U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 040-09027/95-001

Docket No. 040-09027

License No. SMC-1562

Licensee: Cabot Corporation

Facility Name: Reading Pennsylvania Site

Inspection at: Tulpehocken Street
Reading, Pennsylvania

Inspection Conducted: January 18-19 and 24, 1995

Inspector: Stephen W. Holmes, Radiation Specialist — 14 FEB 95 date

Approved by: John D. Kinneman, Chief
Site Decommissioning Section — 2/14/95 date

Inspection Summary: Confirmatory survey inspection on January 18 and 19, 1995 (Inspection No. 040-09027/95-001).

Areas Inspected: Announced inspection limited to a confirmatory survey of the overhead and walls of the Main Processing Building at the licensee's Reading, Pennsylvania facility for residual uranium and thorium contamination prior to release of facility for unrestricted use. Eighty wipes were taken and assayed for removable uranium and thorium activity. The facility was surveyed and 160 direct readings were made to identify fixed surface contamination.

Results: Residual contamination was identified in two small areas during the inspection. Prior to the conclusion of the inspection on January 19, 1995, the licensee's contractor decontaminated these areas. The licensee's survey data accurately reflects the condition of the overhead and walls of the Main Processing Building at the licensee's Reading, Pennsylvania facility.

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DETAILS

1.0 Persons Contacted

* Anthony T. Campitelli, Manager, Environmental Affairs/Radiation Safety Officer, Cabot Corporation
* Karen A. Craig, Project Engineer, NES Inc.
Jeff Hetue, Health Physics Technician, NES Inc.
* Bill Needrith, Site Supervisor, NES Inc.
Mike Pries, Health Physics Technician, NES Inc.
Mark Wachowski, Health Physics Technician, NES Inc.
*# Dennis W. Reisenweaver, Manager, Radiological Services Department, NES Inc.

* denotes those present at exit interview
*# contacted by telephone on January 19, 1995

2.0 Background

From April 1967 through May 1968 a predecessor to the Cabot Corporation operated an ore processing plant at this site in Reading, Pennsylvania. An electric arc furnace in the Main Processing Building at the site was used to increase the percentage of tantalum in low grade ore. During this process the naturally occurring thorium and uranium in the ore became incorporated into the silica slag. The slag was cooled, dumped onto the floor, broken into chunks, and disposed of as waste in the nearby slag pile.

Two previous decontamination efforts have been made to remediate the site for unrestricted release. Both times the conclusion of an ORISE confirmatory radiological survey conducted for the NRC was that the Main Processing Building and surrounding area did not satisfy NRC guidelines for release for unrestricted use.

At present the site is abandoned and the structures deteriorated. Cabot Corporation hired NES Inc. to perform decommissioning of the Reading site (excluding the slag pile itself) so that it would be suitable for release for unrestricted use. Upon successful decontamination by NES Inc. and release by the NRC for unrestricted use, the building is scheduled to be razed and the metal salvaged.

3.0 Instruments Used in Survey

Fixed surface contamination was measured with an Eberline Smart Portable microcomputer-based, scaler/ratemeter (ESP-2, NRC Serial No. 21940) coupled to a Model HP-260 Geiger-Muller (GM) detector (NRC Serial No. 021942) or an AC-3 Alpha Scintillation probe (NRC Serial No. 12572). The ESP-2 and both probes were calibrated with a National Institute of Science and Technology (NIST) traceable standard. The AC-3 probe has an effective detection area of 59 square centimeters (cm^2) and an efficiency of 8.8 % for thorium with a lower limit of detection (LLD) of 161 disintegrations (dpm) per 100 cm^2 for a one minute count. The HP-260 probe has an effective detection area of 15 cm^2 and an efficiency

of 26.5% for cesium-137 with a LLD of between 586 and 699 dpm per 100 cm^2 for a one minute count (background increased form 19.5 to 29 cpm over the length of the survey). Background was evaluated and recorded on each day of use. Since thorium has a lower guideline than uranium and since the alpha efficiencies are equivalent, the thorium guideline was used for all analyses.

Removable contamination samples were taken with dry filter paper over an area of approximately 100 cm^2. After each wipe was taken, the filter paper was placed inside an individual envelope to prevent cross contamination. Some wipes covered areas larger than 100 cm^2; however, all results are given in dpm per 100 cm^2. Wipes were counted for 10 minutes on a Tennelec LB 5100 gas flow proportional counter at the Region I Office for gross alpha/beta with a LLD of 5 dpm alpha and 8 dpm beta for a ten minute count at 95% confidence for type 1 and type 2 errors. Results are reported in dpm per wipe at an uncertainty of one sigma.

4.0 Review of NES Inc. Final Survey Data

The inspector reviewed the final survey data provided by NES Inc. of the overhead and walls and evaluated the survey point locations, the number of readings and wipes taken, and the survey results. The data consisted of thirty survey points in each of the eight unaffected overhead and the six unaffected wall grids. Thirty two points were taken in the three small affected areas identified in the overhead. Two one minute counts (one for alpha and one for beta/gamma) and one wipe were taken at each point.

Based on the NRC-approved Decommissioning Plan and the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" (the "Guidelines"), the inspector determined that the number and locations of survey points were appropriate. The results of the individual counts and wipes were all below the guideline numbers and there were no anomalous readings or atypical trends.

5.0 Survey Design

Prior to the confirmatory survey, the inspector reviewed the licensee's final survey data in order to identify areas within the facility to be surveyed. The inspector elected to survey all areas of the facility due to the identification of contamination levels in excess of NRC guidelines for unrestricted use in the two previous confirmatory surveys. A confirmatory survey is usually expected to address approximately 10% of the points taken by the licensee. This survey covered 16.4 % in the unaffected area and 30.5% in the three affected areas. At each survey point one minute counts were taken for both alpha and beta/gamma surface contamination and a wipe was taken for removable contamination.

6.0 Survey for Removable Contamination

The inspector took 69 wipes on various surfaces in the fourteen unaffected overhead and wall grids and 11 wipes in the three small affected overhead areas. Removable contamination results and survey location diagrams are provided for each area surveyed in Appendix 1 and 2 at the end of this report, respectively.

The Guidelines provide the criteria for determining whether a facility may be released for unrestricted use. The removable contamination criteria in these Guidelines for natural thorium are no more than 200 dpm/100 cm^2.

Based on the removable contamination survey results, no area in excess of a Guideline value was identified.

7.0 Survey for Surface Contamination

Surface contamination was monitored with the Eberline ESP-2 in the ratemeter mode coupled sequentially to the HP-260 probe and the AC-3 Alpha Scintillation probe at the spots where wipes were taken.

During the inspection, two locations with elevated surface contamination levels were identified by the inspectors. The two elevated contamination levels were located in affected areas previously surveyed by the licensee. Location # 41 was found to read 1,986 dpm/100cm^2 and location # 47 was found to read 1,458 dpm/100cm. The licensee promptly performed decontamination of these areas. The contaminated surface area identified in each case was less than one hundred square centimeters. The inspector re-surveyed the remediated areas and concluded that the licensee's decontamination efforts were successful in reducing the contamination to less than the average value in the Guidelines.

Surface contamination (removable plus fixed) results and locations are provided for each area surveyed in Appendix 1 and 2 at the end of this report, respectively. With regard to the two areas remediated by the licensee, the measurements presented in Appendix 1 represent the radiation levels following remediation.

The total contamination criteria in the Guidelines for thorium are 1,000 dpm/100 cm^2 averaged over an area not to exceed one square meter. A maximum contamination level of 3,000 dpm/100 cm^2 is allowed over an area not to exceed 100 cm^2. Based on the results of the surface contamination survey, no area in excess of a Guideline value was identified.

8.0 Oak Ridge Institute for Science and Education (ORISE) Survey

On January 24, 1995 the inspector visited the site to observe the confirmatory survey being performed by ORISE and to verify that the ORISE survey, which covered the outdoor soil and the interior floor of the process building, combined with the inspector's survey, documented in this report, would encompass the entire site. The inspector, through discussion with the ORISE staff and observation of their survey activities, confirmed that the consolidated surveys would cover the whole site. No safety concerns were identified.

9.0 Exit Interview

The inspector met with the licensees representatives listed in Section 1.0 of this report and discussed the scope and findings of this inspection. They acknowledged the inspection findings.

Appendix 1
Survey Results

Location: Overhead Grid # 20

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
1	I-Beam	< LLD	< LLD	<586
2	I-Beam	< LLD	< LLD	<586
3	I-Beam	< LLD	< LLD	<586
4	I-Beam	< LLD	< LLD	<586
5	I-Beam	< LLD	< LLD	<586

Location: Overhead Grid # 21

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
6	I-Beam	< LLD	< LLD	<586
7	I-Beam	< LLD	< LLD	<586
8	I-Beam, at NES survey point	< LLD	< LLD	<586
9	I-Beam	< LLD	< LLD	<586
10	I-Beam	< LLD	< LLD	<586

Location: Overhead Grid # 23

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
11	I-Beam, at NES survey point	< LLD	< LLD	<586
12	I-Beam at Crane	< LLD	< LLD	<586
13	I-Beam	< LLD	< LLD	<586
14	Top of I-Beam	< LLD	< LLD	<586
15	Bottom of I-Beam	< LLD	< LLD	<586

[1]Removable contamination in dpm/100 cm^2
[2]Surface contamination (fixed and removable) in dpm/100 cm^2

Location: Overhead Grid # 22

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
16	I-Beam	< LLD	< LLD	<586
17	Side of I-Beam	< LLD	< LLD	<586
18	I-Beam	< LLD	< LLD	<586
19	I-Beam at building peak	< LLD	< LLD	<586
20	Door top	< LLD	< LLD	<586

Location: Overhead Grid # 24

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
21	Side of I-Beam	< LLD	< LLD	<586
22	I-Beam	< LLD	< LLD	<586
23	I-Beam	< LLD	< LLD	<586
24	I-Beam	< LLD	< LLD	<586
25	I-Beam	< LLD	< LLD	<586

Location: Overhead Grid # 26

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
26	I-Beam	< LLD	< LLD	<586
27	I-Beam	< LLD	< LLD	<586
28	I-Beam	< LLD	< LLD	<586
29	I-Beam	< LLD	< LLD	968 $\pm$ 39
30	I-Beam	< LLD	< LLD	<586

[1]Removable contamination in dpm/100 cm^2
[2]Surface contamination (fixed and removable) in dpm/100 cm^2

Location: Overhead Grid # 27

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
31	I-Beam	< LLD	< LLD	<586
32	I-Beam	< LLD	< LLD	<586
33	I-Beam	< LLD	< LLD	<586
34	I-Beam	< LLD	< LLD	<586
35	I-Beam	< LLD	< LLD	<586

Location: Overhead Grid # 25

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
36	I-Beam	< LLD	< LLD	<586
37	I-Beam	< LLD	< LLD	<586
33	I-Beam	< LLD	< LLD	<586
39	I-Beam	< LLD	< LLD	<586

