radioactivity contamination limits set forth by the United States Atomic Energy Commission and the State of New Jersey.

FIGURE 1

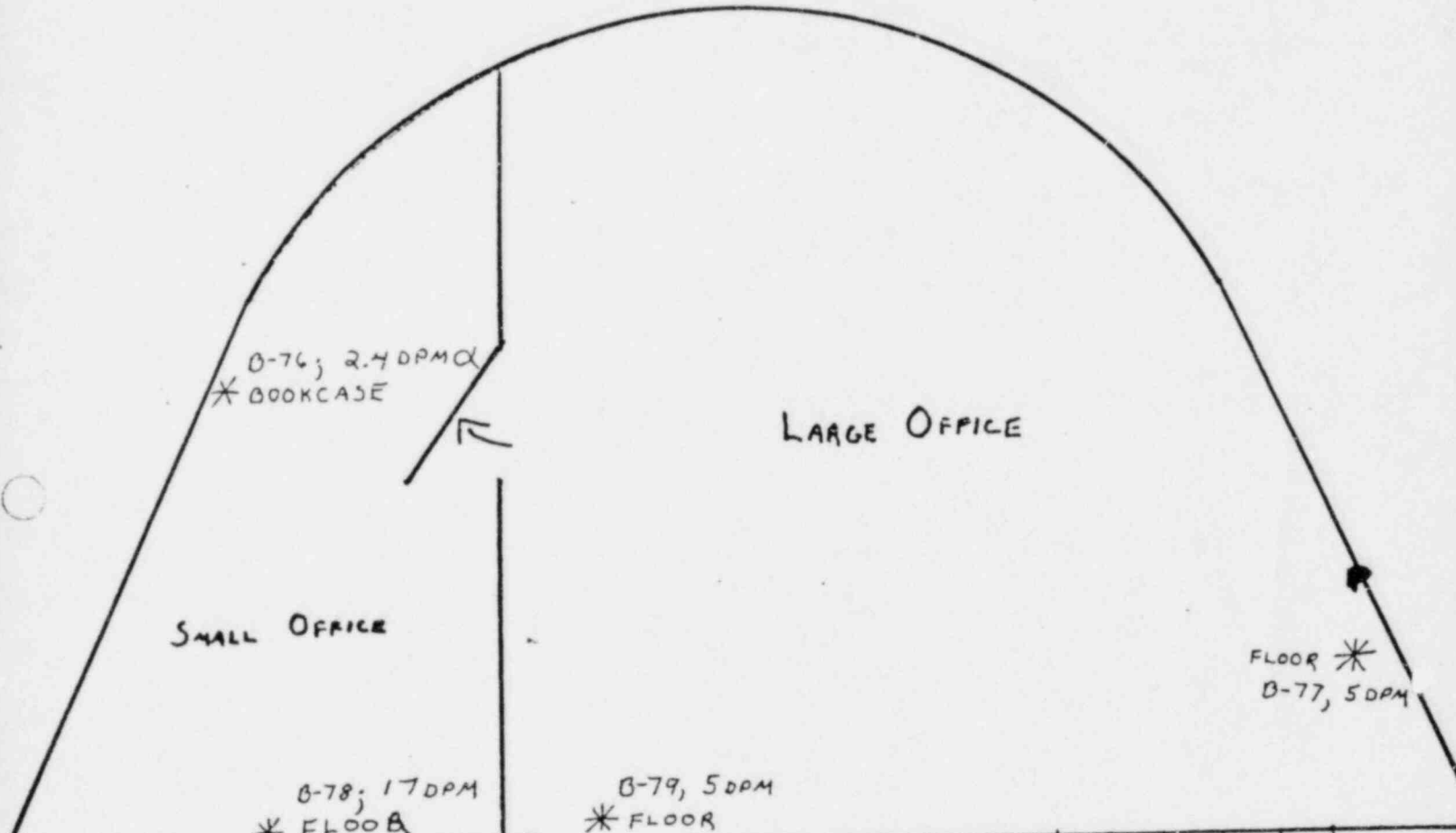
Key to Following Diagrams:

* = Location of smear sample e.g.;
B-78 is the sample number
17 DPM is the removable alpha
DPM/100 CM².

Meter reading of the room is in the
upper right corner, except for "hot"
spots as indicated.



BETA-GAMMA = 0.1 mR/hr



B-76; 2.4DPM
* BOOKCASE

LARGE OFFICE

SMALL OFFICE

* FLOOR
B-77, 5DPM

* FLOOR
B-78; 17DPM

* FLOOR
B-79, 5DPM

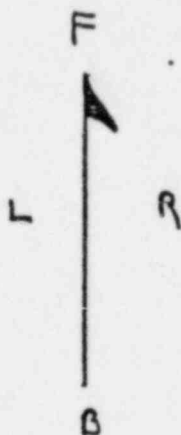
STAIRS TO 1ST FLOOR

* WALL
B-80, 0DPM

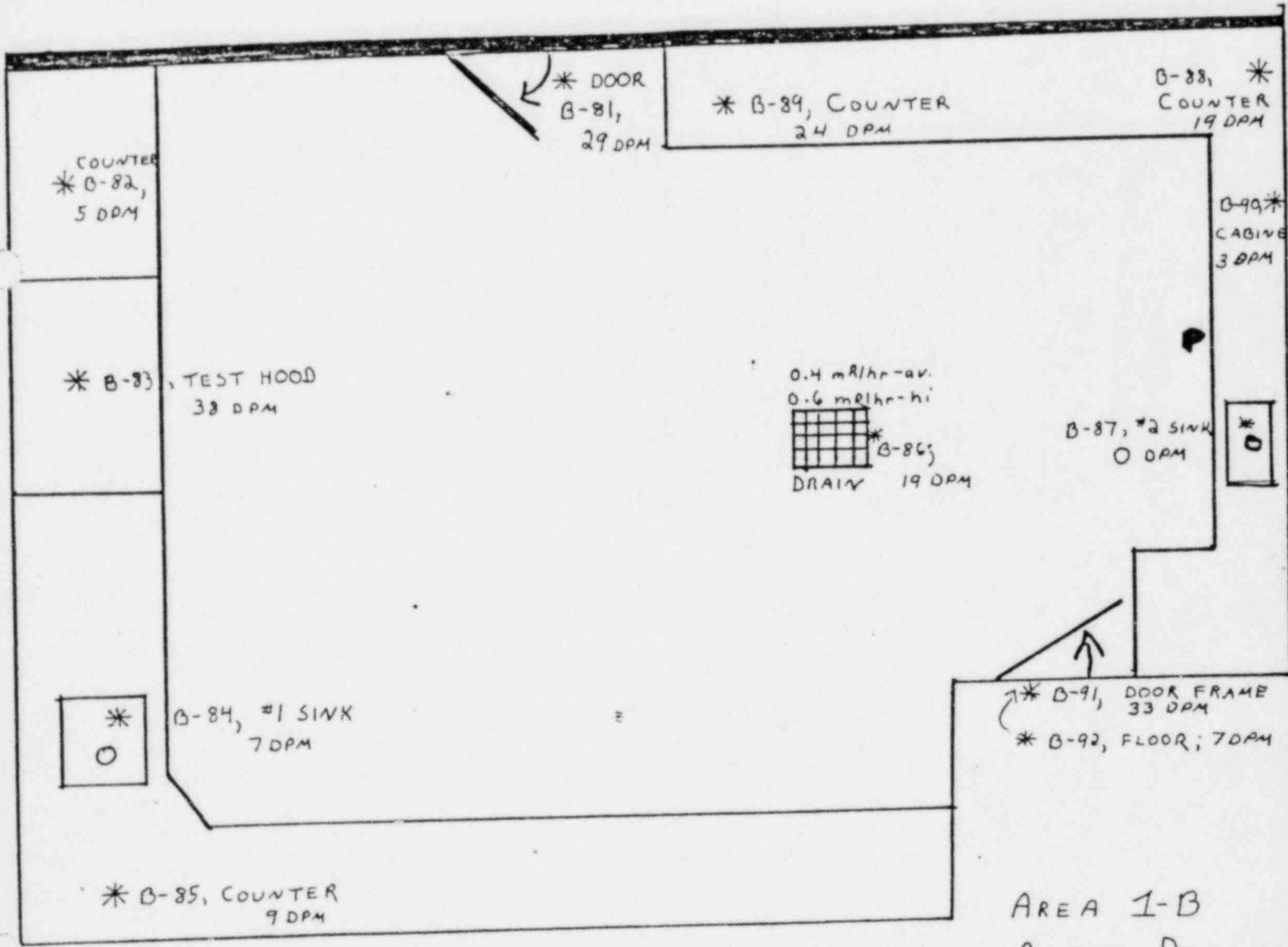
LAB #1

AREA 1-A
AFTER DECON.

OFFICES
2ND. FLOOR, MAIN B

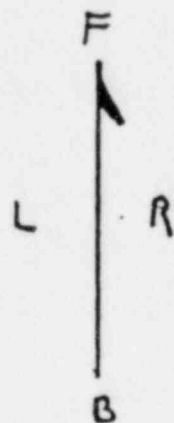


BETA-GAMMA = 0.1 mR/hr av
0.2 mR/hr hi

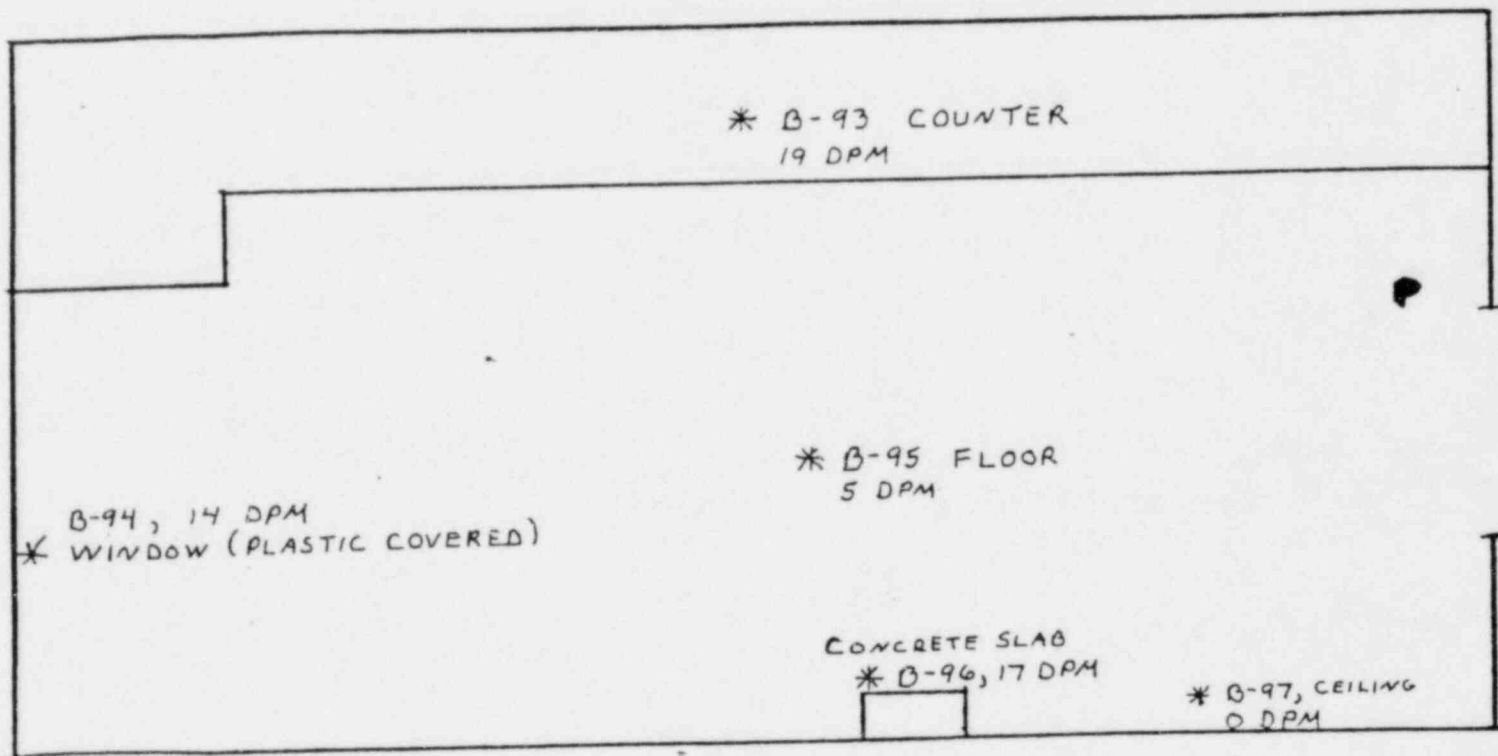


AREA 1-B
AFTER DECON
LAB No. 1

2ND. FLOOR, MAIN BLD



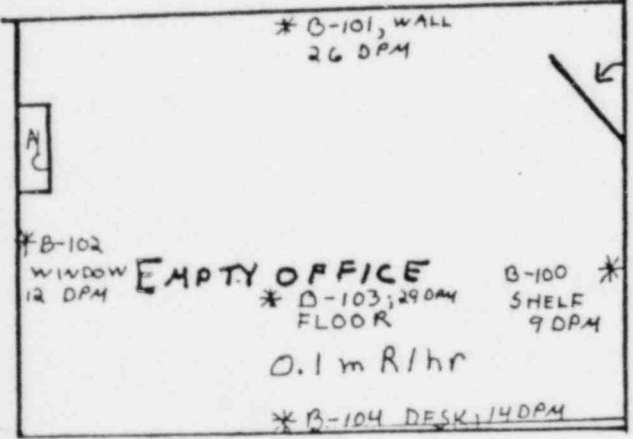
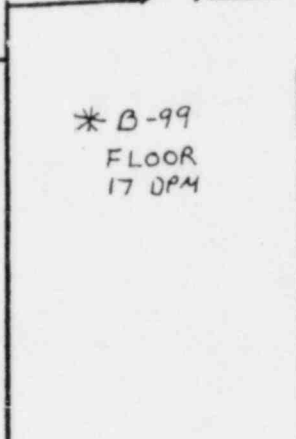
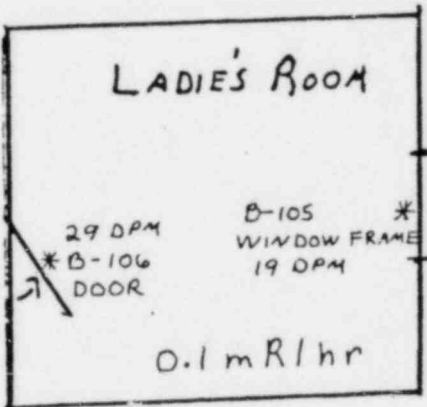
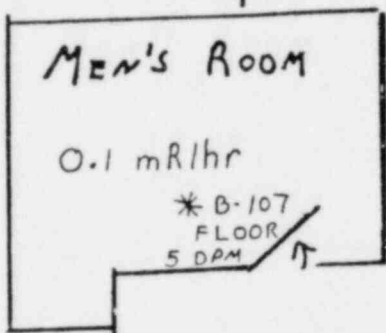
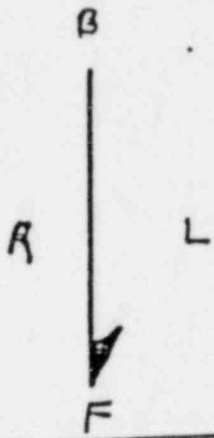
BETA-GAMMA = 0.1 mR/hr



AREA 1-C
AFTER DECON.

SAMPLE PREPARATION ROOM
2ND. FLOOR, MAIN BLDG.

BETA-GAMMA 0.1 mR/hr



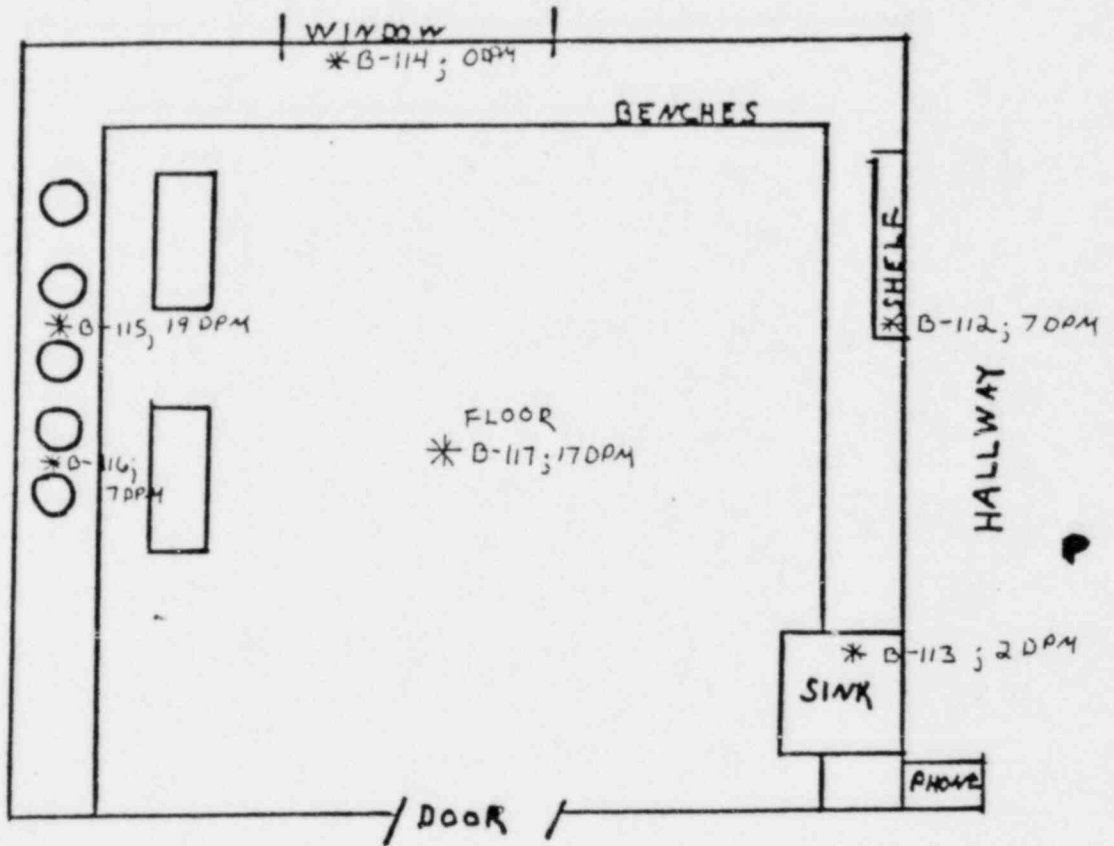
AREA 1-D
AFTER DECON.

HALL, LADIE'S & MEN'S ROOM,
EMPTY OFFICE
2ND. FLOOR MAIN BLDG.

BETA-GAMMA

0.05 mR/hr

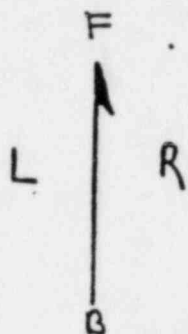
0.4 mR/hr



AREA I-E

AFTER DECON.

GRINDING & POLISHING TEST LAB
2ND FLOOR MAIN BLDG.



BETA-GAMMA 0.2 mR/hr
0.4 mR/hr

* FLOOR
B-108; 29 DPM

* B-110; 14 DPM
FLOOR

B-111; 90 DPM
WINDOW

B-109; 9 DPM



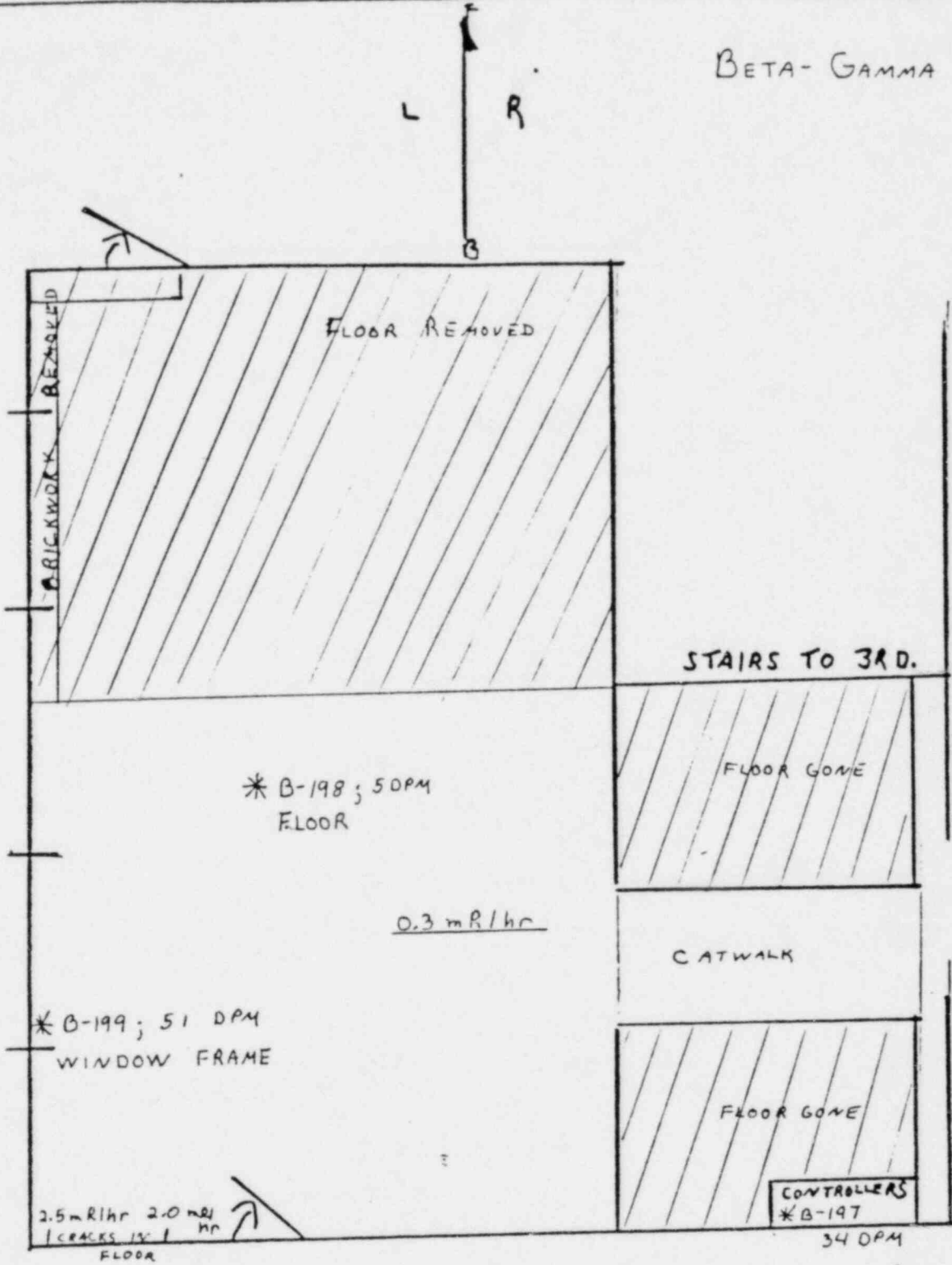
0.6 mR/hr

AREA 1-F
AFTER DECON.

(The below area was cleaned, and now reads: 0.1 mR/hr)
1.0 mR/hr AGAINST NAILED DOOR

STORAGE AREA
2ND LEVEL, MAIN BL

BETA-GAMMA 0.3 mR/hr



AREA I-G.

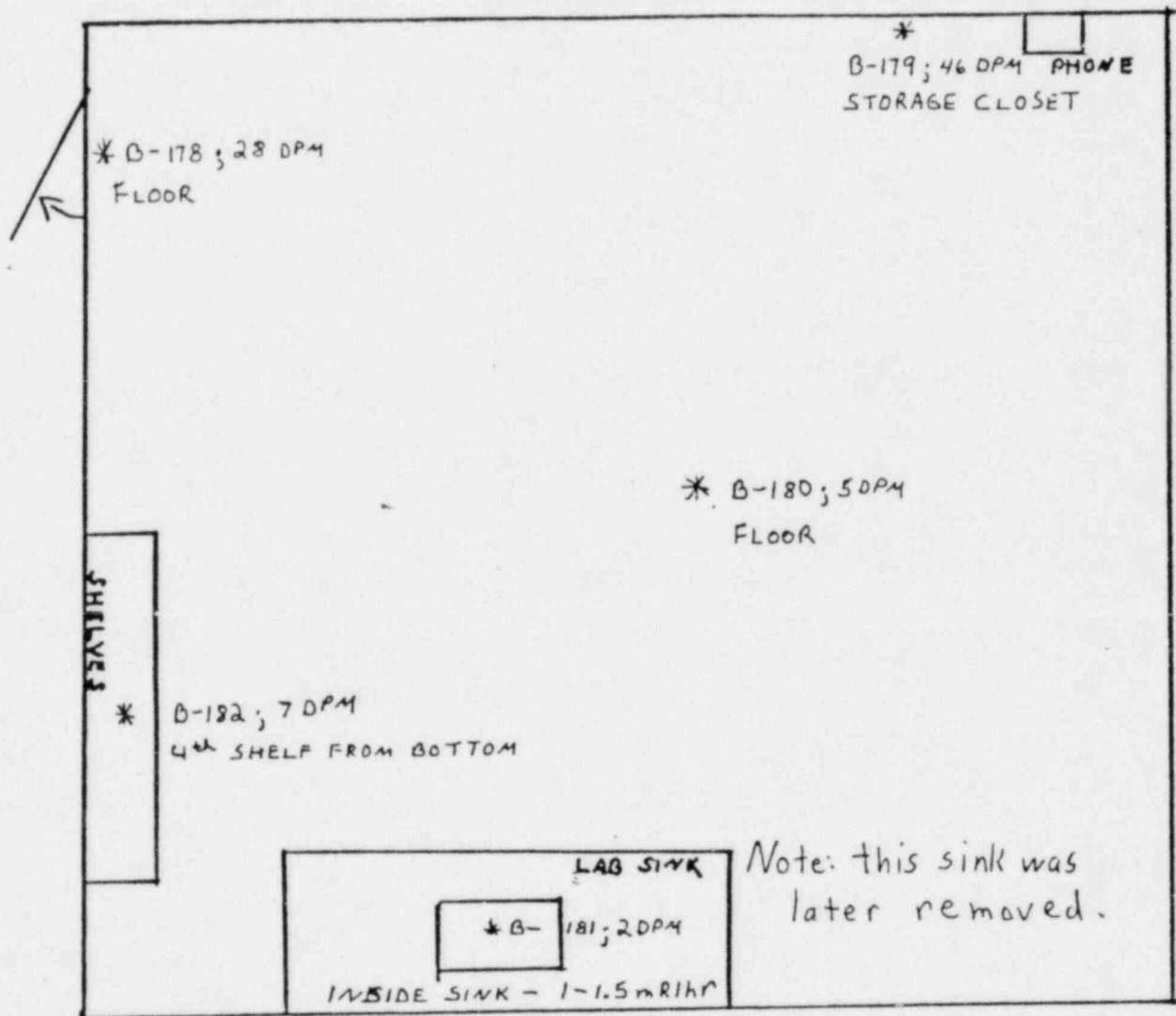
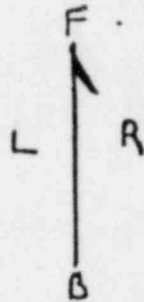
AFTER DECON.

PRESS ROOM & SULFONATION ROOM

2ND FLOOR, MAIN BLDG.

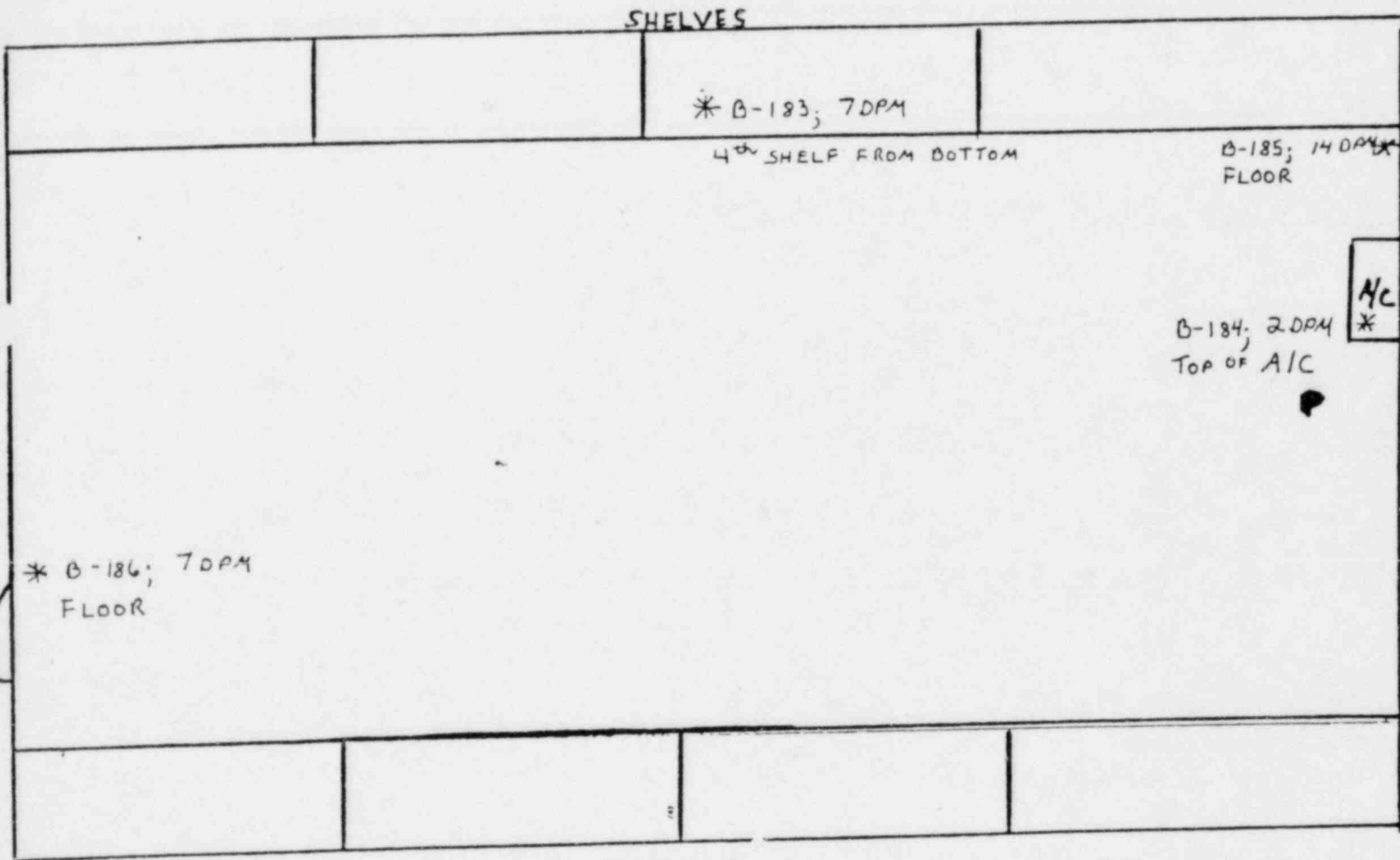
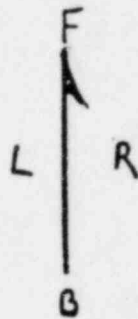
BETA - GAMMA