Location: Affected I-Beam D 28-27

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
40	I-Beam at NES survey point	< LLD	< LLD	<699
41	I-Beam at NES survey point	< LLD	8 ± 3	<699
42	I-Beam	< LLD	< LLD	<699

[1]Removable contamination in dpm/100 cm^2
[2]Surface contamination (fixed and removable) in dpm/100 cm^2

Location: Affected I-Beam D 26-25

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
43	I-Beam at NES survey point	< LLD	< LLD	<699
44	I-Beam at NES survey point	< LLD	< LLD	<699
45	I-Beam at NES survey point	7 ± 2	12 ± 3	<699

Location: Affected I-Beam E 17-23

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
46	I-Beam	< LLD	< LLD	<699
47	I-Beam at NES survey point	< LLD	< LLD	<699
48	I-Beam	< LLD	< LLD	<699
49	I-Beam at NES survey point	< LLD	< LLD	<699
50	I-Beam	< LLD	< LLD	<699

[1]Removable contamination in dpm/100 cm^2
[2]Surface contamination (fixed and removable) in dpm/100 cm^2

Location: Interior Wall Grid # 1

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
51	Brick wall	< LLD	< LLD	<699
52	Brick wall	< LLD	< LLD	<699
53	Brick wall	< LLD	< LLD	<699
75	Brick wall	< LLD	< LLD	805 ± 39
76	Concrete wall	< LLD	< LLD	<699

Location: Interior Wall Grid # 2

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
54	Wall	< LLD	< LLD	<699
55	Wall	< LLD	< LLD	<699
56	Wall	< LLD	< LLD	<699
77	Wall	< LLD	< LLD	<699
78	Corrugated metal wall	< LLD	< LLD	<699

Location: Interior Wall Grid # 3

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
57	Wall	< LLD	< LLD	<699
58	Wall	< LLD	< LLD	<699
59	Brick wall	< LLD	< LLD	855 ± 39
79	Wall I-Beam	< LLD	< LLD	<699
80	Wall	< LLD	< LLD	<699

[1]Removable contamination in dpm/100 cm^2
[2]Surface contamination (fixed and removable) in dpm/100 cm^2

Location: Interior Wall Grid # 4

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
60	Corrugated metal wall	< LLD	< LLD	<699
61	Wall	< LLD	< LLD	<699
62	Wall	< LLD	< LLD	<699
68	Brick wall	< LLD	< LLD	<699
69	Brick wall	< LLD	< LLD	830 ± 39

Location: Interior Wall Grid # 5

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
63	Wall	< LLD	< LLD	<699
64	Wall	< LLD	21 ± 3	<699
65	Corrugated metal wall	< LLD	< LLD	<699
70	Brick wall	< LLD	< LLD	855 ± 39
71	Wall	< LLD	< LLD	<699

Location: Interior Wall Grid # 6

Wipe Number	Location	Alpha[1]	Beta[1]	Survey[2]
66	Wall	< LLD	< LLD	<699
67	Wall	< LLD	< LLD	<699
72	Garage door	< LLD	< LLD	<699
73	Wall	< LLD	< LLD	<699
74	Brick wall	< LLD	< LLD	<699

[1]Removable contamination in dpm/100 cm^2
[2]Surface contamination (fixed and removable) in dpm/100 cm^2

Appendix 2

Survey Point Location Diagrams

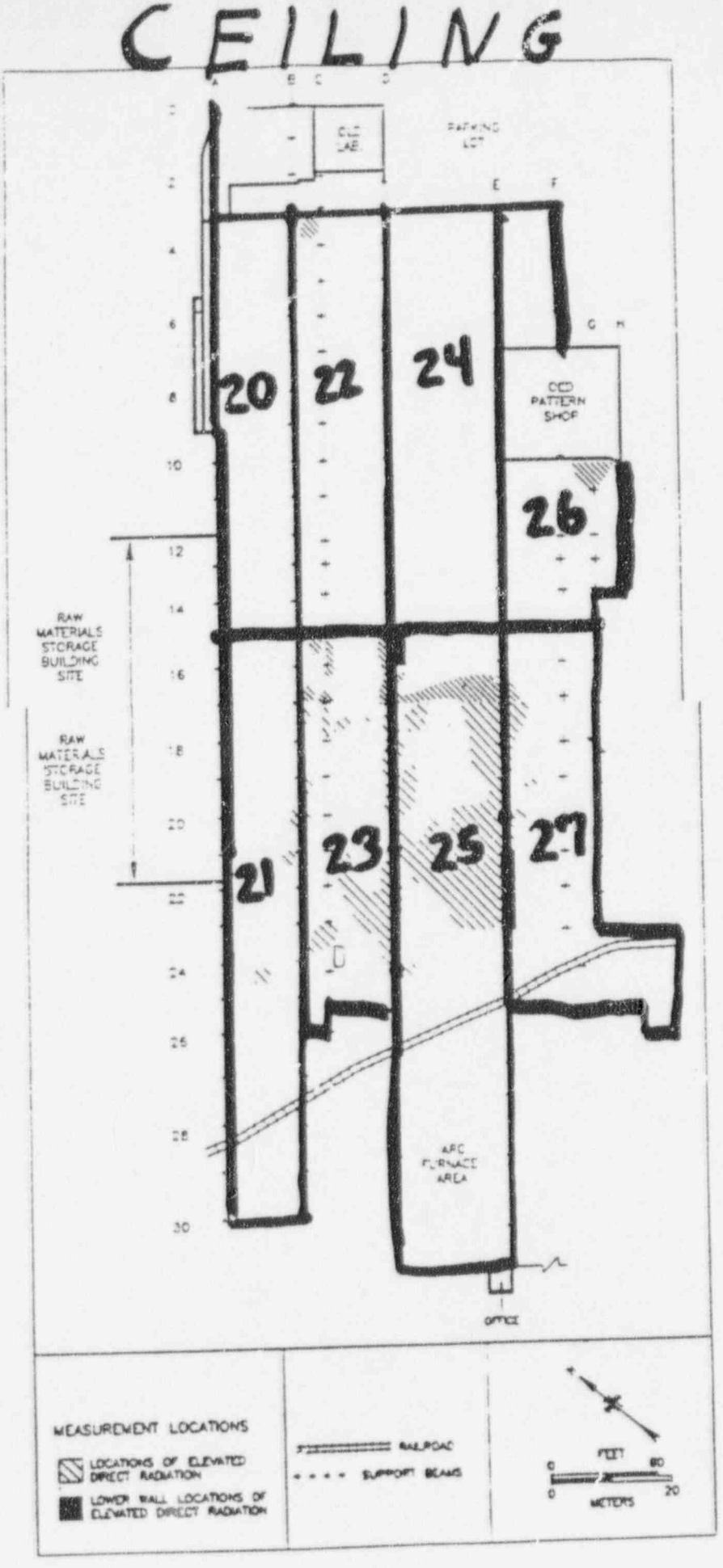
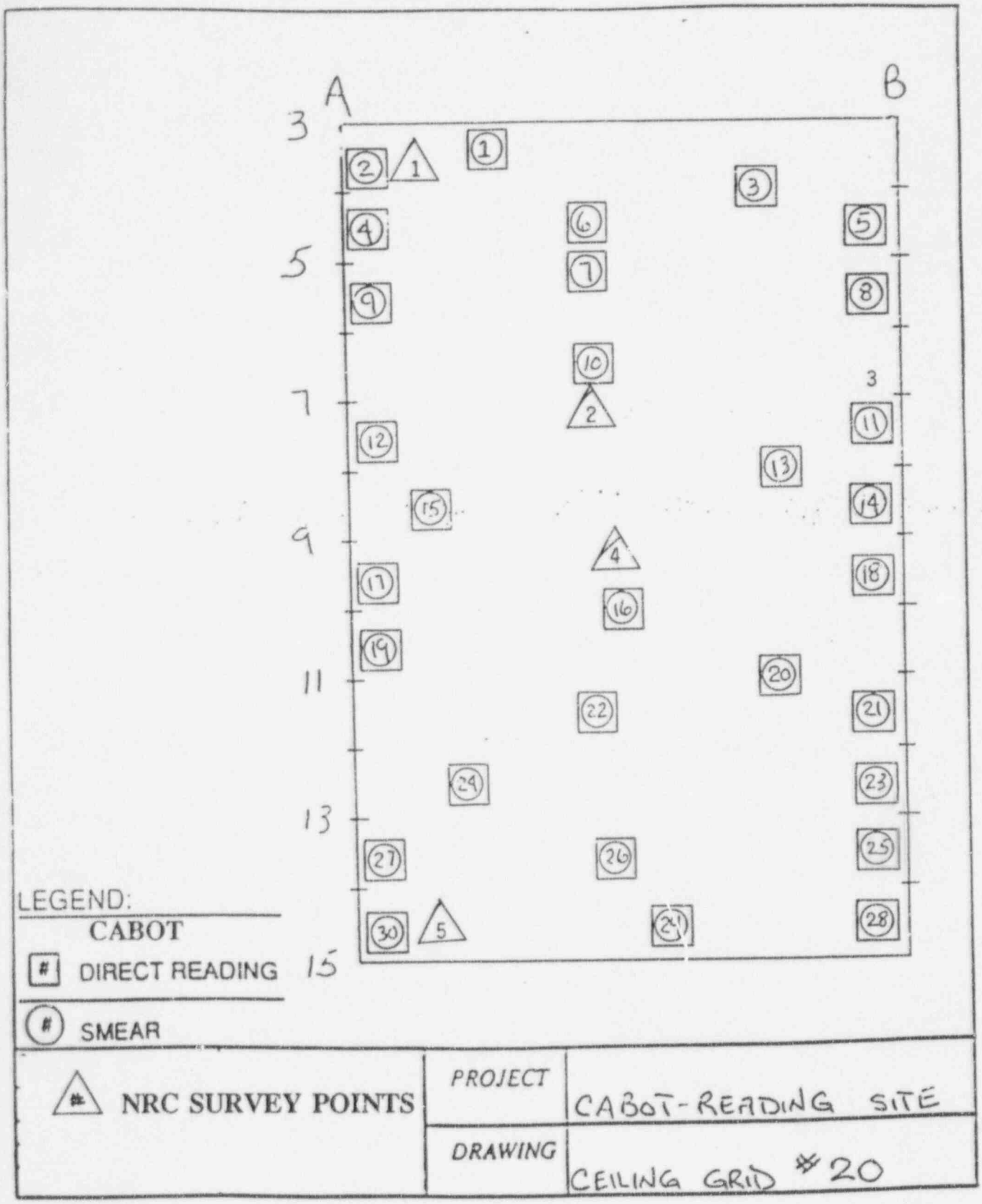