0.15 mR/hr
0.2 mR/hr



AREA 1-H
AFTER DECON.
TEST LAB #2
2ND LEVEL, MAIN BL

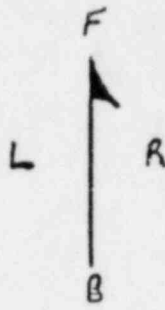
BETA-GAMMA 0.15 mR/hr a
0.2 mR/hr h



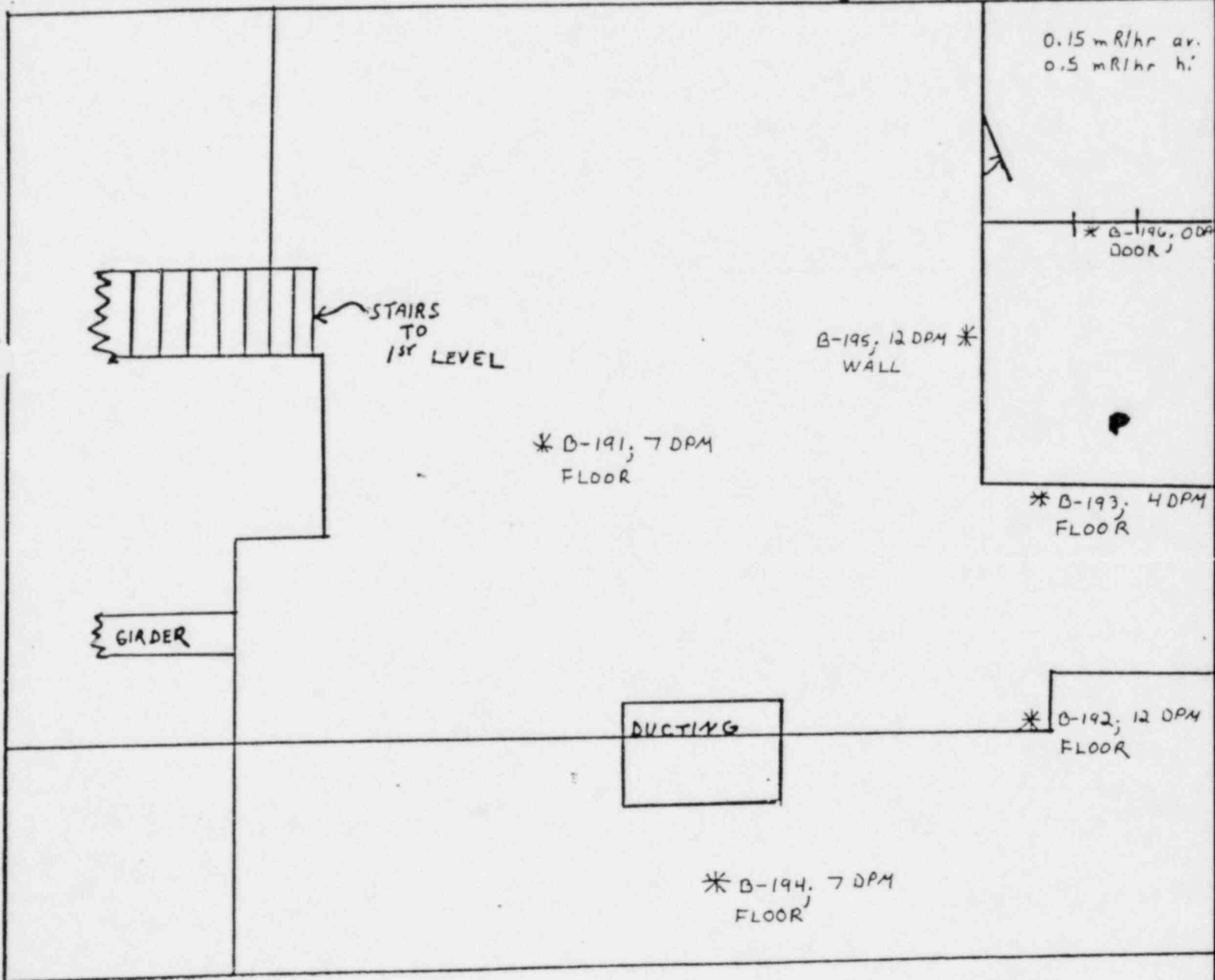
AREA 1-I

AFTER DECON.

CONFERENCE ROOM #1
2ND. FLOOR, MAIN BLDG.



BETA-GAMMA 0.15 mR/hr a
0.2 mR/hr h



0.15 mR/hr av.
0.5 mR/hr h

* B-196, OPA DOOR

B-195; 12 DPM * WALL

* B-191; 7 DPM FLOOR

* B-193; 4 DPM FLOOR

GIADER

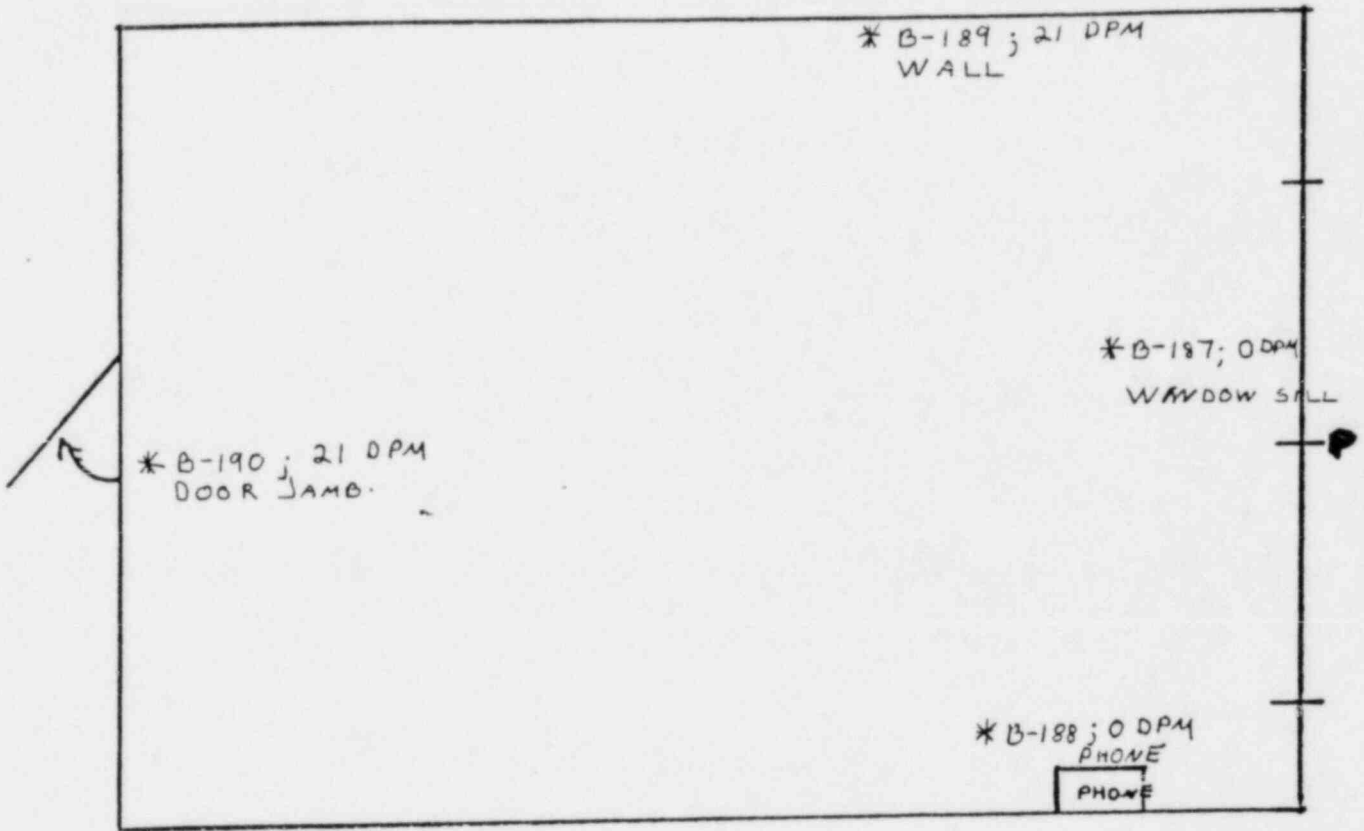
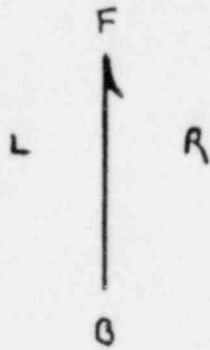
DUCTING

* B-192; 12 DPM FLOOR

* B-194; 7 DPM FLOOR

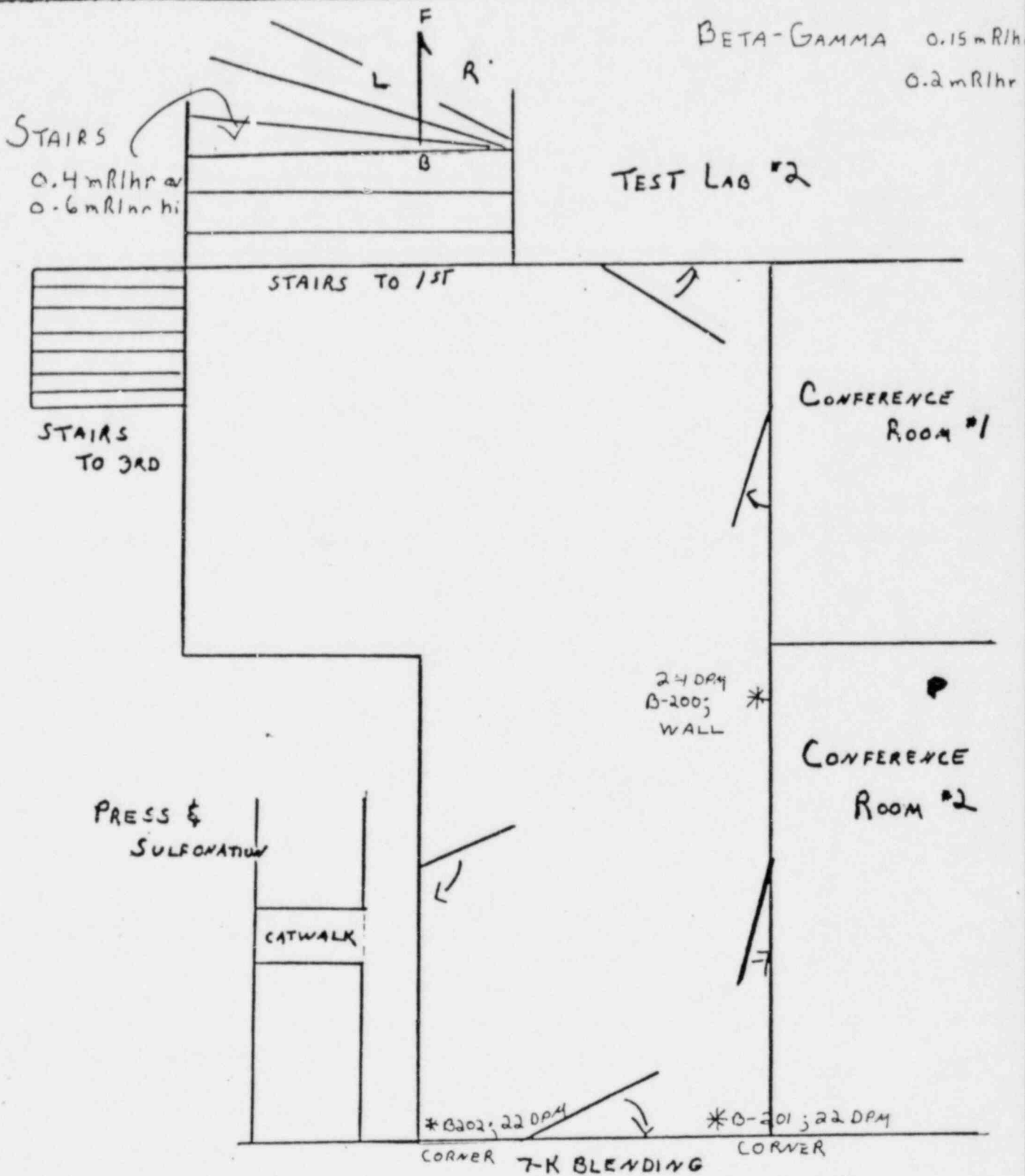
AREA 1J, AFTER DECON.
7-K BLENDING & STORAGE
2ND LEVEL, MAIN BLD

BETA-GAMMA 0.15 mR/hr
0.25 mR/hr

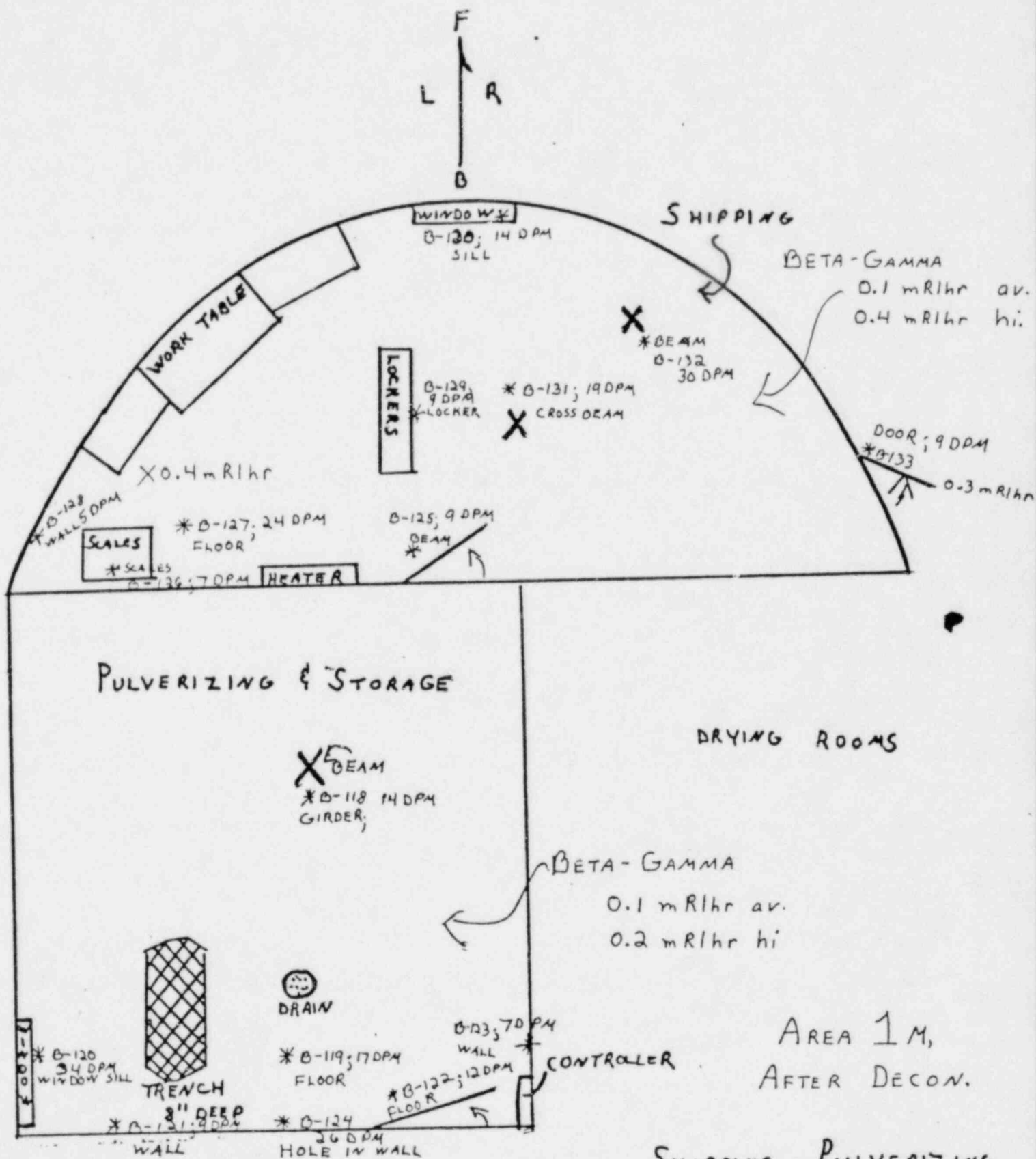


AREA 1K
AFTER DECON.

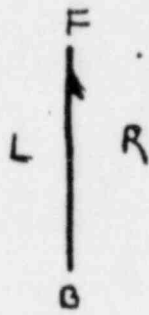
CONFERENCE ROOM #2
2ND FLOOR, MAIN BLDG.



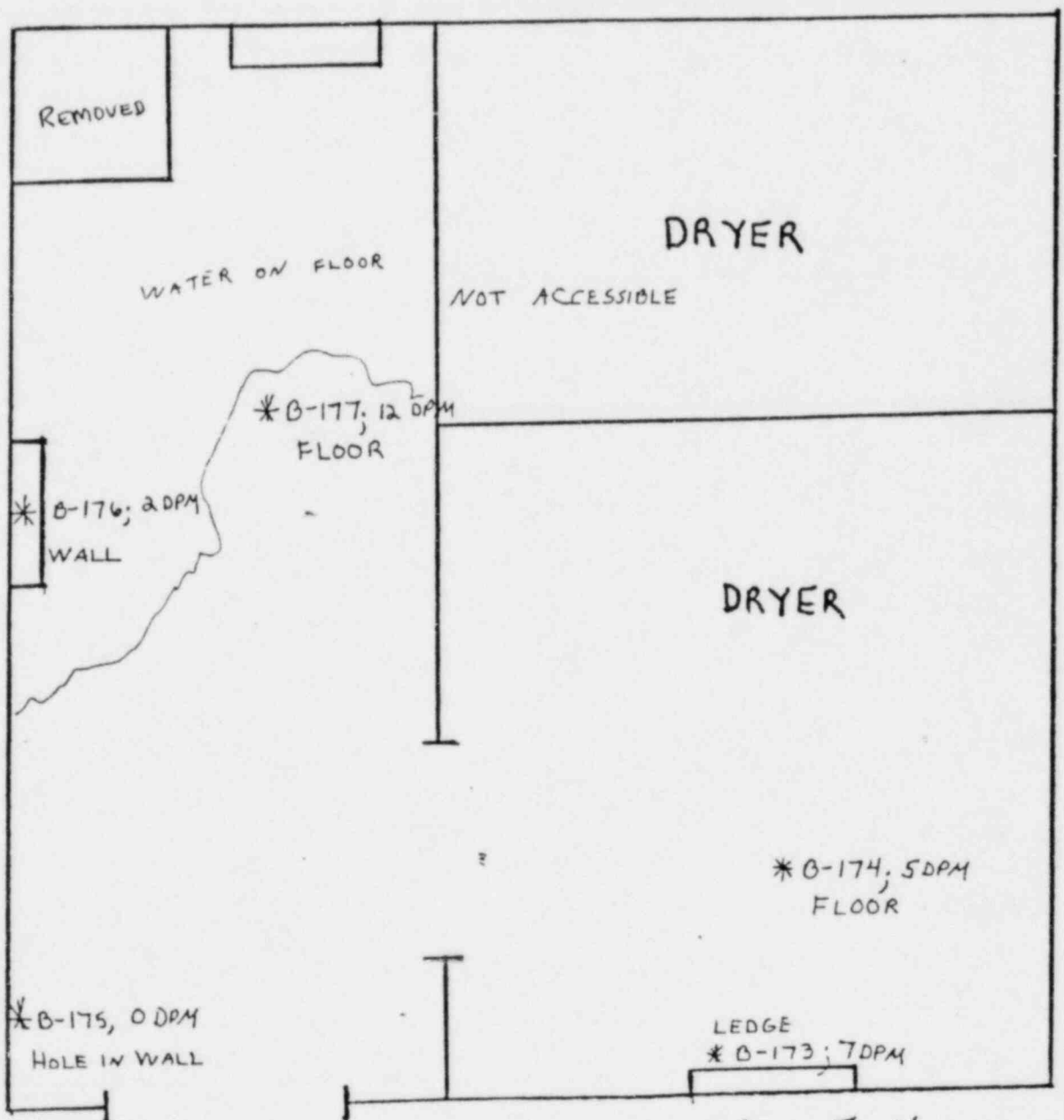
AREA 1-L
AFTER DECON.
SECOND FLOOR HALLWAY
MAIN BLDG.



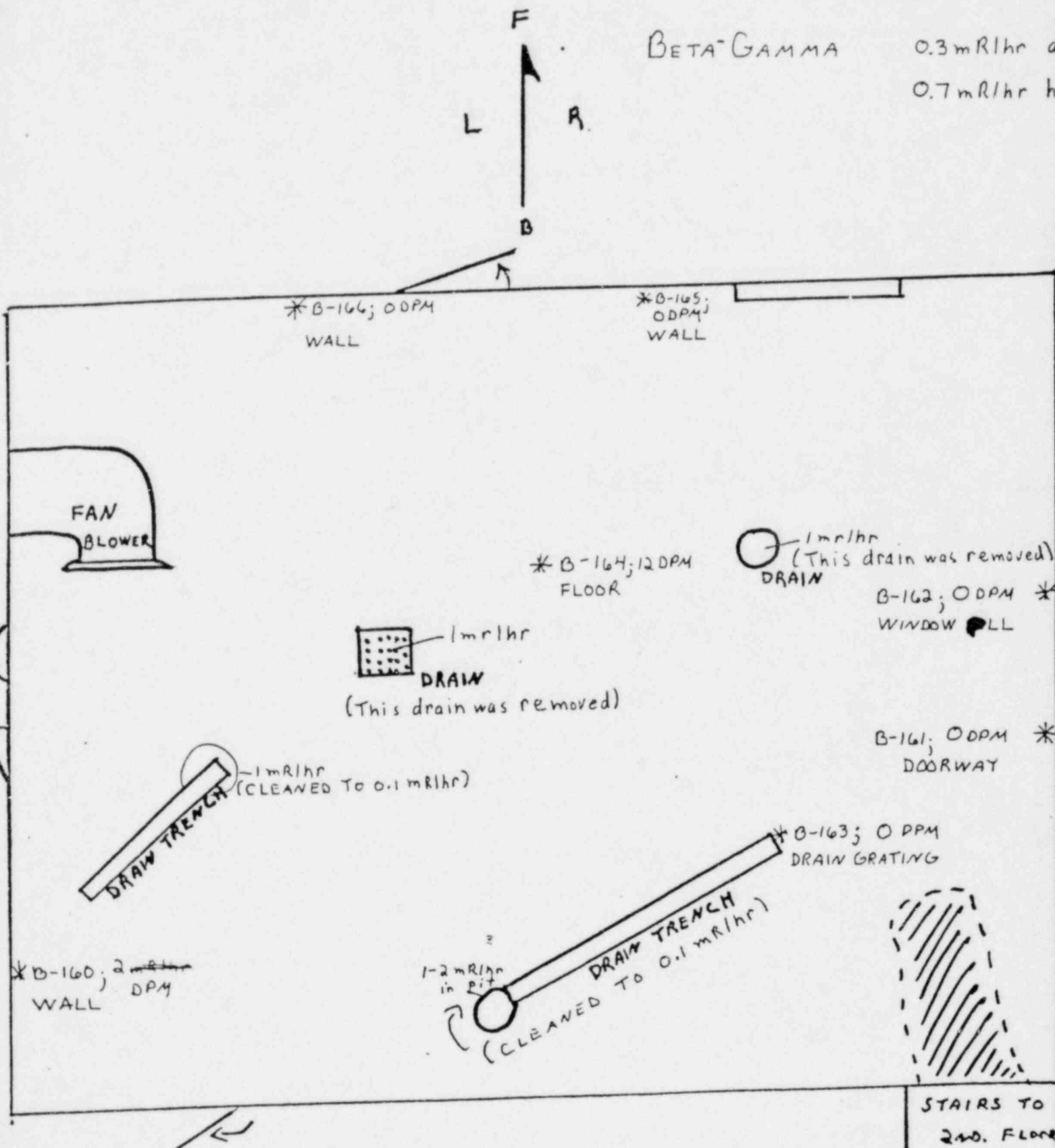
SHIPPING, PULVERIZING
CERIUM OXIDE STORAGE
1ST FLOOR, MAIN BLDG.



BETA-GAMMA 0.15 mR/hr av
0.3 mR/hr hi



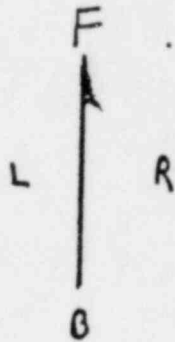
AREA 1 N, AFTER DECON
DRYING ROOMS
1ST. FLOOR MAIN BLDG.



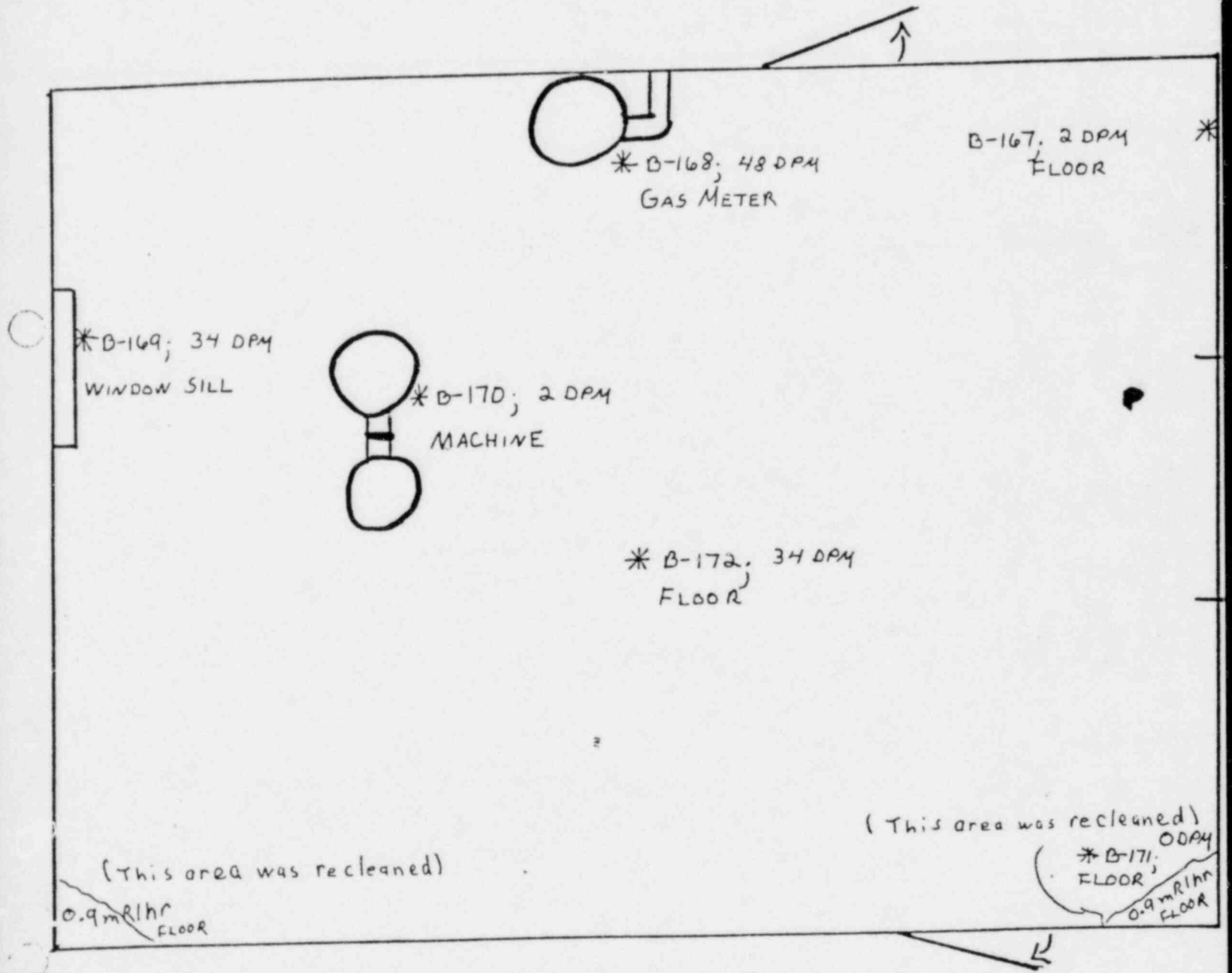
AREA-1-0

AFTER DECON.

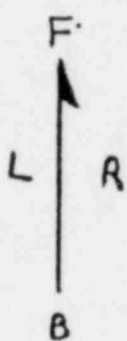
FURNACE & PRESS ROOM
1ST. FLOOR, MAIN BLDG.