FIGURE 7. Processing Building, South Section -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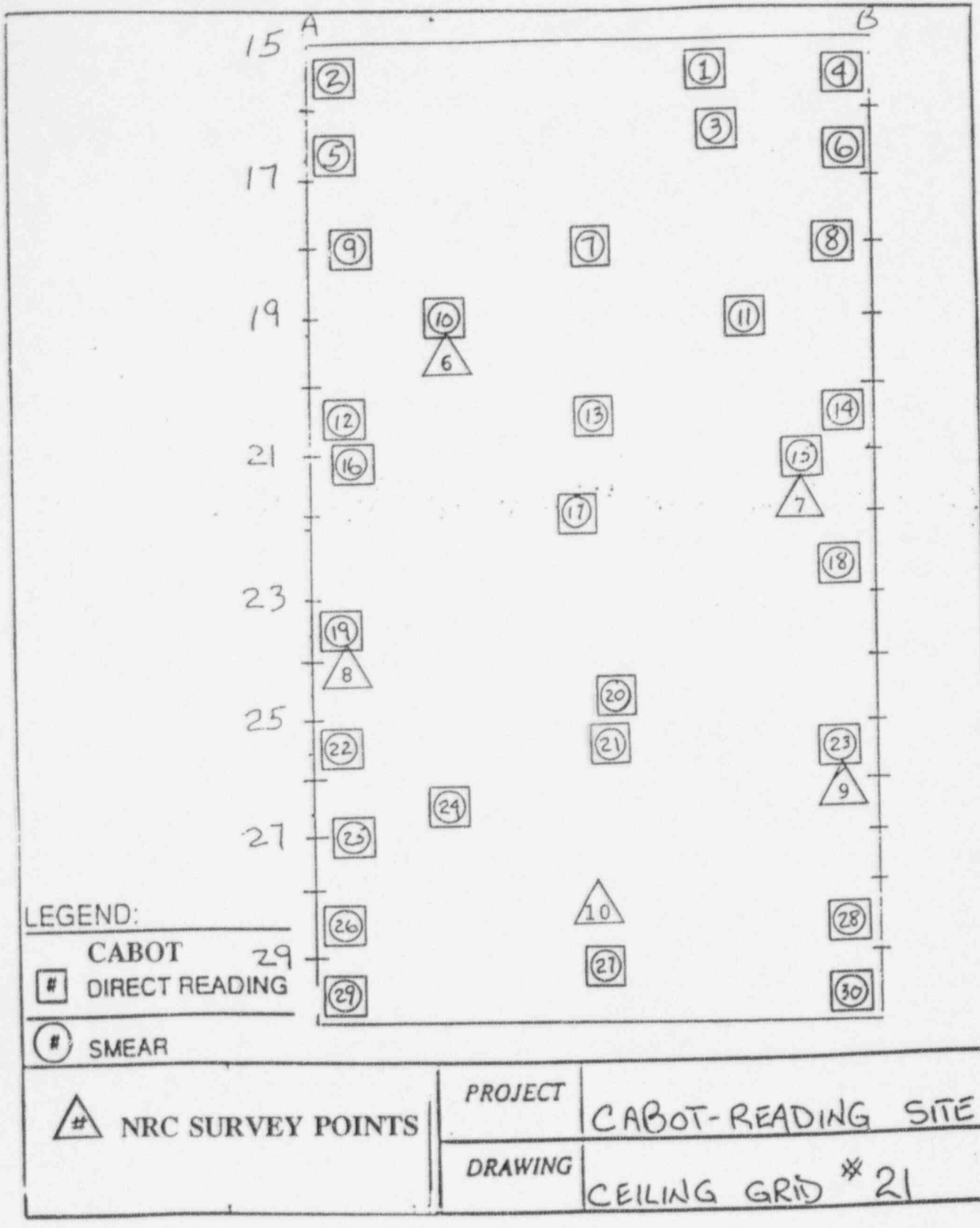
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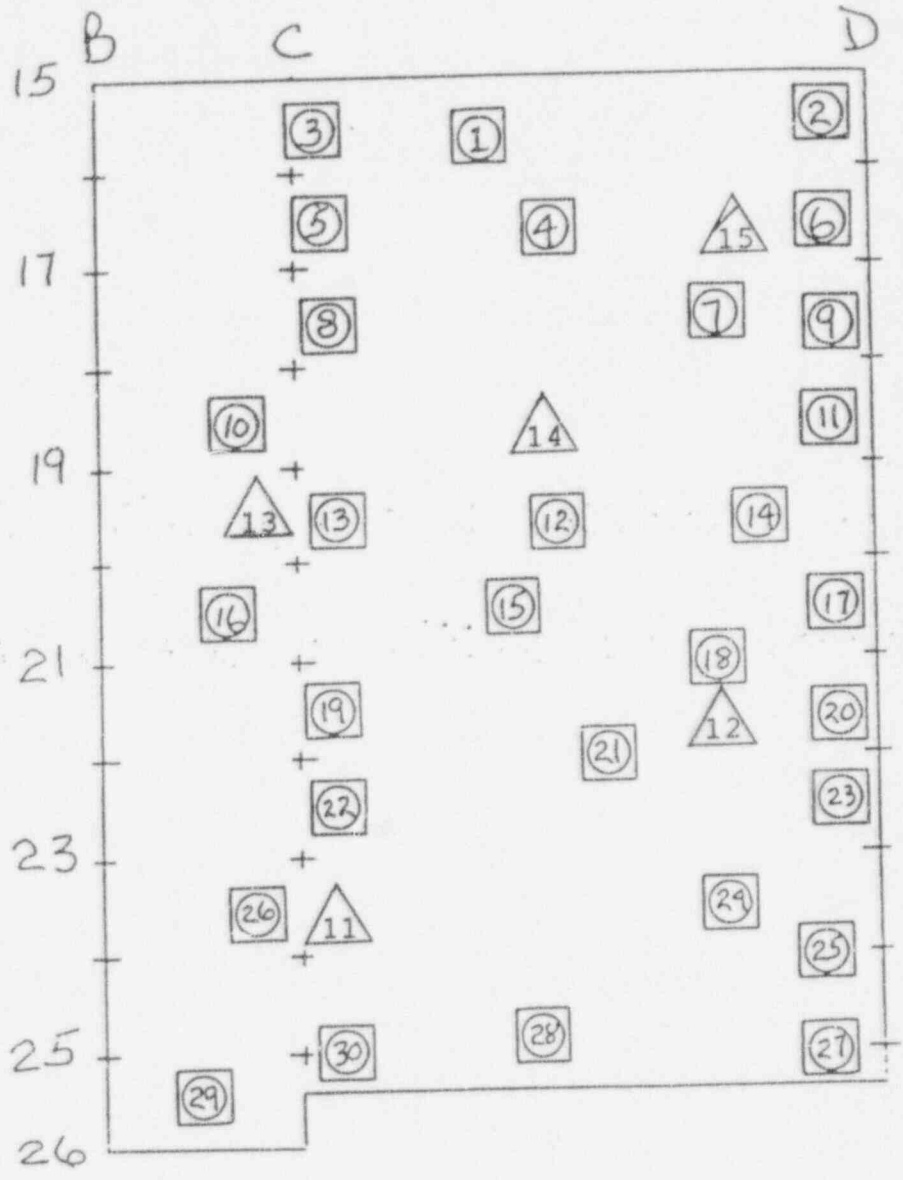

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CABOT
[#] DIRECT READING

(#) SMEAR

△# NRC SURVEY POINTS	PROJECT	CABOT-READING SITE
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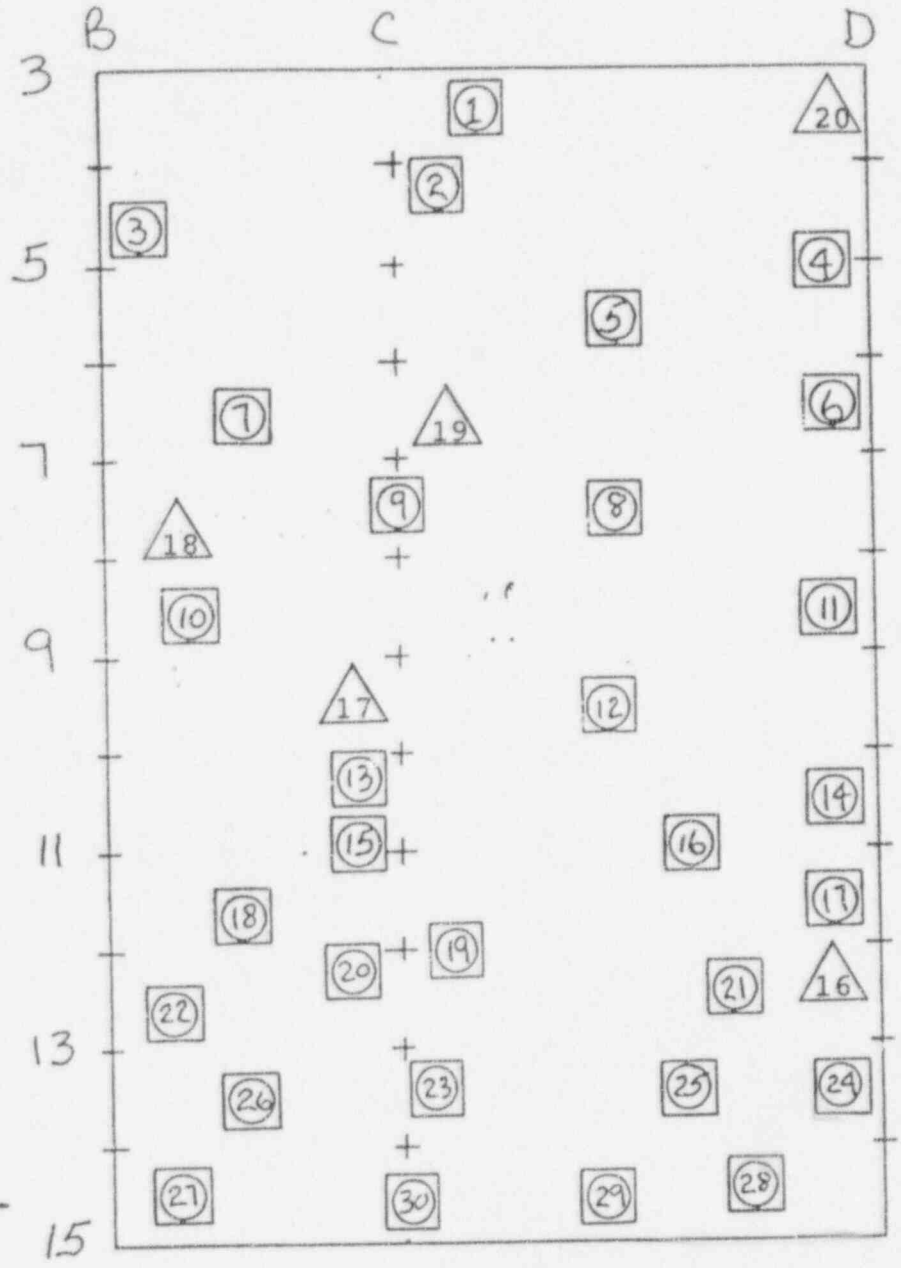

LEGEND:

CABOT

[#] DIRECT READING

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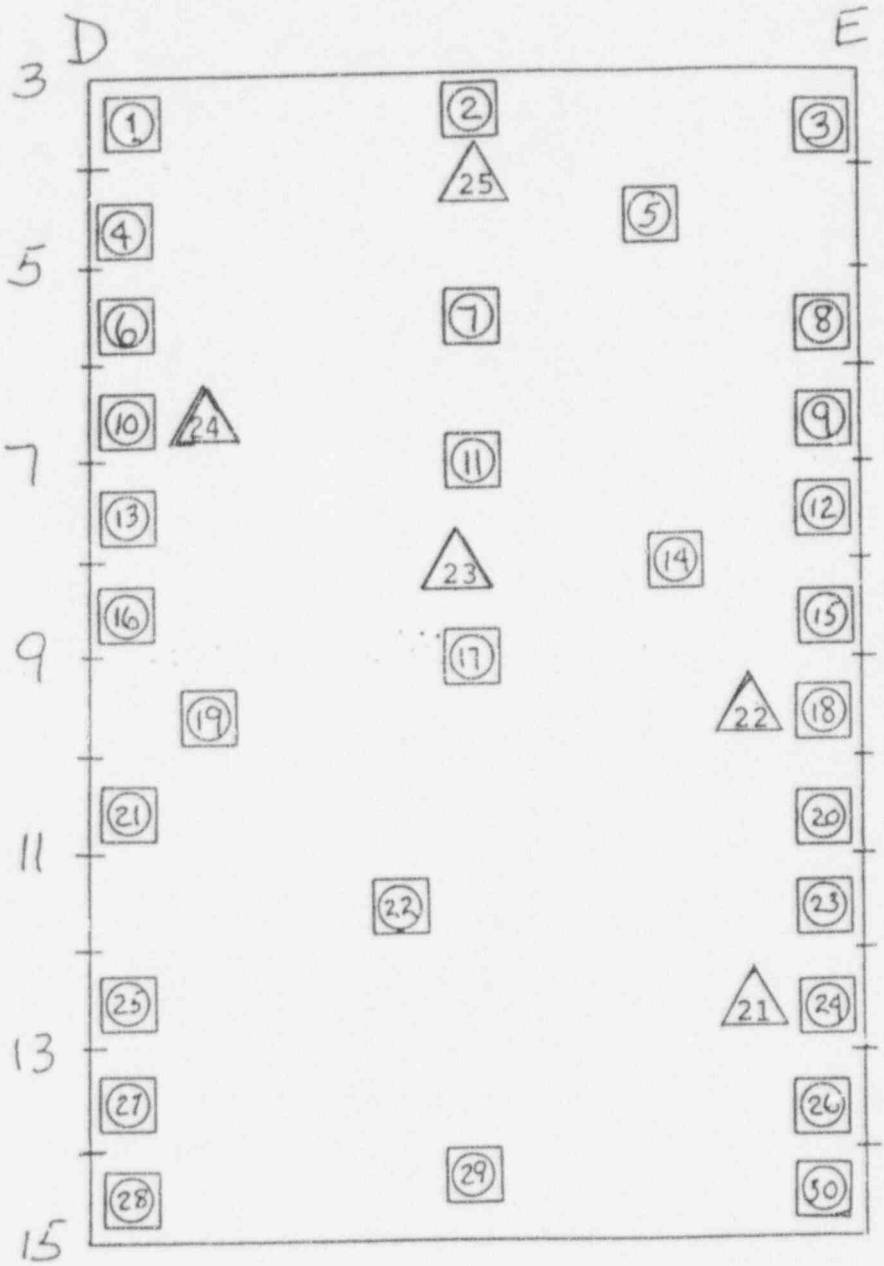

LEGEND:

CABOT

[#] DIRECT READING

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NRC SURVEY POINTS

PROJECT	CABOT-READING SITE
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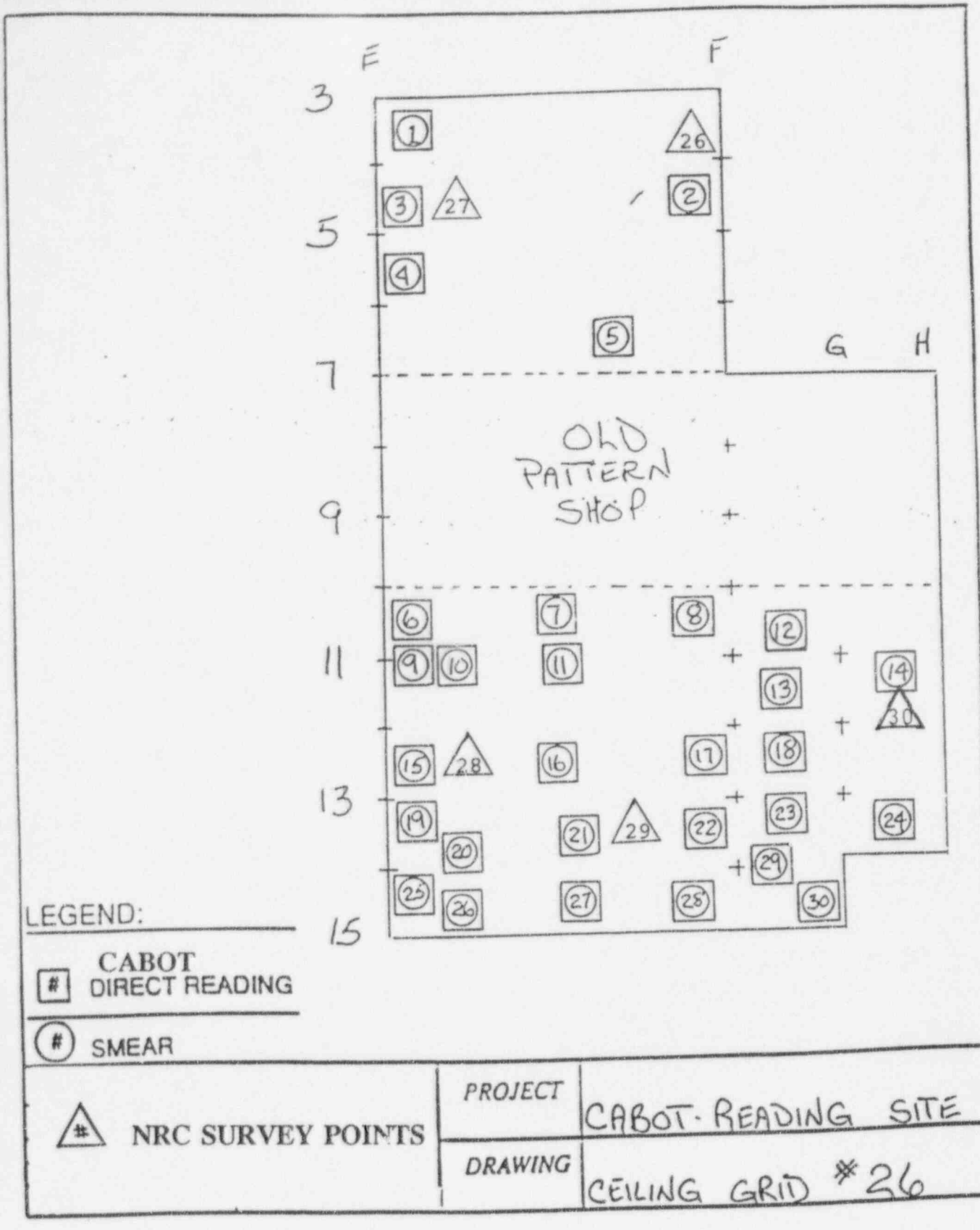
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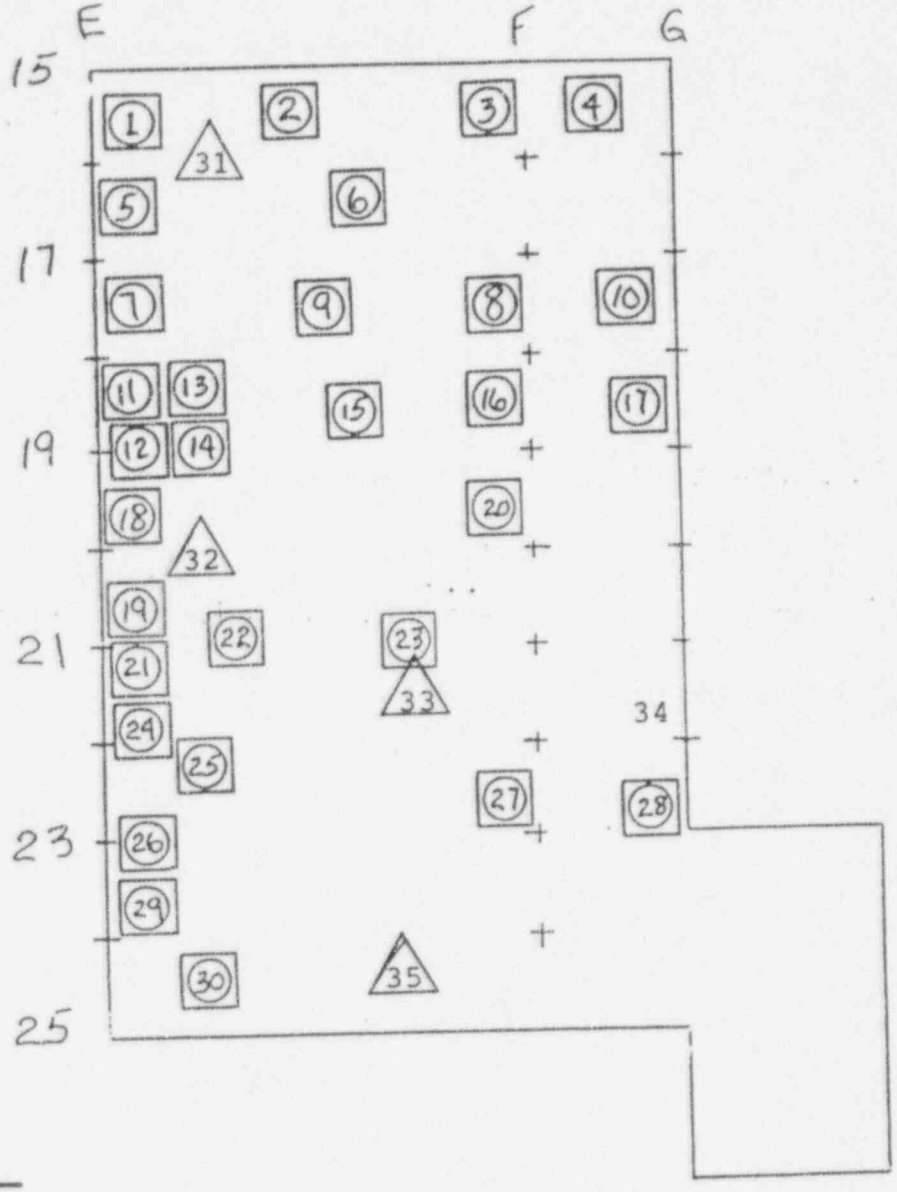