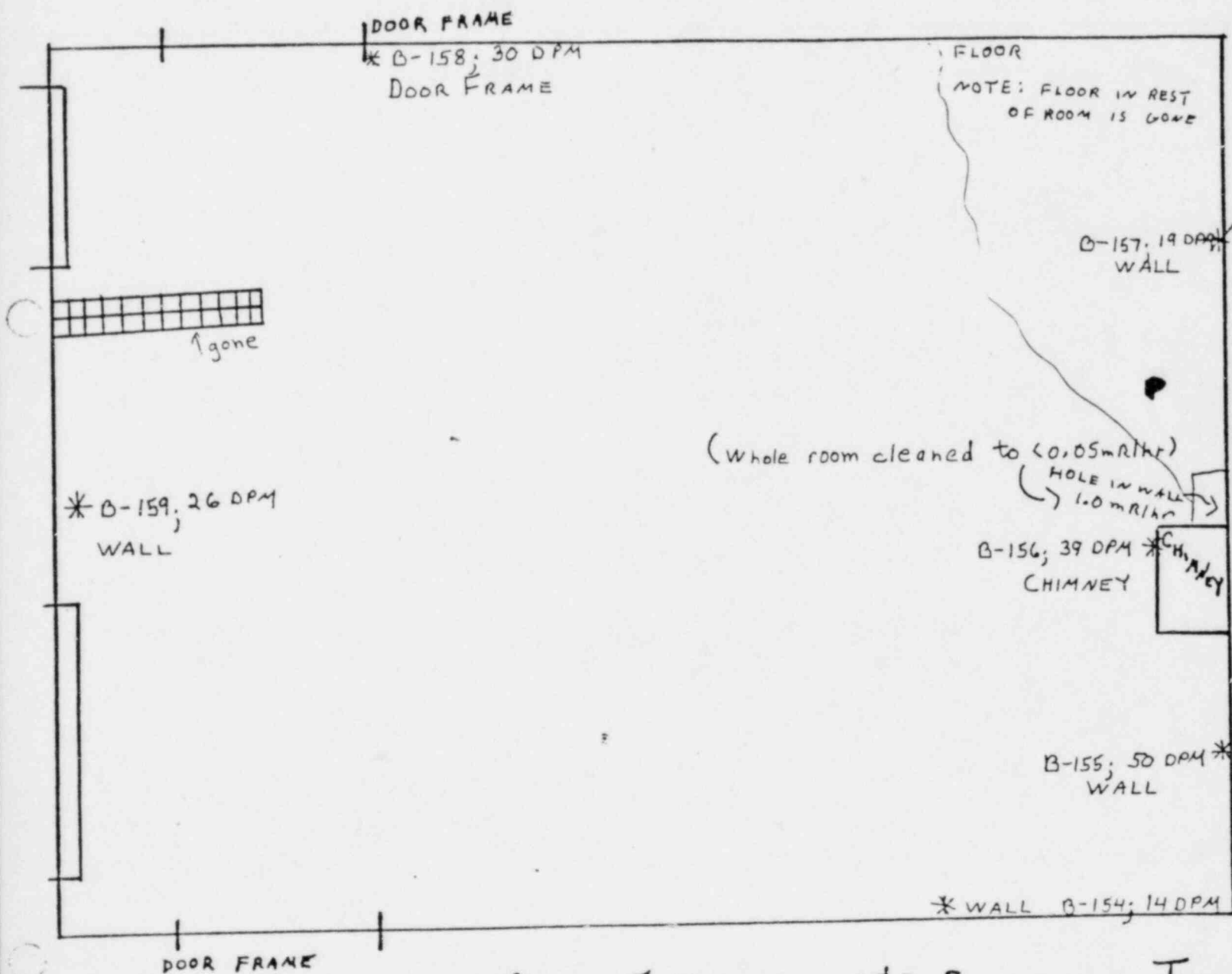
BETA-GAMMA 0.3 mR/hr av
0.6 mR/hr hi



AREA 1-P, AFTER DECON.
SHARPLES COLLECTOR ROOM
1ST FLOOR, MAIN BLDG

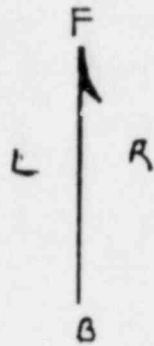


BETA-GAMMA 0.25 mR/hr av.
0.7 mR/hr hi

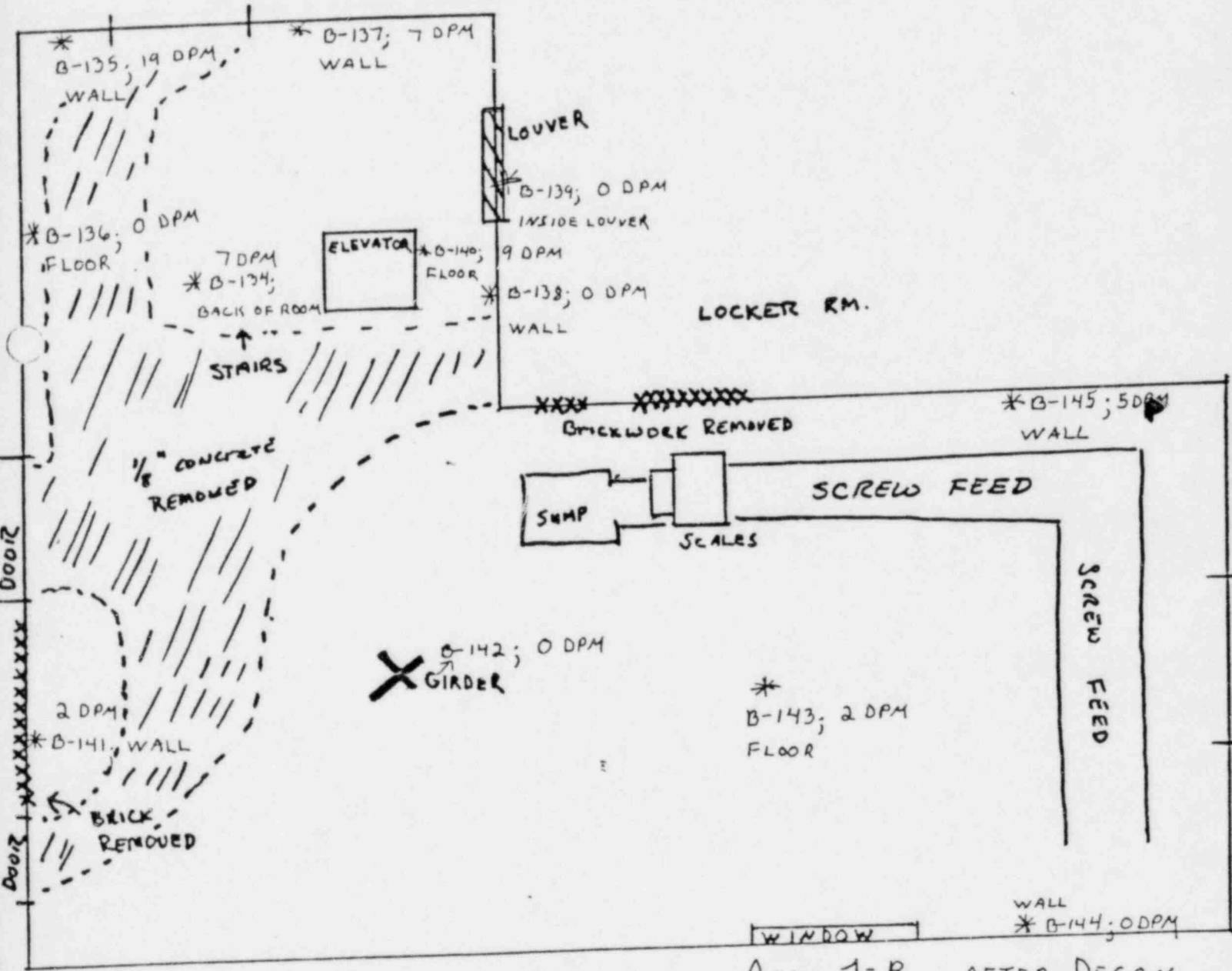


AREA 1Q,
AFTER DECON.

1&2 SULFONATION TANK
ROOMS
FIRST FLOOR, MAIN BL

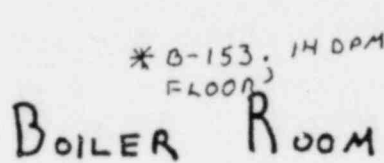
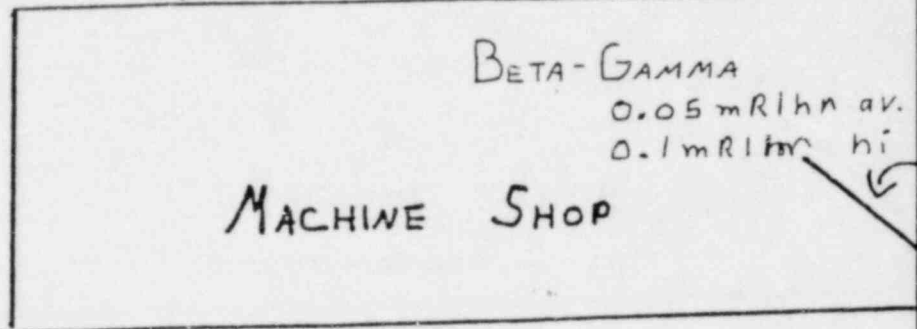
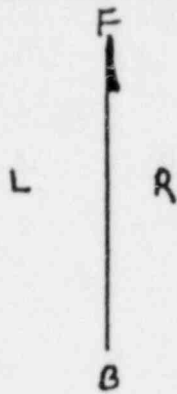


BETA-GAMMA 0.2 mR/hr av.
0.7 mR/hr hi

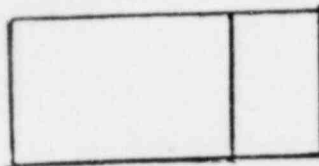


AREA 1-R, AFTER DECON.
7-K BASTACITE ROOM

1ST LEVEL, MAIN BLDG.



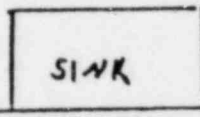
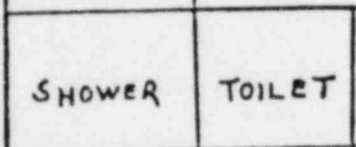
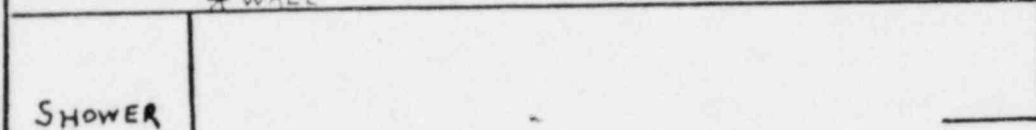
BETA-GAMMA 0.2 mR/hr av.
 0.4 mR/hr hi



* B-152; 19 DPM
 INCINERATOR

B-150; 17 DPM
 DOOR

B-151; 36 DPM
 * WALL

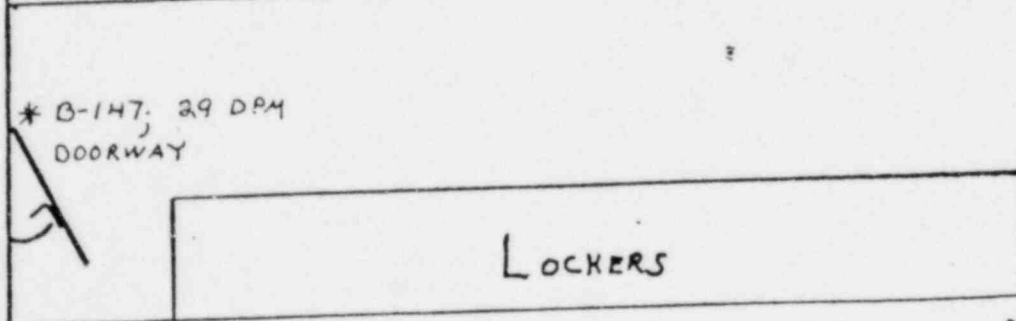


WALL
 * B-149; 35 DPM

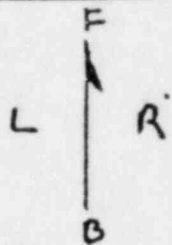
BETA-GAMMA 0.1 mR/hr av.
 0.3 mR/hr hi



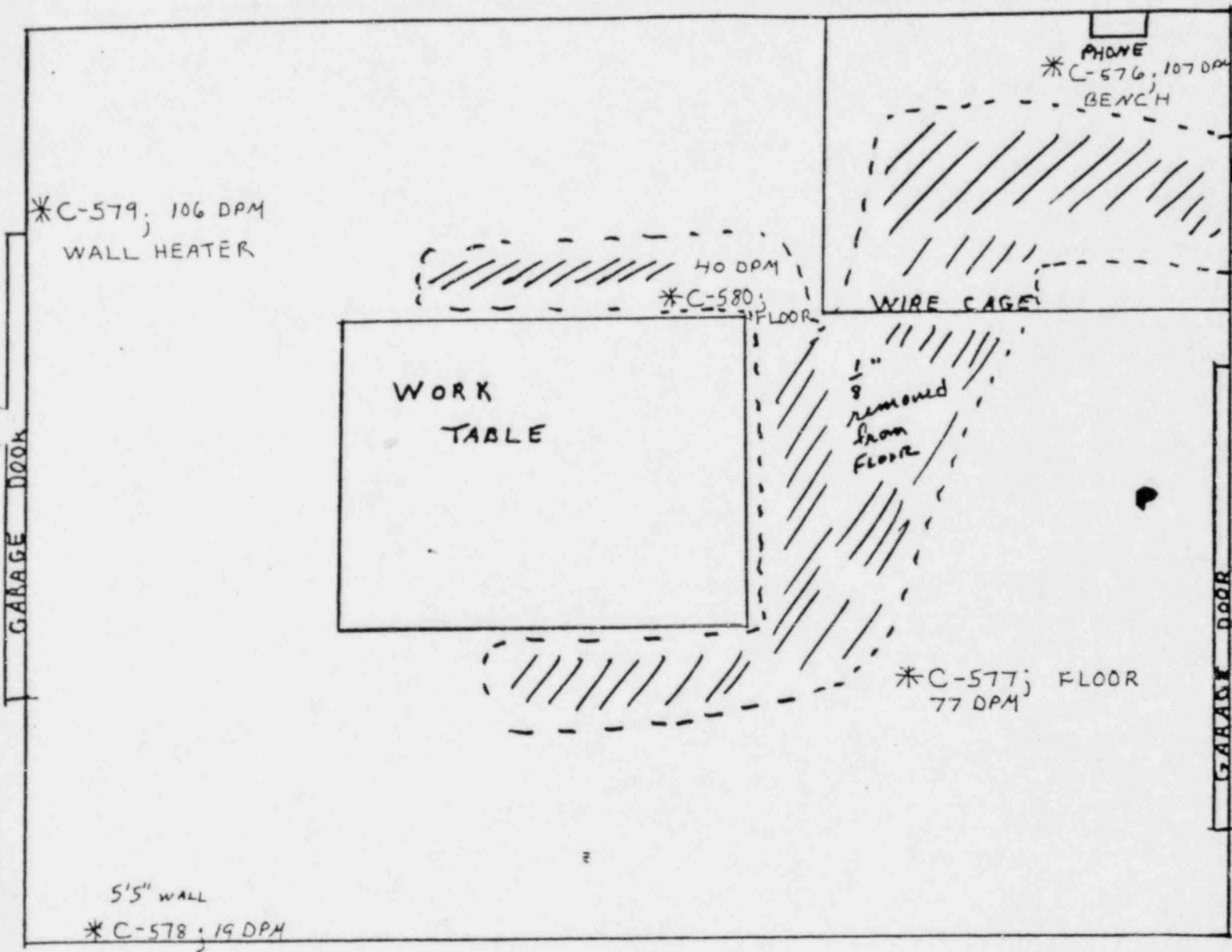
B-146;
 46 DPM



AREA 1-S, AFTER DECON.
 LOCKER & BOILER ROOMS
 MACHINE SHOP
 1ST. FLOOR, MAIN BLDG



BETA - GAMMA 0.3 mR/hr av.
0.7 mR/hr av.

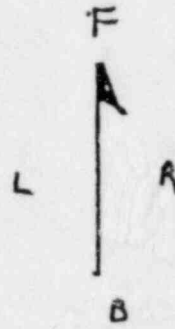


AREA 2-A

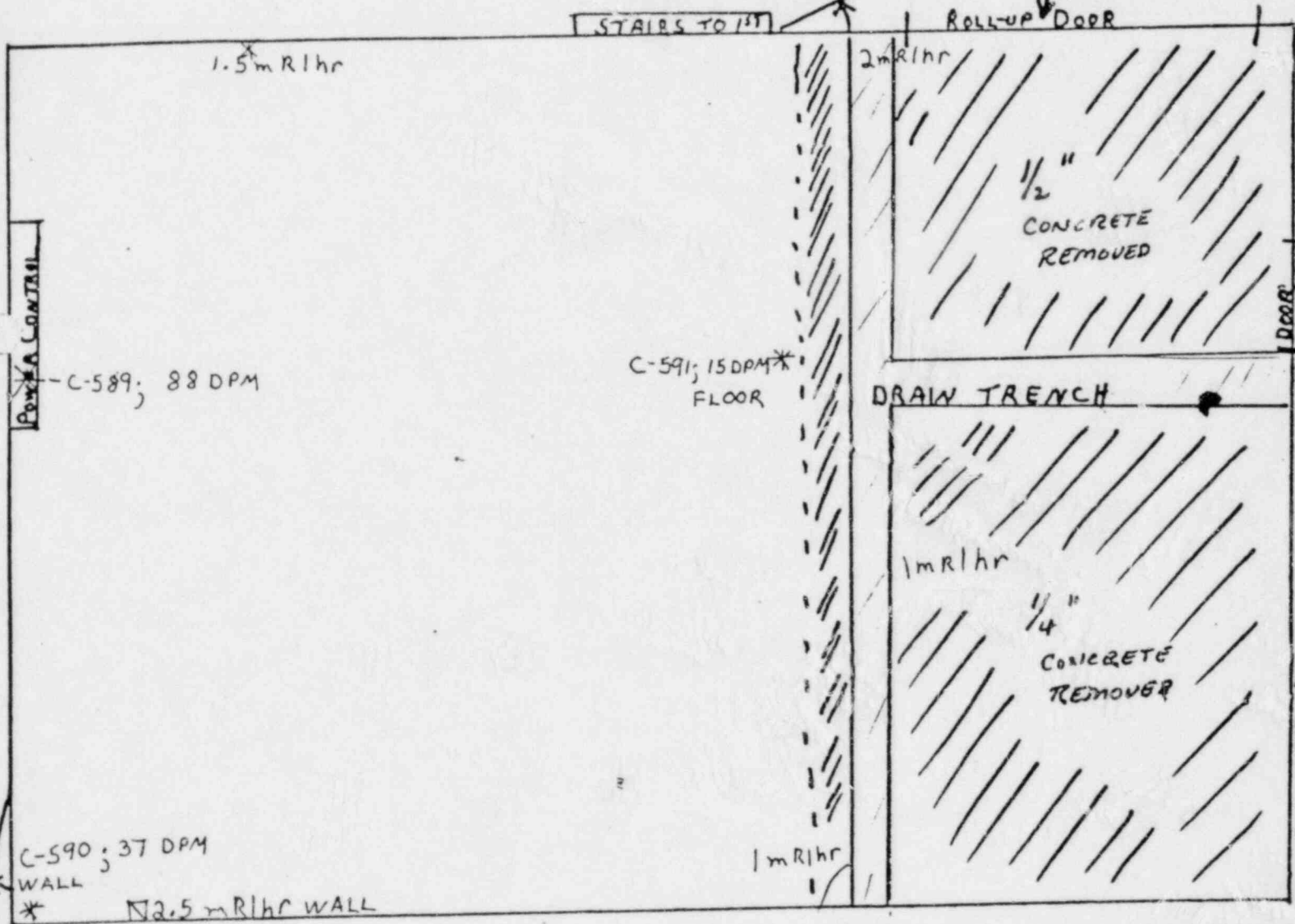
AFTER DECON.