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△# NRC SURVEY POINTS

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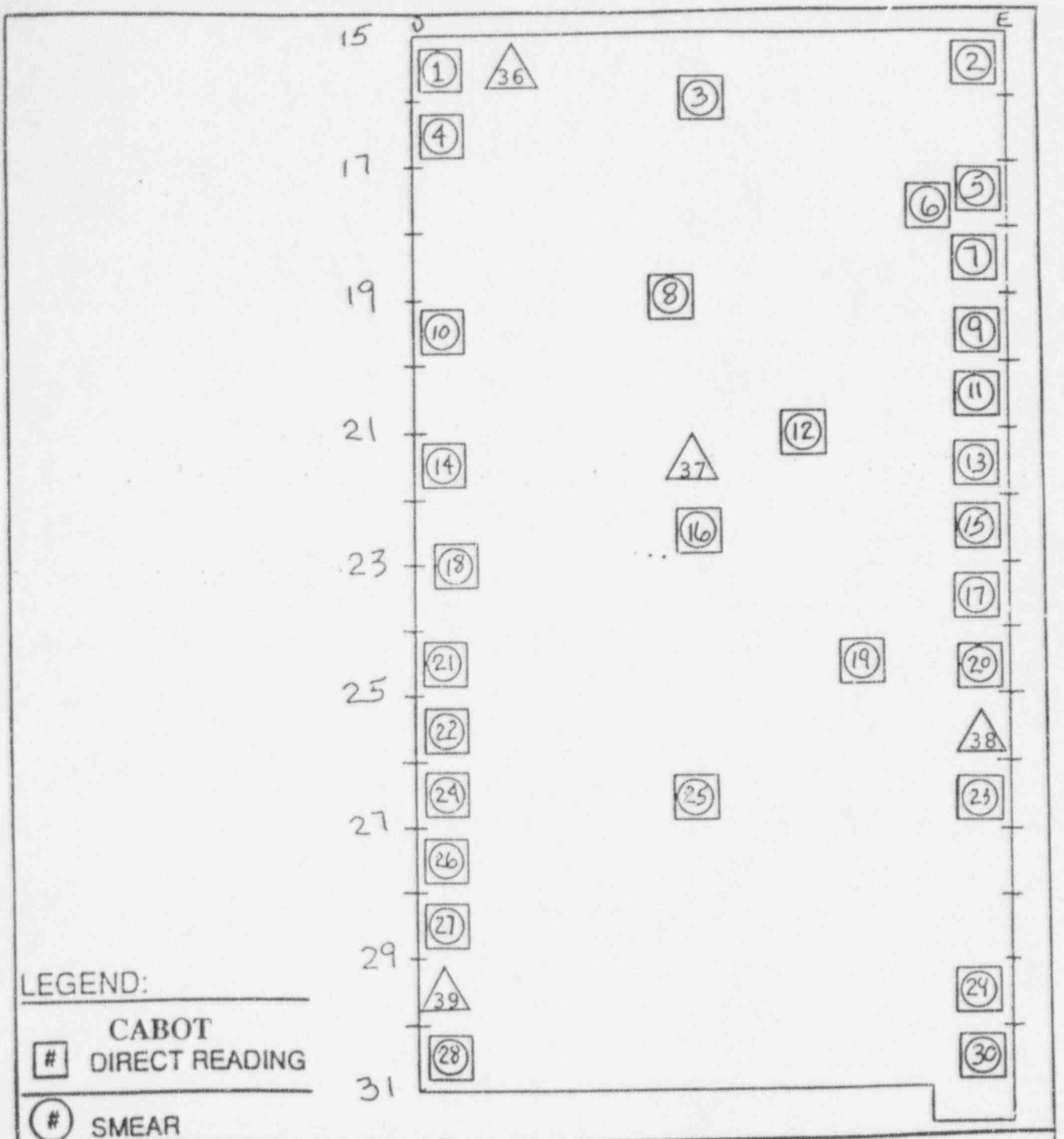
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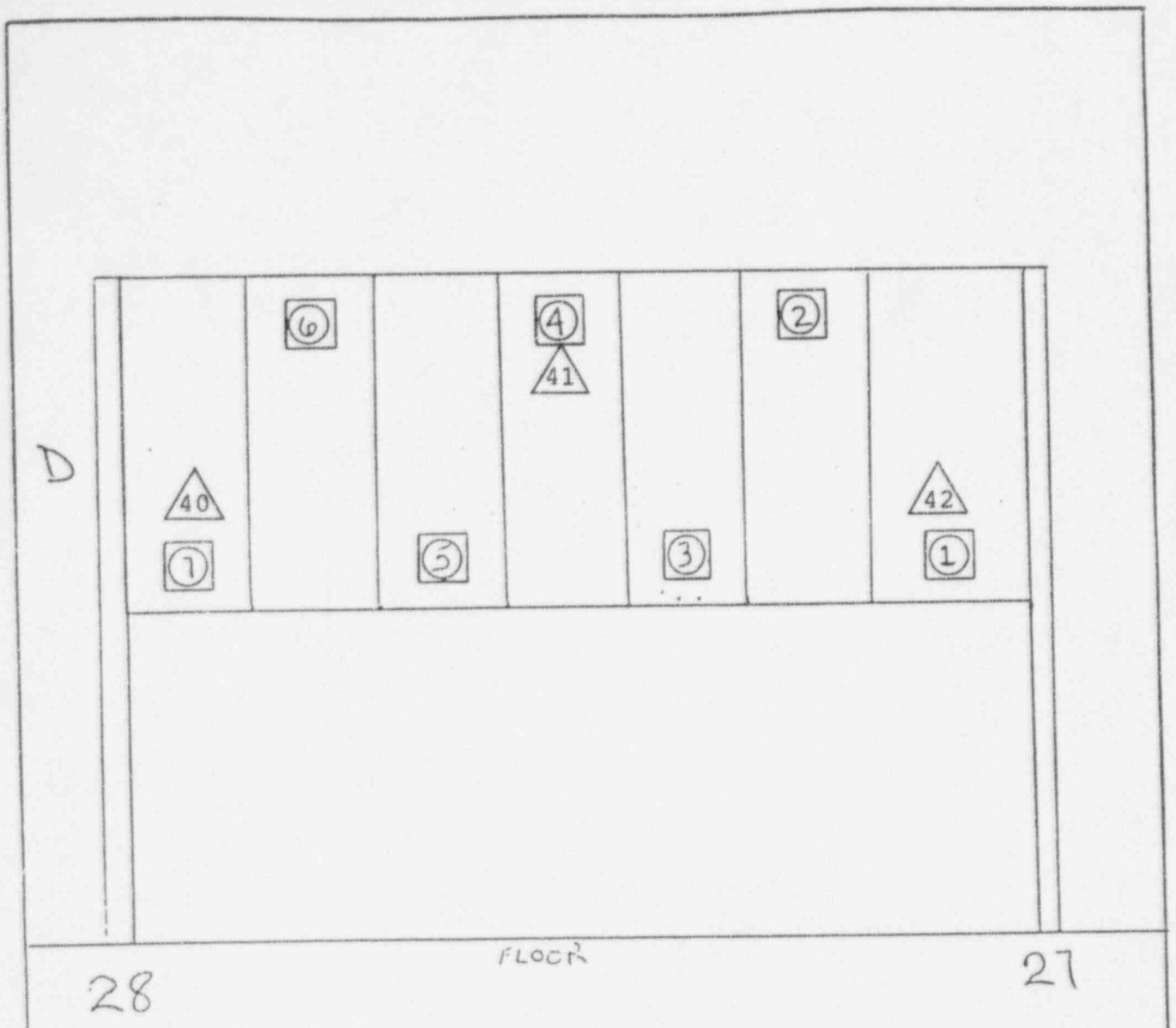

LEGEND:

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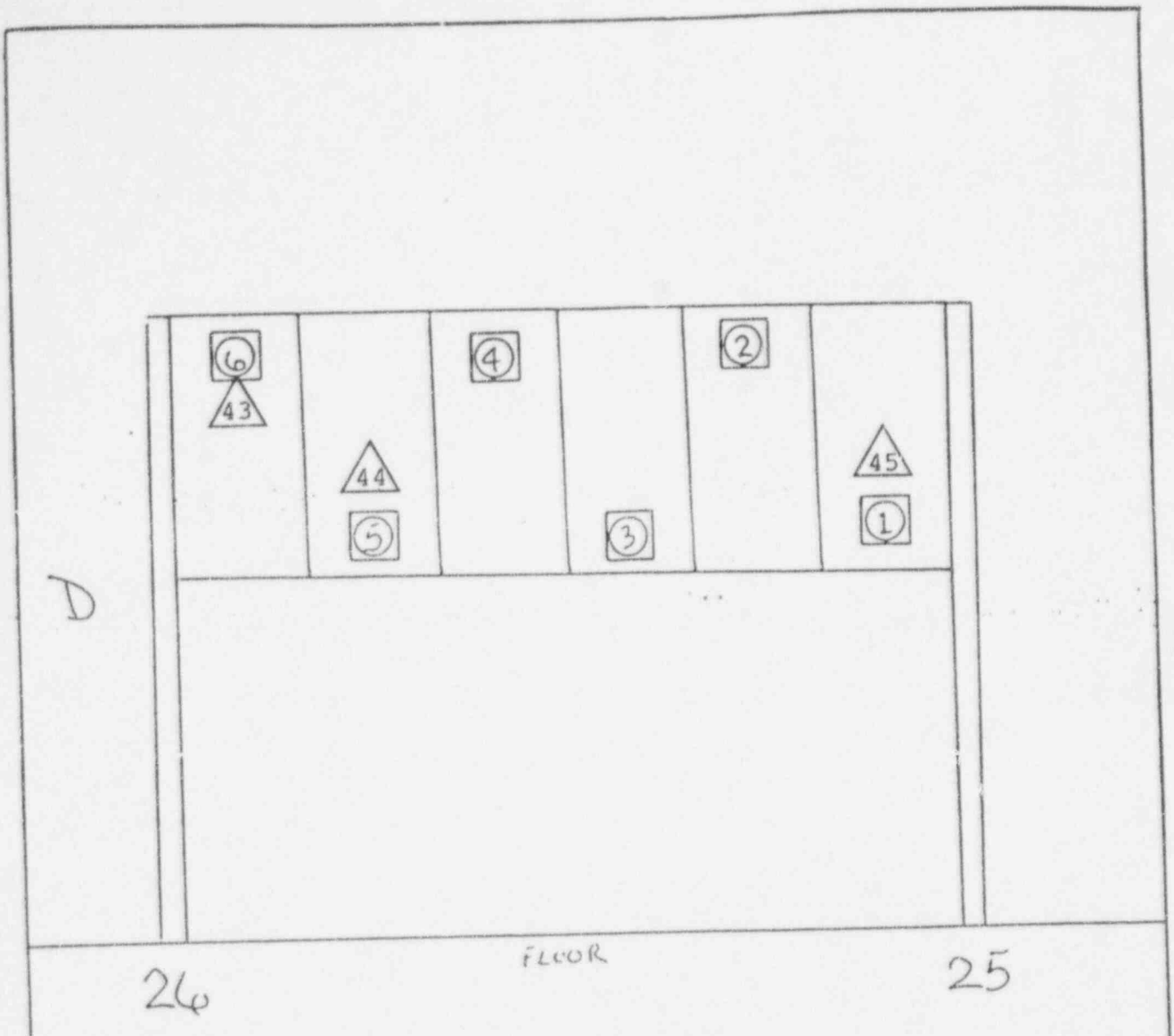
△# NRC SURVEY POINTS

PROJECT	CABOT- READING SITE
DRAWING	AFFECTED BEAM D 28-27



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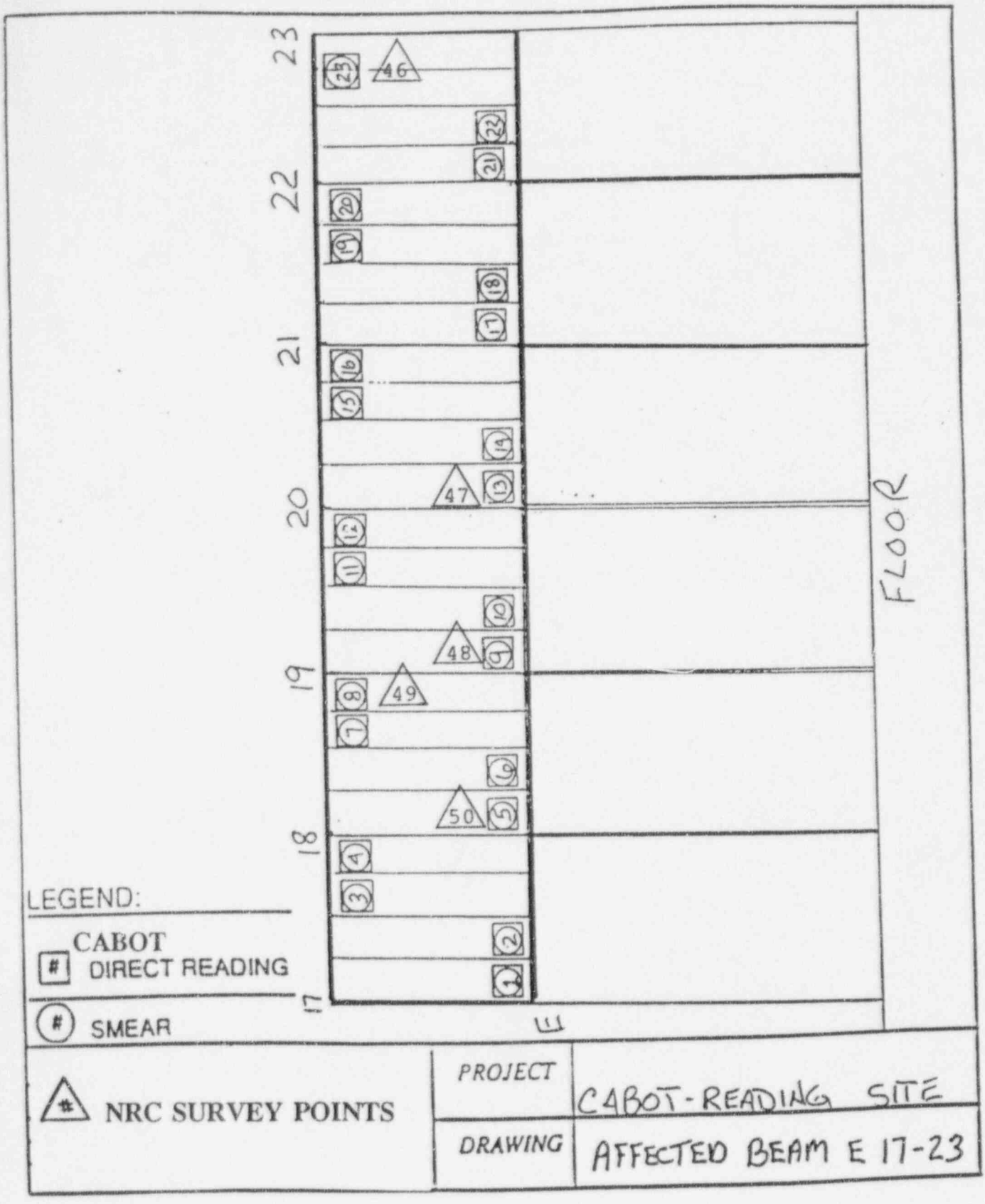
PROJECT	CABOT READING SITE
DRAWING	AFFECTED BEAM D 26-25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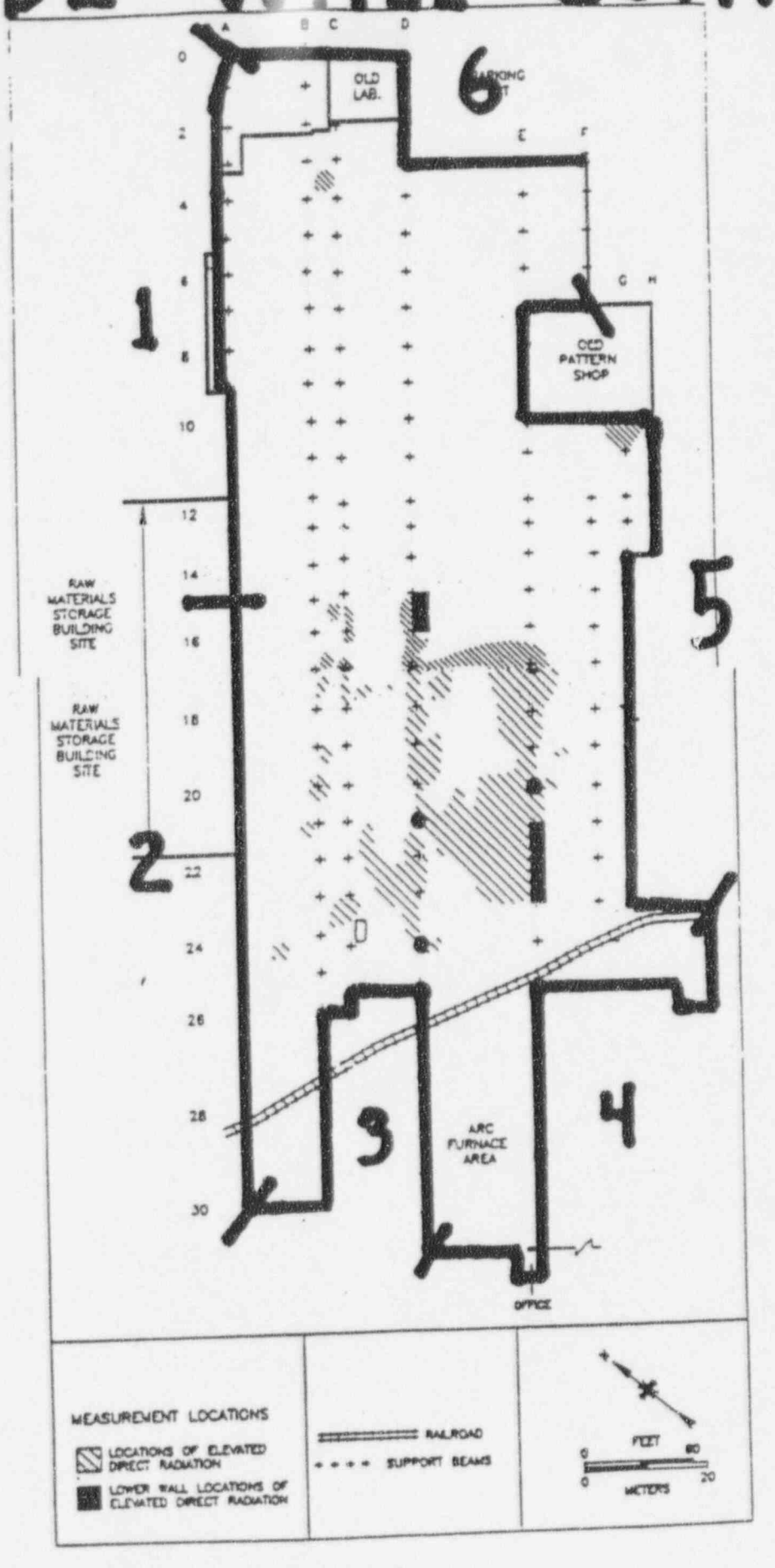
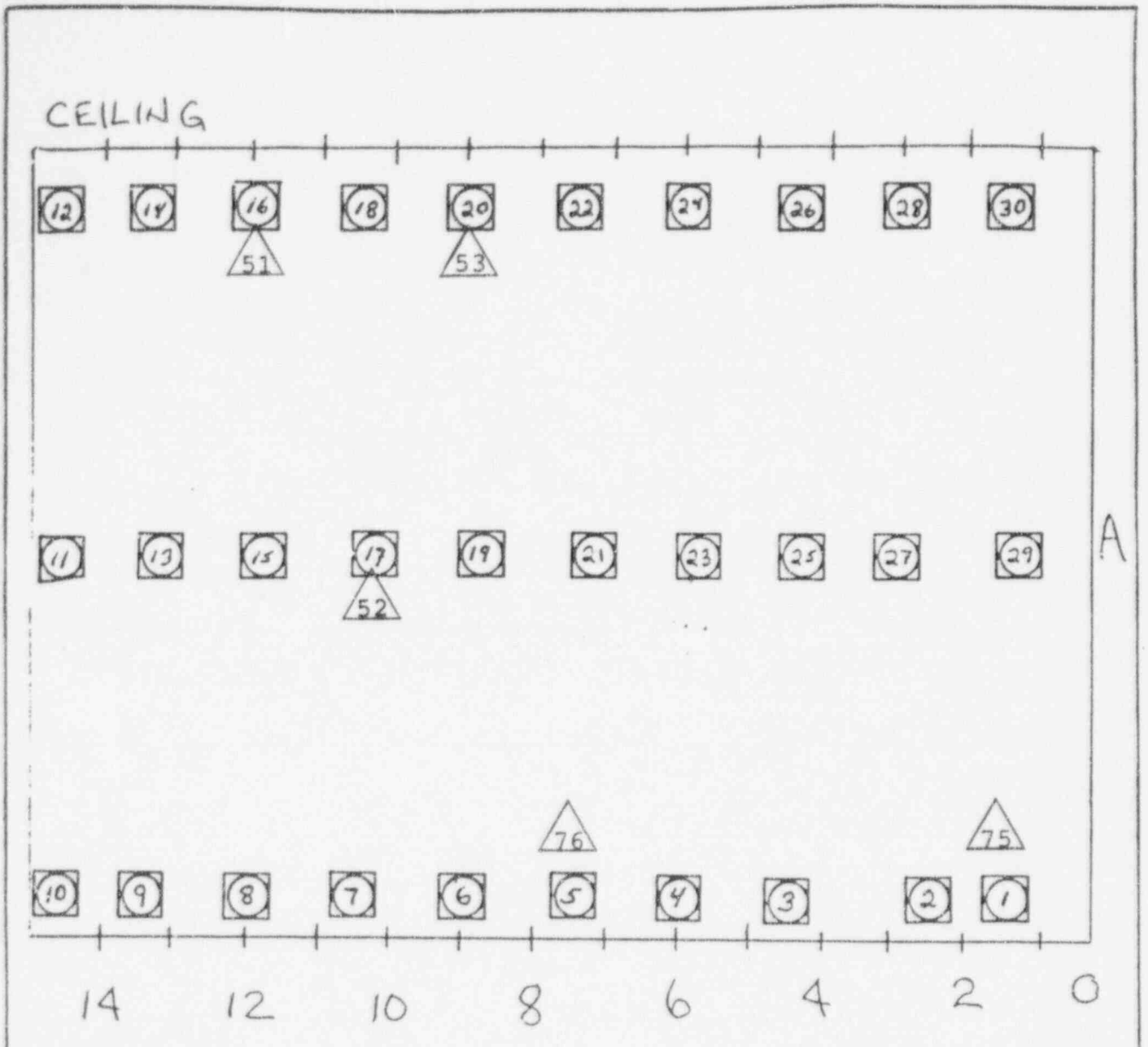
INSIDE WALL SURVEY