WORKSHOP BUILDING

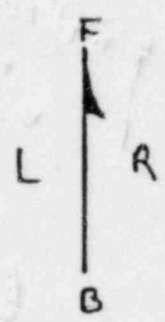
BETA-GAMMA 0.3 mR/hr
* 1-2 mR/hr in drain



* Note: whole area cleaned to less than 0.1 mR/hr
CONCRETE WALL REMOVED



AREA 2-B;
AFTER DECON.
BLOG # 2
BALL MILL
2ND LEVEL STORAGE



BETA-GAMMA 0.5mR/hr av.
1mR/hr in trench & concrete
(cleaned to 0.15 mR/hr)

STORAGE AREA

TRENCH

*C-588; 48 DPM WALL 1mR/hr

*C-586; 85 DPM FLOOR

1mR/hr

TRENCH

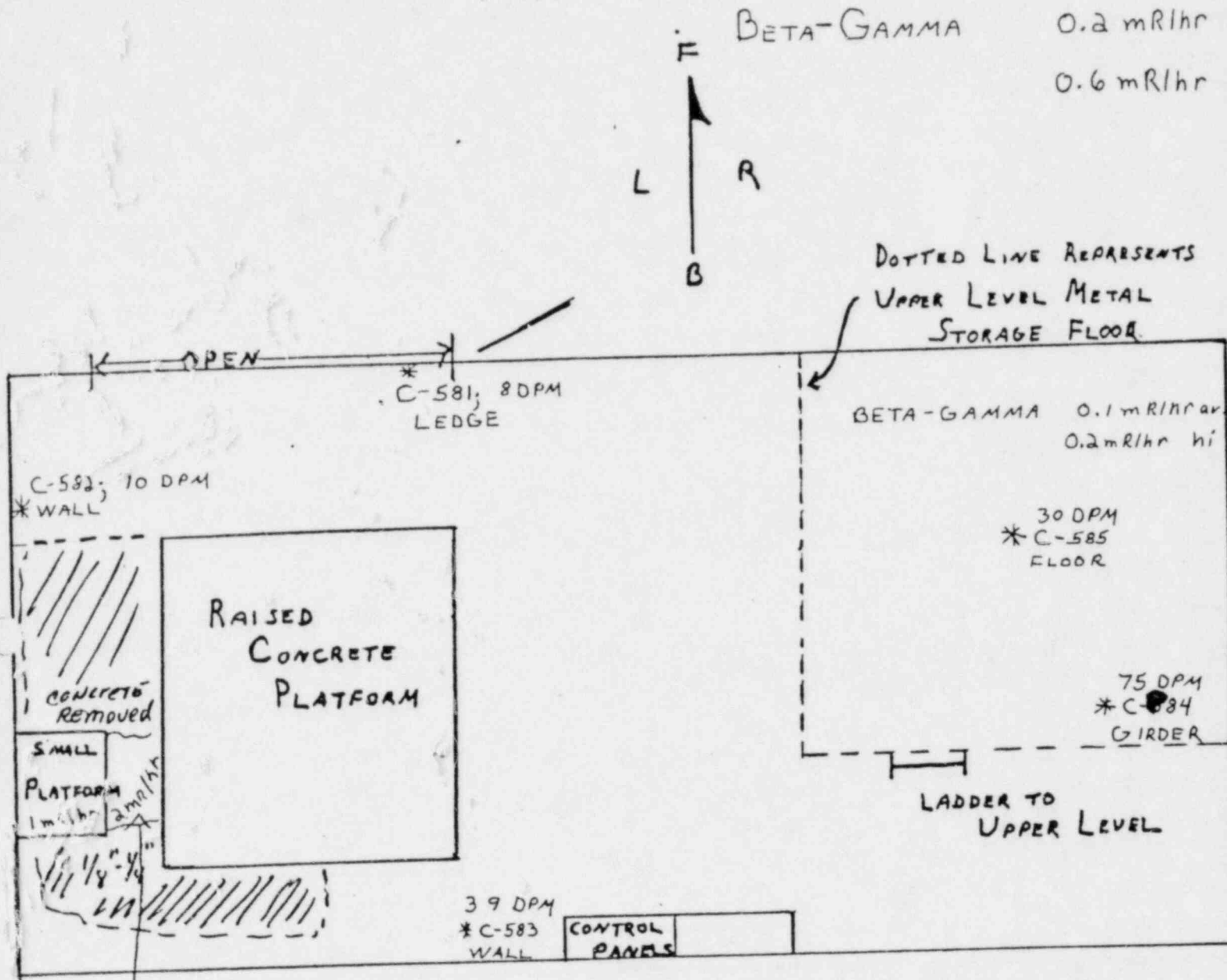
C-587; 104 DPM

1mR/hr

STAIRS TO 2ND

TRENCH

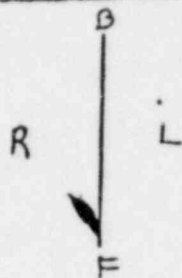
AREA 2-C
AFTER DECON.
BALL MILL
LOWER OPERATIO



(CLEANED TO 0.15 mR/hr)

AREA 2-D
 AFTER DECON.

COMPRESSOR ROOM

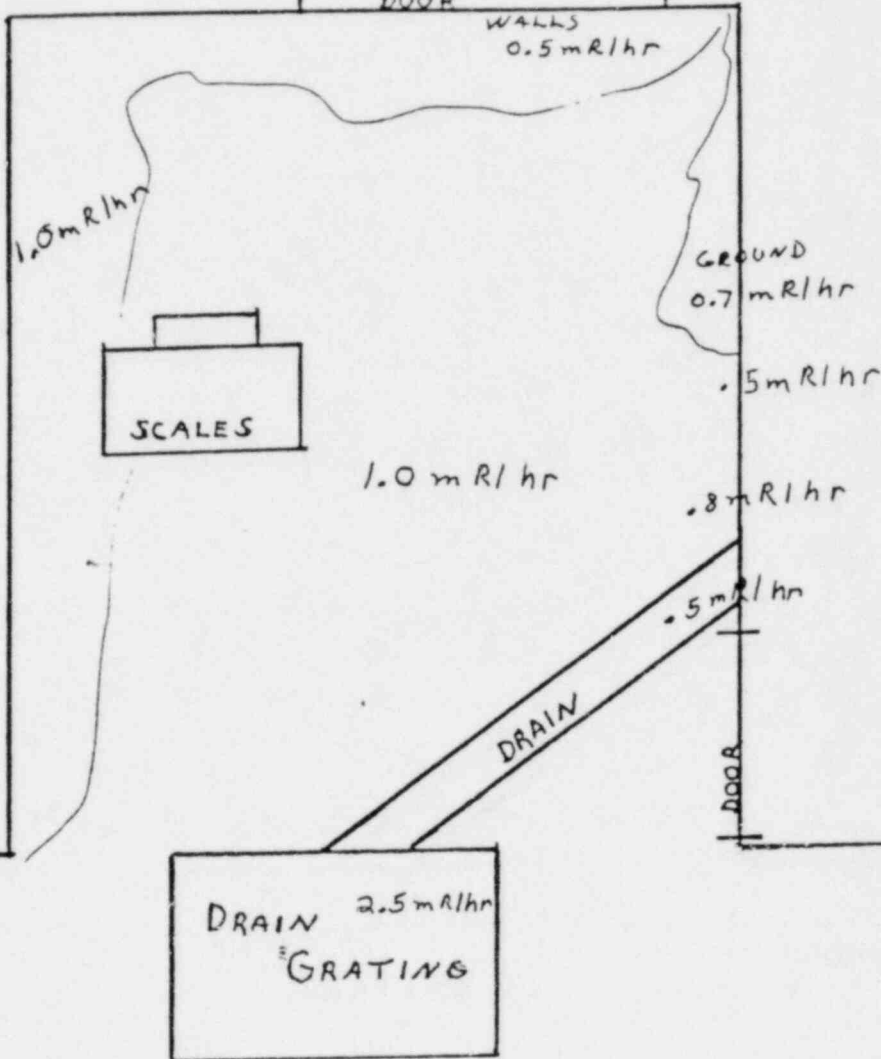


BETA-GAMMA BELOW

NOTE: whole area was cleaned to less than .15 mR/hr, av.

ELECTRONUCLEONICS STORAGE, 2nd level

DOOR

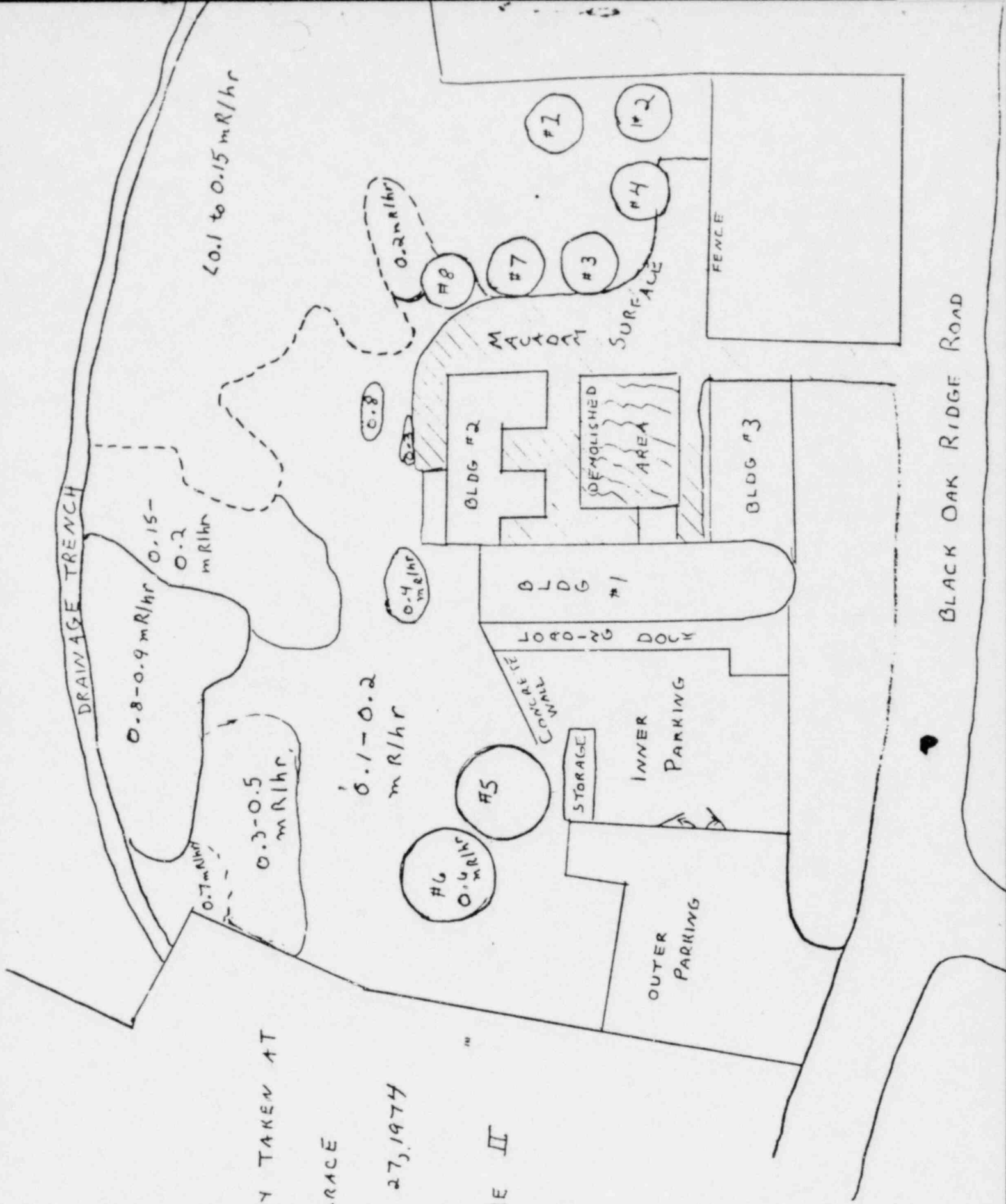


AREA 2-E

AFTER PRELIMINARY DECON.