Processing Building, South Section -



LEGEND:

CABOT

[#] DIRECT READING

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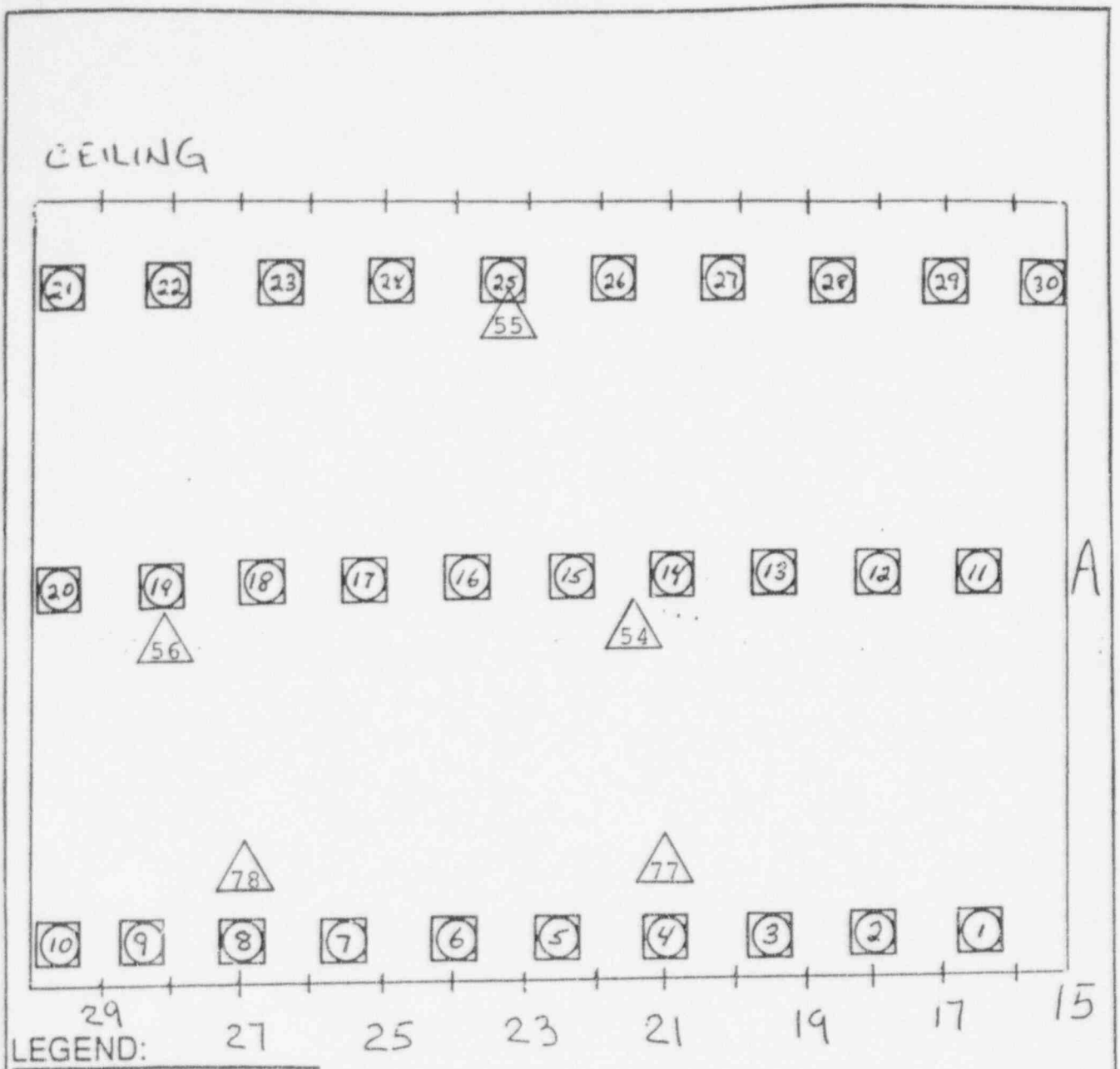
(#) NRC SURVEY POINTS	PROJECT	CABOT-READING SITE
	DRAWING	INTERIOR WALL GRID #1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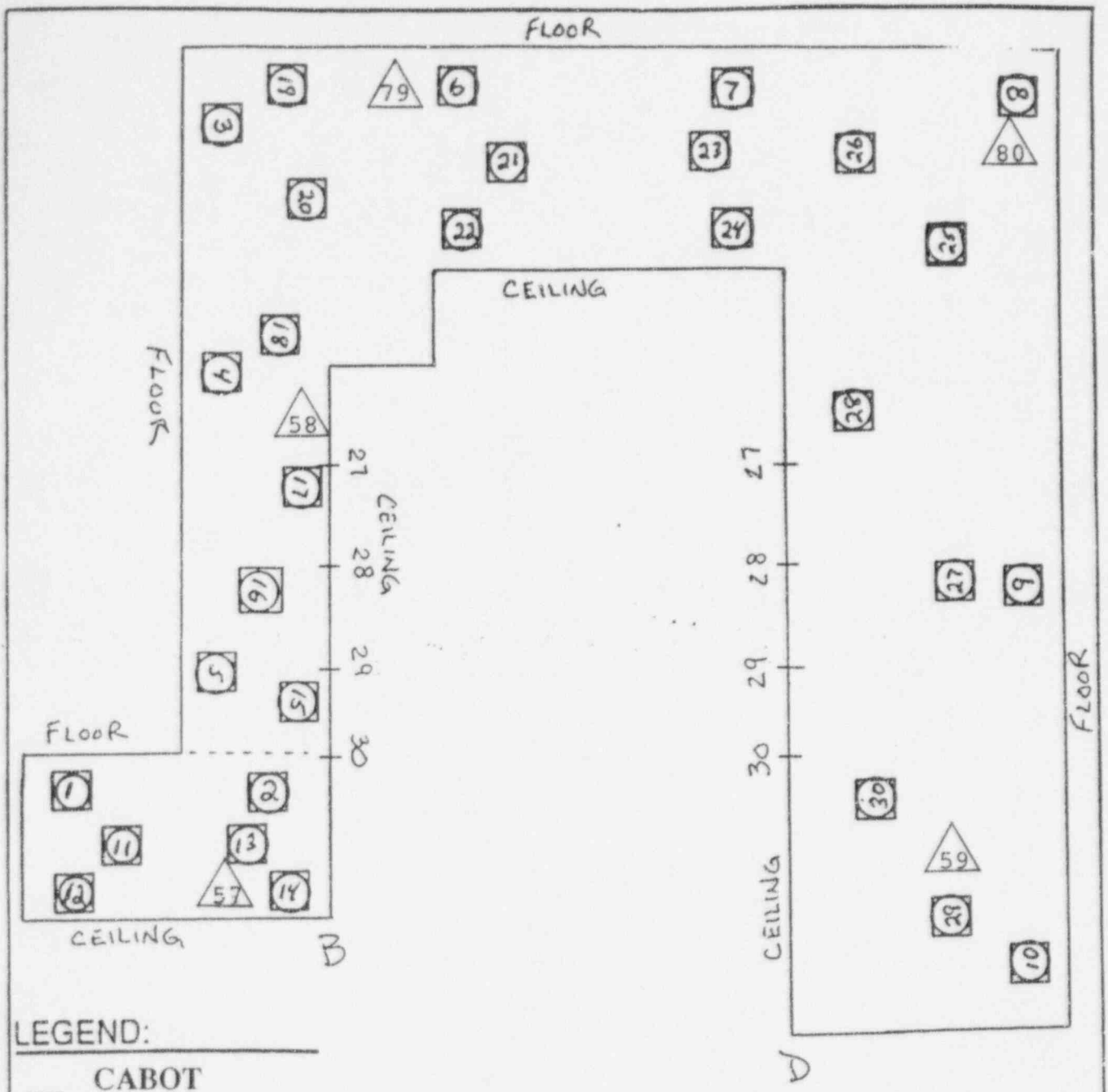
INTERIOR WALL GRID #2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NRC SURVEY POINTS
PROJECT
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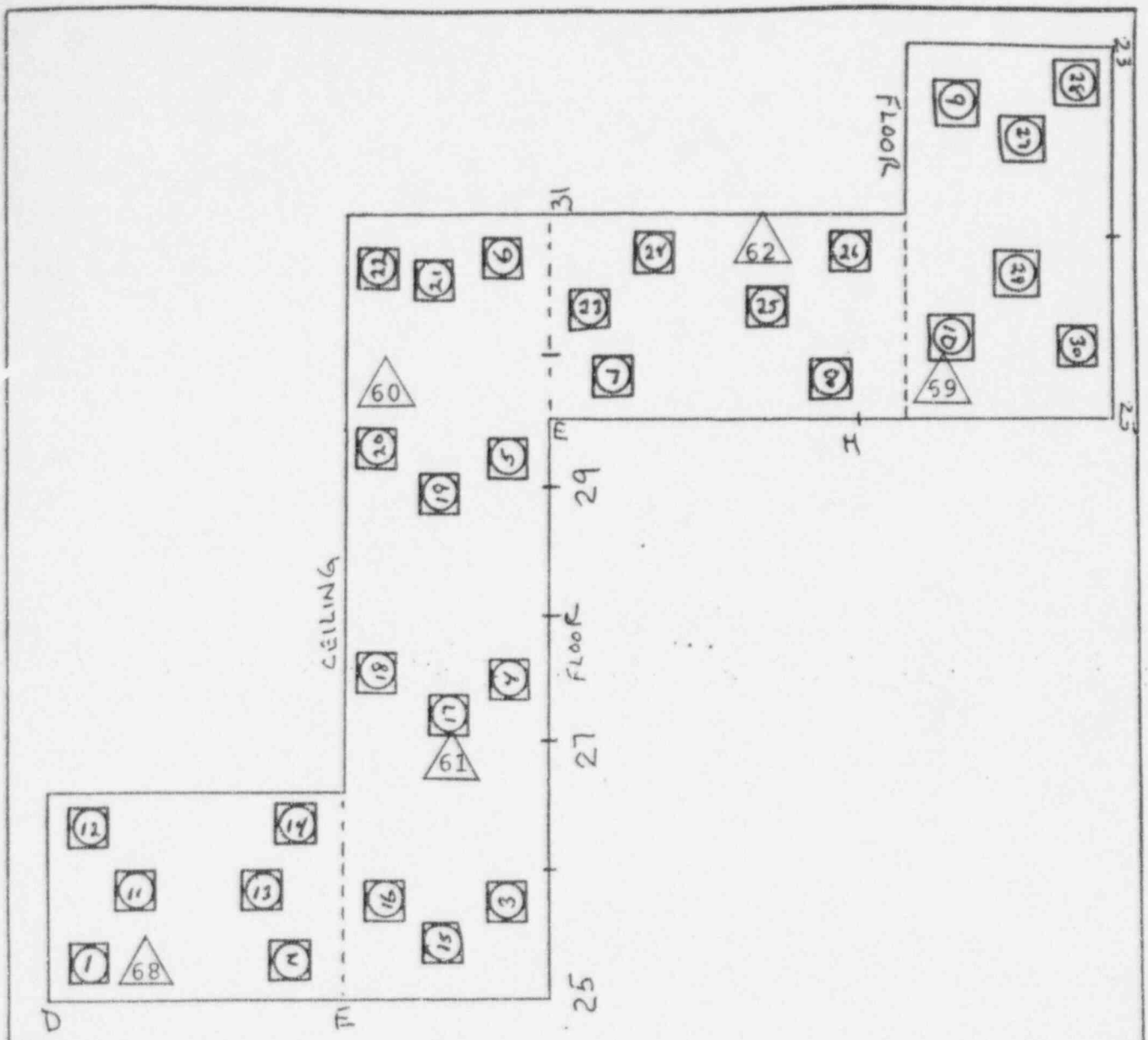
DRAWING
INTERIOR WALL GRID # 3

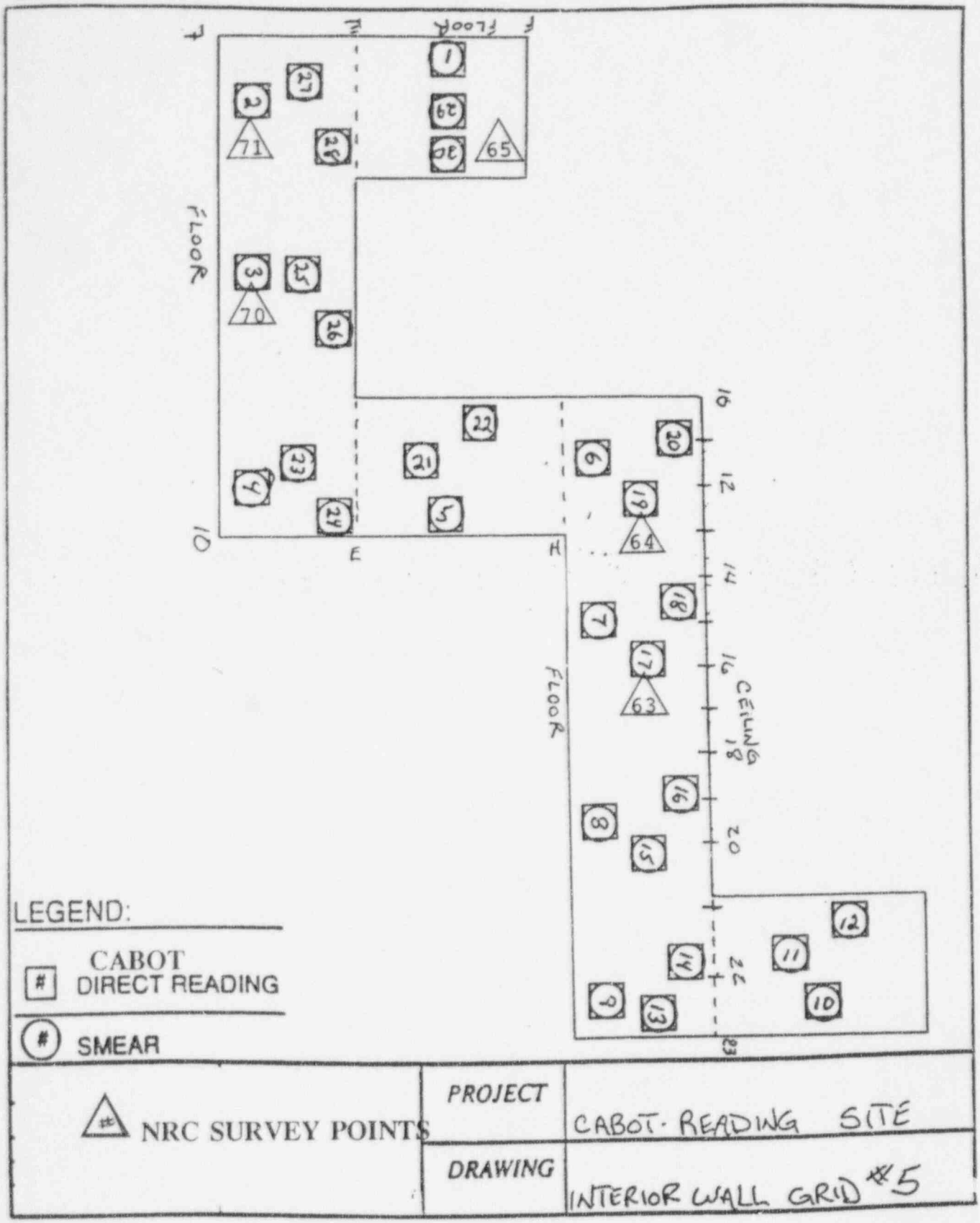


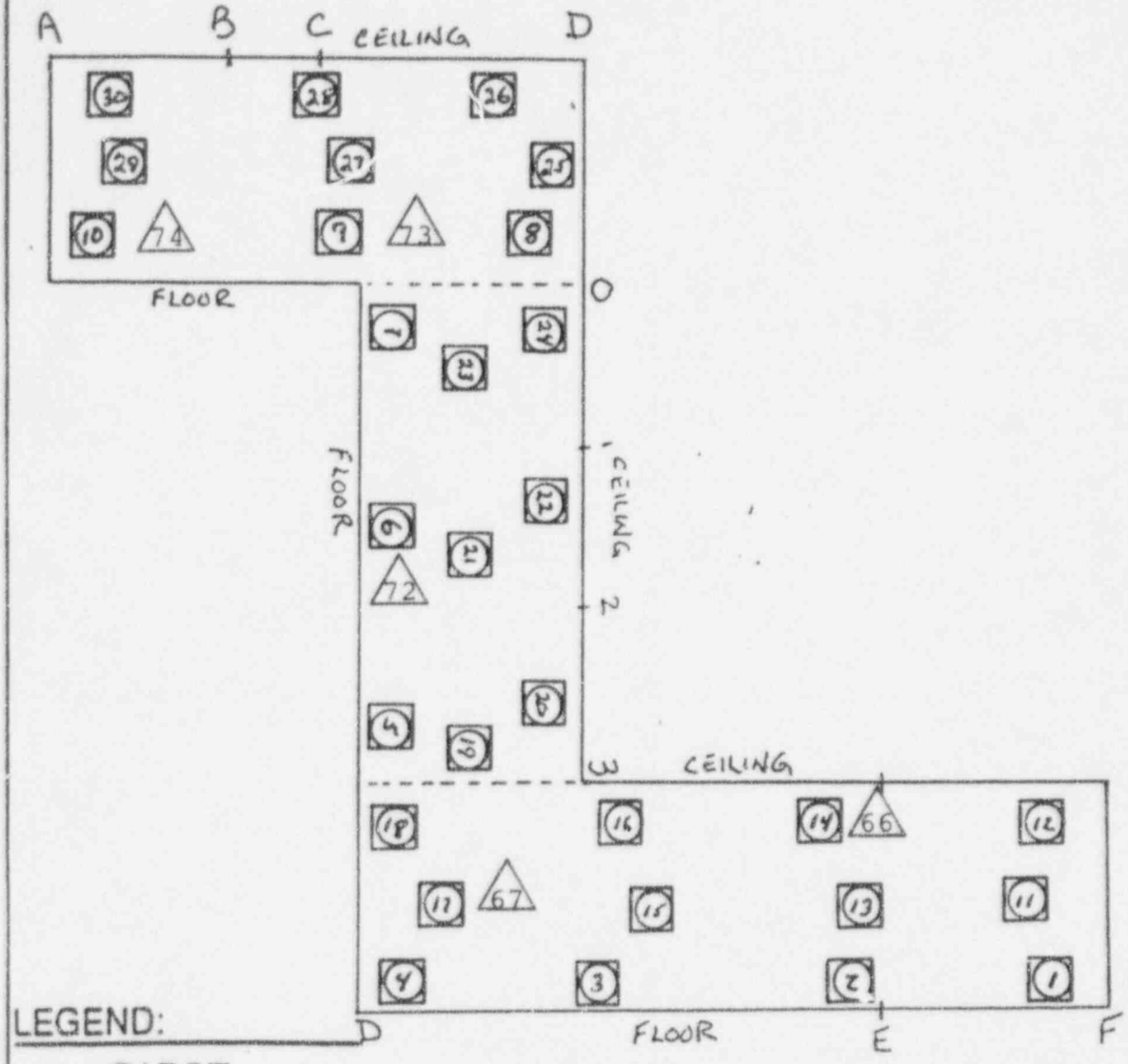
LEGEND:

CABOT
[#] DIRECT READING

(#) SMEAR

NRC SURVEY POINTS	PROJECT	CABOT-READING SITE
	DRAWING	INTERIOR WALL GRID #4


FLOOR
FLOOR
CEILING
LEGEND:
CABOT
DIRECT READING
SMEAR
NRC SURVEY POINTS
PROJECT
CABOT-READING SITE
DRAWING
INTERIOR WALL GRID #5


A
B
C
CEILING
D
30
28
26
29
27
25
10
74
9
73
8
FLOOR
O
1
24
23
FLOOR
CEILING
22
6
21
72
2
4
20
3
CEILING
18
16
14
66
12
17
67
15
13
11
4
3
2
1
LEGEND:
D
FLOOR
E
F
CABOT
DIRECT READING
(#) SMEAR
NRC SURVEY POINTS
PROJECT
CABOT - READING SITE
DRAWING
INTERIOR WALL GRID #6