OUTSIDE,

3 BUILDINGS



SURVEY TAKEN AT

W.R. GRACE

JUNE 27, 1974

FIGURE II

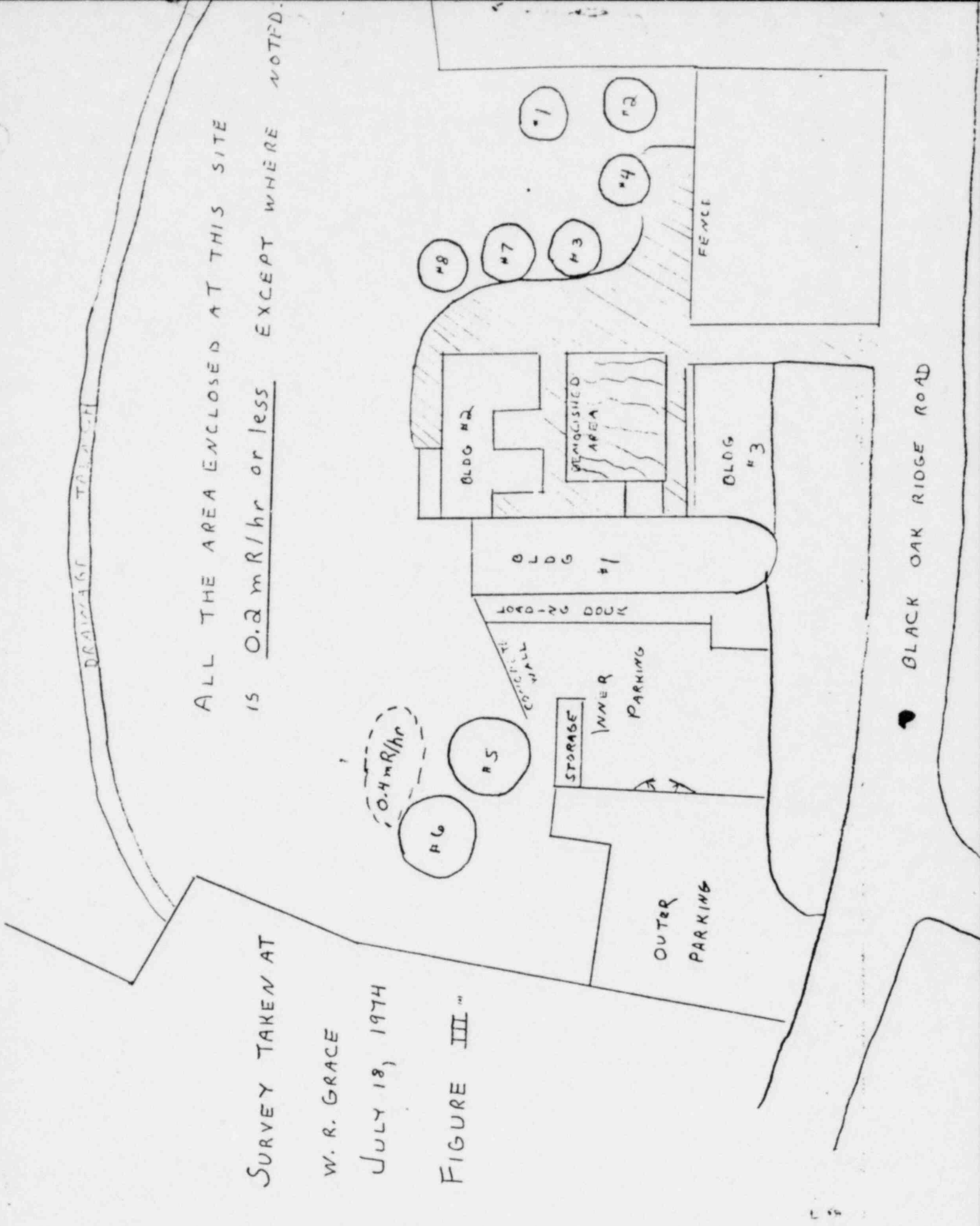
SURVEY TAKEN AT

W. R. GRACE

JULY 18, 1974

FIGURE III

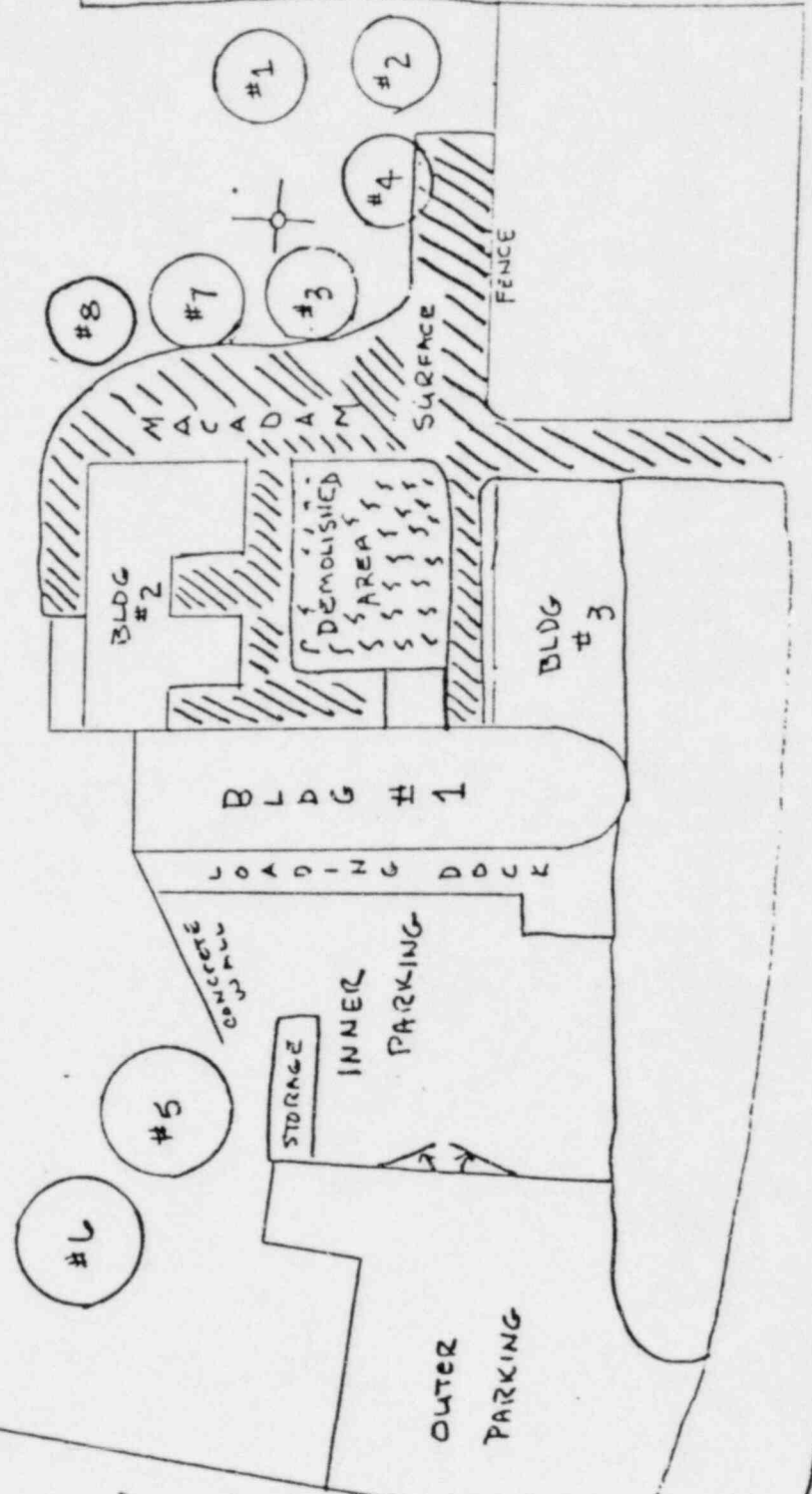
ALL THE AREA ENCLOSED AT THIS SITE
IS 0.2 mR/hr or less EXCEPT WHERE NOTED.



DRAINAGE TRENCH

SITE OF DISPOSAL SITES AT
W. R. GRACE COMPANY

WASTE DISPOSAL NOTES
LISTED IN PART III.



BLACK OAK RIDGE RD.

APPENDIX A

Radioactivity Limits
for
Unrestricted Release
of
Equipment

RADIOACTIVITY LIMITS FOR UNRESTRICTED RELEASE

of .

FACILITIES and EQUIPMENT

1. The maximum amount of fixed alpha radioactivity in disintegrations per minute per 100 square centimeters on buildings or equipment should not exceed 25,000 dpm.
2. The average amount of fixed alpha radioactivity in disintegrations per minute per 100 square centimeters on buildings or equipment should not exceed 5,000 dpm.
3. The maximum amount of removable (capable of being removed by wiping the surface with a filter paper or soft absorbent paper) alpha radioactivity in disintegrations per minute per 100 square centimeters on buildings or equipment should not exceed 1,000 dpm.
4. (a) The maximum level at one centimeter from the most highly contaminated surface of a building or piece of equipment measured with an open-window beta-gamma survey meter through a tissue equivalent absorber of not more than seven milligrams per square centimeter should not exceed 1.0 millirad per hour.
(b) The average radiation level at one centimeter from the contaminated surface of the building or equipment measured in the same manner should not exceed 0.2 millirad per hour.
5. The contamination limits for abandonment of facilities involving U-233 or plutonium should not exceed 1/10 of the limits in items 1, 2 and 3 above.

NOTES: A. A reasonable effort should be made to minimize the contamination present.

B. Surfaces of premises, equipment or scrap likely to be contaminated, and of such size, construction, or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the levels specified above.

C. Premises, equipment or scrap having contaminated surfaces which have been covered by painting, metal plating or other covering material should be presumed to be contaminated in excess of the levels specified above, unless it can be established that the contamination was below the above levels prior to applying the covering.

APPENDIX B

Analyses
of
Removable Contamination

APPLIED HEALTH PHYSICS, Inc.

Health Physics Laboratory Report: Analyses of Removable Contamination

Client: W. R. GRACE COMPANY W.O. # _____ Date: _____ Page # 1 of 8

Description of survey: _____

Surveyed by: M. McClosky/R. Slayton Date: 6/3/74 Suspected Activity: Natural Thorium

Counted with: GM detector Scintillation detector Gas Proportional detector

Counter Mfg: NMC Model PC-3A s/n 620(W.R. Grace)

Background of detector before counting: α 8.8cpm β _____

Background of detector after counting: α 7.4 β _____

Efficiency of detector: α 42% β _____ Counted by: RJS 6/4/74

SER. NO.	SAMPLE IDENTIFICATION		Alpha				Beta-Gamma						
			Ctg. Time	c/m Gross	c/m Net	d/m/100cm ²	d/m/100cm ²	Ctg. Time	c/m Gross	c/m Net	d/m/cm ²		
B-76	Time	Location											
		W.R. Grace - Main Office Book Case	2 Min.	18	1	2.4	+ 1.6						
77		Floor	"	21	2	5	+ 1.8						
78		"	"	29	7	17	+ 3						
79		"	"	19	2	5	+ 1.8						
80		Wall	"	15	0	0	+ 0.9						
81		Large Lab - Door	"	40	12	29	+ 3.9						
82		" - Counter	"	20	2	5	+ 1.8						
83		" - Test Hood	"	48	16	38	+ 4.5						
84		" - #1 Sink	"	23	3	7	+ 2.1						
85		" Corner Counter	"	24	4	9	+ 2.3						
86		" Drain	"	33	8	19	+ 3.2						
87		" #2 Sink	"	14	0	0	+ 0.9						
88		" Counter	"	33	8	19	+ 3.2						
89		" "	"	36	10	24	+ 3.6						
90		" Cabinet	"	17	1	3	+ 1.5						
91		" Ledge	"	43	14	33	+ 4.2						
92		" Floor	"	23	3	7	+ 2.1						
93		Sample Preparation Room - Counter	"	32	8	19	+ 3.2						
94		Sample Preparation Room - Window - Plastic covered	"	27	6	14	+ 2.8						
95		Sample Preparation Room - Floor	"	21	2	5	+ 1.8						

APPLIED HEALTH PHYSICS, Inc.

Health Physics Laboratory Report. Analyses of Removable Contamination

Client: W.R. GRACE COMPANY W.O. # _____ Date: _____ Page # 2 of _____

Description of survey: _____

Surveyed by: M. McClosky/R. Slayton Date: 6/3/74 Suspected Activity: Natural Thorium

Counted with: GM detector Scintillation detector Gas Proportional detector

Counter Mfg: NMC Model PC-3A s/n 620(W.R. Grace)

Background of detector before counting: α 8.8 cpm β _____

Background of detector after counting: α 7.4 β _____

Efficiency of detector: α 42% β _____ Counted by: RJS 6-4-74

SER. NO.	SAMPLE IDENTIFICATION		Alpha				Beta-Gamma					
			Ctg. Time	c/2m Gross	c/m Net	d/m	d/m/100cm ²	Ctg. Time	c/m Gross	c/m Net	d/m	d/m/cm ²
96	Time	Location	2 Min.	30	7	17	\pm 3					
97		Sample Preparation Room - Concrete Slab	"	10	0	0	\pm 0.9					
98		Sample Preparation Room - Ceiling	"	20	2	5	\pm 1.8					
99		Small Hallway - Floor	"	29	7	17	\pm 3					
100		Small Hallway - Floor	"	24	4	9	\pm 2.3					
101		Empty Office - Shelf	"	38	11	26	\pm 3.7					
102		" - Wall	"	26	5	12	\pm 2.6					
103		" - Window	"	40	12	29	\pm 3.9					
104		" - Floor	"	28	6	14	\pm 2.3					
105		" - Desk	"	32	8	19	\pm 3.2					
106		Ladies' Room - Window Frame	"	39	12	29	\pm 3.9					
107		" - Door	"	20	2	5	\pm 1.8					
108		Men's Room - Floor	"	40	12	29	\pm 3.9					
109		Storage Area, 2nd Level - Floor	"	23	4	9	\pm 2.3					
110		Storage Area, 2nd Level - Fan	"	28	6	14	\pm 2.3					
111		Storage Area, 2nd Level - Floor	"	24	4	9	\pm 2.3					
112		Storage Area, 2nd Level - Window	"	21	3	7	\pm 2.1					
113		Grinding-Polishing Test Lab - Shelf	"	18	1	2	\pm 1.3					
114		Grinding-Polishing Test Lab - Sink	"	15	0	0	\pm 0.9					
115		Grinding-Polishing Test Lab - Bench	"	32	8	19	\pm 3.2					
116		Grinding-Polishing Test Lab - Bet. 2nd & 3rd Vat	"	21	3	7	\pm 2.1					
117		Grinding-Polishing Test Lab - 4th & 5th Vat	"	29	7	17	\pm 3					
118		Grinding-Polishing Test Lab - Floor	"	27	6	14	\pm 2.3					
		Shipping, Pulverizing Cerium Oxide Storage-Girder	"									

APPLIED HEALTH PHYSICS, Inc.

Health Physics Laboratory Report: Analyses of Removable Contamination

Client: W.R. GRACE W.O.# _____ Date: _____ Page # 3 of _____

Description of survey: _____

Surveyed by: M. McClosky/R. Slayton Date: 6-3-74 Suspected Activity: Natural Thorium

Counted with: GM detector Scintillation detector Gas Proportional detector

Counter Mfg: NMC Model PC-3A s/n 620 (W.R. Grace)

Background of detector before counting: α 8.8cpm^β

Background of detector after counting: α 7.4 β _____

Efficiency of detector: α 42% β _____ Counted by: RJS 6-4-74

SER. NO.	SAMPLE IDENTIFICATION		Alpha				Beta-Gamma								
			Ctg. Time	c/2m Gross	c/m Net	d/m	d/m/100cm ²	Ctg. Time	c/m Gross	c/m Net	d/m	d/m/cm ²			
119	Shipping, Pulverizing	Cerium Oxide Storage-Floor	2 min	29	7	17	+ 3								
120	Shipping, Pulverizing	Cerium Oxide Storage-Window	"	47	15	34	+ 4.2								
121	Shipping, Pulverizing	Cerium Oxide Storage-Sill	"	23	4	9	+ 2.3								

APPLIED HEALTH PHYSICS, Inc.

Health Physics Laboratory Report: Analyses of Removable Contamination

Client: W.R. GRACE W.O. # _____ Date: _____ Page # 4 of _____

Description of survey: _____

Surveyed by: M. McClosky/R. Slayton Date: 6-3-74 Suspected Activity: Natural Thorium

Counted with: GM detector Scintillation detector Gas Proportional detector

Counter Mfg: NMC Model PC-3A s/n 620 (W.R. Grace)

Background of detector before counting: α 10 β _____

Background of detector after counting: α 9 β _____

Efficiency of detector: α 42% β _____ Counted by: RS, MM 6-5-74

SER. NO.	SAMPLE IDENTIFICATION		Alpha				Beta-Gamma						
			Ctg. Time	c/2m Gross	c/m Net	d/m	d/m/100cm ²	Ctg. Time	c/m Gross	c/m Net	d/m	d/m/cm ²	
B-122	Time	Location	2 min	28	5	12	+2.6						
B-123		Shipping, Pulverizing Cerium Oxide Storage-Floor	"	24	3	7	+2.1						
124		Shipping, Pulverizing Cerium Oxide Storage-Wall	"	39	11	26	+3.7						
125		Shipping, Pulverizing Cerium Oxide Storage-Hole in Wall	"	26	4	9	+2.3						
127		Shipping, Pulverizing Cerium Oxide Storage-Beam	"	23	3	7	+2.1						
128		Shipping, Pulverizing Cerium Oxide Storage-Scales	"	37	10	24	+3.6						
129		Shipping, Pulverizing Cerium Oxide Storage-Floor	"	22	2	5	+1.9						
130		Shipping, Pulverizing Cerium Oxide Storage-Locker	"	25	4	9	+2.3						
131		Shipping, Pulverizing Cerium Oxide Storage-Window	"	30	6	14	+2.8						
132		Shipping, Pulverizing Cerium Oxide Storage-Sill	"	33	8	19	+3.2						
133		Shipping, Pulverizing Cerium Oxide Storage-Cross Beam	"	44	13	30	+3.9						
134		Shipping, Pulverizing Cerium Oxide Storage-Beam	"	26	4	9	+2.3						
135		Shipping, Pulverizing Cerium Oxide Storage-Door	"	24	3	7	+2.1						
136		First Level 7-K Bastasite Room-Back of Room	"	34	8	19	+3.2						
137		First Level 7-K Bastasite Room-Wall	"	15	0	0	+0.97						
138		First Level 7-K Bastasite Room-Floor	"	24	3	7	+2.1						
139		First Level 7-K Bastasite Room-Wall	"	13	0	0	+0.97						
140		First Level 7-K Bastasite Room-Wall	"	16	0	0	+0.97						
141		First Level 7-K Bastasite Room-Inside Louver	"	25	4	9	+2.3						
142		First Level 7-K Bastasite Room-Floor	"	19	1	2	+1.4						
143		First Level 7-K Bastasite Room-Wall	"	14	0	0	+0.97						
144		First Level 7-K Bastasite Room-Girder	"	20	1	2	+1.4						
145		First Level 7-K Bastasite Room-Floor	"	20	1	2	+1.4						

APPLIED HEALTH PHYSICS, Inc.

Health Physics Laboratory Report: Analyses of Removable Contamination

Client: W.R. GRACE W.O.# _____ Date: _____ Page # 6 of 8

Description of survey: _____

Surveyed by: M. McClosky/R. Slayton Date: 6-3-74 Suspected Activity: Natural Thorium

Counted with: GM detector Scintillation detector Gas Proportional detector

Counter Mfg: NMC Model PC-3A s/n 620 (W.R. Grace)

Background of detector before counting: α 4.0 β _____

Background of detector after counting: α 10 β _____

Efficiency of detector: α 42% β _____ Counted by: MM 6-5-74

ER. NO.	SAMPLE IDENTIFICATION		Alpha				Beta-Gamma						
			Ctg. Time	c/m Gross	c/m Net	d/m/100cm ²	d/m/100cm ²	Ctg. Time	c/m Gross	c/m Net	d/m/100cm ²		
8-145	10:00 A.M.	First Level 7-K Bastasite Room-Wall	2 min	17	2	5	± 1.8						
46		Locker & Boiler Room-Radiator		55	21	46	± 4.9						
47		Locker & Boiler Room-Doorway		37	12	29	± 3.9						
48		Locker & Boiler Room-Metal Floor		43	15	34	± 4.2						
49		Locker & Boiler Room-Wall		46	16	35	± 4.3						
50		Locker & Boiler Room-Door		27	7	17	± 3.0						
51		Locker & Boiler Room-Wall		48	17	36	± 4.3						
52		Locker & Boiler Room-Incinerator		29	8	19	± 3.2						
53		Locker & Boiler Room-Floor		26	6	14	± 2.8						
54		1 & 2 Sulfonation Tank Room-Wall		25	6	14	± 2.8						
55		1 & 2 Sulfonation Tank Room-Wall		60	23	50	± 5.1						
56		1 & 2 Sulfonation Tank Room-Chimney		49	18	39	± 4.5						
57		1 & 2 Sulfonation Tank Room-Wall		29	8	19	± 3.2						
58		1 & 2 Sulfonation Tank Room-Door Frame		39	13	30	± 3.9						
59		1 & 2 Sulfonation Tank Room-Wall		36	11	26	± 3.7						
60		Furnace & Press Room-Wall		15 ^F	1	2	± 1.3						
61		Furnace & Press Room-Doorway		7	0	0	± 0.8						
62		Furnace & Press Room-Window Sill		13	0	0	± 0.8						
63		Furnace & Press Room-Drain Grating		13	0	0	± 0.8						
64		Furnace & Press Room-Floor		24	5	12	± 2.6						
65		Furnace & Press Room-Wall		10	0	0	± 0.8						
66		Furnace & Press Room-Wall		12	0	0	± 0.8						
67		Sharples Collector Room-Floor		15	1	2	± 1.3						

APPLIED HEALTH PHYSICS, Inc.

Health Physics Laboratory Report: Analyses of Removable Contamination

Client: W.R. GRACE W.O # _____ Date: _____ Page # 7 of 8

Description of survey: _____

Surveyed by: M. McClosky/R. Slayton Date: 6-3-74 Suspected Activity: Natural

Counted with: GM detector Scintillation detector Gas Proportional detector
Thorium

Counter Mfg: NMC Model PC-3A s/n 620 (W.R. Grace)

Background of detector before counting: α 7.0 β _____

Background of detector after counting: α 4.0 β _____

Efficiency of detector: α 42% β _____ Counted by: MM 6-5-74

SER. NO.	SAMPLE IDENTIFICATION		Alpha				Beta-Gamma						
			Ctg. Time	c/2m Gross	c/m Net	d/m	d/m/100cm ²	Ctg. Time	c/m Gross	c/m Net	d/m	d/m/cm ²	
0-168	9:00 A.M.	Sharples Collector Room-Gas Meter	2 min	52	20	48	+4.9						
169		Sharples Collector Room-Window Sill		26	14	34	+4.2						
170		Sharples Collector Room-Machine		13	1	2	+1.2						
171		Sharples Collector Room-Floor		12	0	0	+0.7						
172		Sharples Collector Room-Floor		26	14	34	+4.2						
173		Drying Rooms-Ledge		17	3	7	+2.0						
174		" " Floor		15	2	5	+1.7						
175		" " Hole in wall		10	0	0	+0.7						
176		" " Wall		14	1	2	+1.2						
177		" " Floor		21	5	12	+2.6						
178		Test Lab #2 Floor		37	12	28	+3.8						
179		" " " Storage Closet		31	19	46	+4.8						
180		" " " Floor		15	2	5	+1.7						
181		" " " Lab Sink		14	1	2	+1.2						
182		" " " Shelf		19	3	7	+2.0						
183		Conference Room #1-Bookshelf		19	3	7	+2.0						
184		Conference Room #1-Top of A/C		14	1	2	+1.2						
185		Conference Room #1-Floor		23	6	14	+2.7						
186		Conference Room #1-Floor		17	3	7	+2.0						
187		Conference Room #2-Window Sill		11	0	0	+0.7						
188		Conference Room #2-Phone		12	0	0	+0.7						
189		Conference Room #2-Wall		30	9	21	+3.3						
190		Conference Room #2-Door Jamb		30	9	21	+3.3						

APPLIED HEALTH PHYSICS, Inc.

Health Physics Laboratory Report: Analyses of Removable Contamination

Client: W.R. GRACE W.O. # _____ Date: 6-4-74 Page # 1 of 1

Description of survey: _____

Surveyed by: M. McClosky/R. Slayton Date: 6/3/74 Suspected Activity: Natural Thorium

Counted with: GM detector Scintillation detector Gas Proportional detector

Counter Mfg: NMC Model PC-3A s/n 620 (W.R. Grace)

Background of detector before counting: α 8.2 cpm β _____

Background of detector after counting: α 8.8 β _____

Efficiency of detector: α 42% β _____ Counted by: RJS 6-4-74

SER. NO.	SAMPLE IDENTIFICATION		Alpha				Beta-Gamma						
			Ctg. Time	c/2m Gross	c/m Net	d/m	d/m/100cm ²	Ctg. Time	c/m Gross	c/m Net	d/m	d/m/cm ²	
576	11:20 P.M.	Outside Work Shop-Bench	2 min	107	45	107	±7.4						
577		" " " Floor		77	30	77	±6.3						
578		" " " 5'5" Wall		33	8	19	±3.2						
579		" " " Wall Heater		106	45	106	±7.3						
580		" " " Floor		51	17	40	±4.6						
		Compressor Room- Ledge		24	4	8	±2.2						
582		" " Wall		25	4	10	±2.4						
583		" " Wall		50	17	39	±4.5						
584		" " Girder		80	32	75	±6.2						
585		" " Storage Floor		42	13	30	±3.9						
586		Ball Mill Lower Operation- Floor		85	34	81	±6.4						
587		Ball Mill Lower Operation- Window Sill		104	44	104	±7.3						
588		Ball Mill Lower Operation- Wall		57	20	48	±4.9						
589		Ball Mill 2nd Level Storage- Power Supply		91	37	88	±6.7						
590		Ball Mill 2nd Level Storage- Wall		48	16	37	±4.4						
591		Ball Mill 2nd Level Storage- Floor		30	7	15	±2.9						

TABLE I

RESULTS OF DECONTAMINATION RADIATION FINAL SURVEY

<u>Location</u>	<u>Reference</u>	<u>Beta-Gamma Meter Survey mR/hr</u>		<u>Alpha Removable Contamination DPM/100 cm²</u>	
		<u>average</u>	<u>high</u>	<u>average</u>	<u>high</u>
W. R. Grace Office, 2nd level, Main Bldg.	1-A	0.1	0.1	6±1.8	17±3
Lab #1, 2nd level, Main Bldg.	1-B	0.1	0.2	16±2.7	38±4.5
Floor Drain, 2nd level, Main Bldg.	1-B	0.4	0.6	---	19±3.2
Sample Preparation Room, 2nd level, Main Bldg.	1-C	0.1	0.1	11±2.3	19±3.2
Small Hallway, 2nd level, Main Bldg.	1-D	0.1	0.1	7±2.4	17±3
Men's Room, 2nd level, Main Bldg.	1-D	0.1	0.1	---	5±1.8
Ladies' Room, 2nd level, Main Bldg.	1-D	0.1	0.1	24±3.6	29±3.9
Empty Office, 2nd level, Main Bldg.	1-D	0.1	0.1	18±3	29±3.9
Grinding & Polishing Test Lab, 2nd level, Main Bldg.	1-E	0.05	0.4	9±2.1	19±3.2
Storage level, 2nd level, Main Bldg. against nailed door	1-F	0.2 ---	0.4 1.0	15±2.7 ---	29±3.9 ---
Press Room & Sulfonation Room, 2nd level, Main Bldg.	1-G	0.3	2.0 (back corner)	30±3.7	51±5.1
Test Lab #2, 2nd level, Main Bldg.	1-H	0.15	0.2	18±2.7	46±4.8

Continued on next page

TABLE I

RESULTS OF DECONTAMINATION RADIATION FINAL SURVEY

<u>Location</u>	<u>Reference</u>	<u>Beta-Gamma Meter Survey mR/hr</u>		<u>Alpha Removable Contamination DPM/100 cm²</u>	
		<u>average</u>	<u>high</u>	<u>average</u>	<u>high</u>
Conference Room #1, 2nd level, Main Bldg.	1-I	0.15	0.2	8 [±] 2.0	14 [±] 2.7
7-K Blending & Storage, 2nd level, Main Bldg.	1-J	0.15	0.2	7 [±] 1.8	12 [±] 2.6
Conference Room #2, 2nd level, Main Bldg.	1-K	0.15	0.25	11 [±] 2.0	21 [±] 3.3
Hallway, 2nd level, Main Bldg. stairs to 1st level	1-L	0.15 0.4	0.2 0.6	23 [±] 3.4 ---	24 [±] 3.5 ---
Shipping, Pulverizing, Cerium Oxide Storage, 1st level, Main Bldg.	1-M	0.1	0.4	15 [±] 2.8	34 [±] 4.2
Drying Rooms, 1st level, Main Bldg.	1-N	0.15	0.3	5.2 [±] 1.6	12 [±] 2.6
Furnace & Press Room, 1st level, Main Bldg. four drains	1-O	0.3 ---	0.7 1.0	2 [±] 1.3 ---	12 [±] 2.6 ---
Sharples Collector Room, 1st level, Main Bldg. two corners	1-P	0.3 ---	0.6 0.9	20 [±] 2.8 ---	48 [±] 4.9 ---
1 & 2 Sulfonation Tank Rooms, 1st level, Main Bldg. brick wall	1-Q	0.25 ---	0.7 1.0	30 [±] 3.9 ---	50 [±] 5.8 ---
7-K Bastacite Room, 1st level, Main Bldg.	1-R	0.2	0.7	4 [±] 1.6	19 [±] 3.2

Continued on next page

TABLE I

RESULTS OF DECONTAMINATION RADIATION FINAL SURVEY

<u>Location</u>	<u>Reference</u>	<u>Beta-Gamma Meter Survey mR/hr</u>		<u>Alpha Removable Contamination DPM/100 cm²</u>	
		<u>average</u>	<u>high</u>	<u>average</u>	<u>high</u>
Locker Room, 1st level, Main Bldg.	1-S	0.1	0.3	36±4.3	46±4.9
Boiler Room, 1st level, Main Bldg.	1-S	0.2	0.4	22±3.3	36±4.3
Machine Shop, 1st level, Main Bldg.	1-S	0.05	0.1	---	---
Workshop Bldg.	2-A	0.3	0.7	70±5.8	107±7.4
Ball Mill, 2nd level, Storage	2-B	0.3	(1.0-2.0) (drains)	47±4.7	88±6.7
Ball Mill, Lower Operation	2-C	0.5	1.0 (trench & concrete)	77±6.2	104±7.3
Compressor Bldg., 1st and 2nd levels small concrete slab	2-D	0.2 ---	0.6 2.0	32±3.8 ---	75±6.2 ---
Outside of Electronucleonic Storage	2-E	1.0	---	---	---

WASTE TREATMENT PLANT.

- A Clarifation 50,000 gal
- B Emergency storage 14,000 gal
- C Retention 50,000 gal
- D Mixer 2000 gal
- E Thickener 2000 gal
- F Filter House

RESIDUES.

- G Ore tailing + gangue
- H Yttrium + Silica sludges
- I Rewashed sludges
- J Waste treatment disposal
- K Thorium hydroxide
- L Carbonate cake
- M Yttrium concentrate

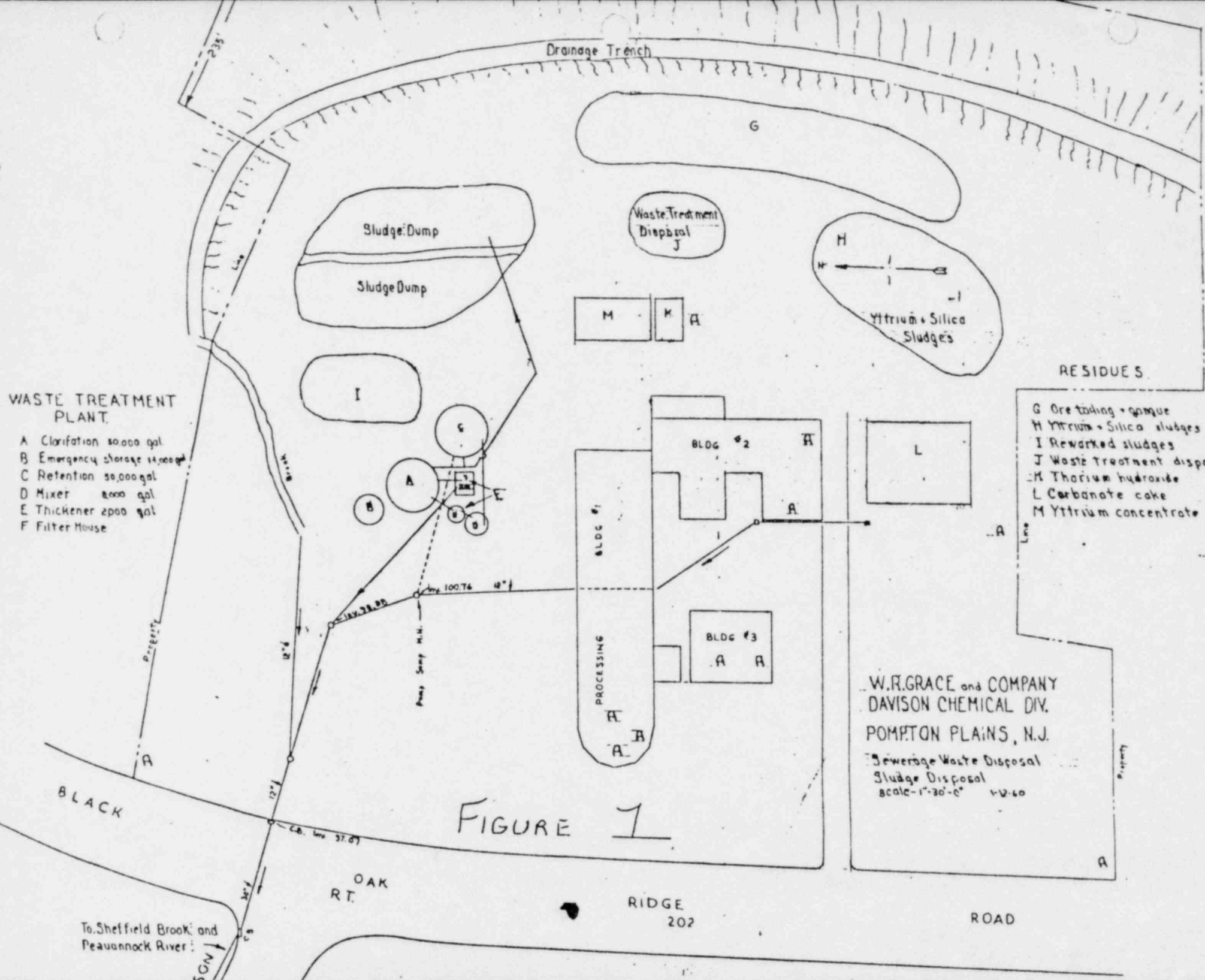


FIGURE 1

W.R.GRACE and COMPANY
 DAVISON CHEMICAL DIV.
 POMPTON PLAINS, N.J.
 Sewerage Waste Disposal
 Sludge Disposal
 scale-1"-30'-0" 1-12-60

To Sheffield Brook and
 Pequannock River