ROCHESTER GAS AND ELECTRIC CORPORATION • 89 EAST AVENUE, ROCHESTER, N.Y. 14649

LEON D. WHITE, JR.
VICE PRESIDENT

TELEPHONE
AREA CODE 716 546-2700

March 11, 1976

Mr. James P. O'Reilly, Director
U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Subject: Reportable Occurrence 76-08 (14-day report), Abnormal degradation of steam generator tubes
R. E. Ginna Nuclear Power Plant, Unit No. 1
Docket No. 50-244

Dear Mr. O'Reilly:

In accordance with Technical Specifications, Article 6.9.2a, the attached report of Reportable Occurrence 76-08, 14-day, is hereby submitted. Two additional copies of this letter and the attachment are enclosed.

Very truly yours,

L. D. White, Jr.

Attachment

cc: Mr. Ernst Volgenau (40)
Mr. William G. McDonald (3)
Mr. Robert A. Purple, (3)

2659

LER 76-08/1T

LICENSEE EVENT REPORT

CONTROL BLOCK: [ ] (1–6)

(PLEASE PRINT ALL REQUIRED INFORMATION)

01	LICENSEE NAME: NYREG1 (7–14)	LICENSE NUMBER: 00-00000-00 (15–25)	LICENSE TYPE: 4111 1 (26–30)	EVENT TYPE: 01 (31–32)	
01 CON'T	CATEGORY: [ ] [ ] (57–58)	REPORT TYPE: T (59)	REPORT SOURCE: L (60)	DOCKET NUMBER: 05 0-0244 (61–68)	EVENT DATE: 02 27 76 (69–74)	REPORT DATE: 03 11 76 (75–80)

EVENT DESCRIPTION

02 During the planned eddy current inspection of the Steam Generator (SG) tubes, 39 tubes
03 in the "A" SG inlet and 2 tubes in the "B" SG inlet showed defects above the wastage
04 limit of 40%. These tubes have been plugged. (Reportable Occurrence 76-08, 14-day)
05
06

	SYSTEM CODE	CAUSE CODE	COMPONENT CODE	PRIME COMPONENT SUPPLIER	COMPONENT MANUFACTURER	VIOLATION
07	CI (10)	B (11)	HTEXCH (12–17)	N (43)	W120 (44–47)	N (48)

CAUSE DESCRIPTION

08 Local corrosion of tube OD surface caused by concentrations of residual phosphates.
09 A complete eddy current program description and report is attached.
10

	FACILITY STATUS	% POWER	OTHER STATUS	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION
11	H (9)	000 (10–12)	NA (13–44)	C (45)	Eddy current examination of tubes (46–80)

	FORM OF ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY	LOCATION OF RELEASE
12	Z (9)	Z (10)	NA (11–44)	NA (45–80)

PERSONNEL EXPOSURES

	NUMBER	TYPE	DESCRIPTION
13	000 (9–11)	Z (12)	NA (13–80)

PERSONNEL INJURIES

	NUMBER	DESCRIPTION
14	000 (9–11)	NA (12–80)

OFFSITE CONSEQUENCES

15 NA

LOSS OR DAMAGE TO FACILITY

	TYPE	DESCRIPTION
16	Z (9)	NA (10–80)

PUBLICITY

17 NA

ADDITIONAL FACTORS

18 An all volatile treatment water chemistry control was started November 1975 and
19 adherence to this has been good to date.

NAME: A. E. Curtis, III PHONE: 716/546-2700, ext. 2263

GPO 881-667

Ginna Station
Steam Generator Inspection
Final Report
March 9, 1976

Rochester Gas and Electric Corporation performed a planned inspection of Ginna Station steam generators from February 15, 1976 through February 27, 1976 in accordance with the Inservice Inspection Program requirements as part of the annual refueling and maintenance outage. A 100% inspection of unplugged tubes in both steam generator inlets and outlets was performed to evaluate the effect of the All Volatile Treatment water chemistry control program instituted in November 1974 and to verify the acceptability of the steam generators for continued operation.

The inspection program just completed is detailed in Figures (1) through (4) and included eddy current examination at 400 KHZ of 100% in both steam generator inlets and outlets. Each tube was examined from at least the first support through the tube sheet, with approximately 200 tubes in each steam generator being examined over the U-bend section; and for dent evaluation approximately 600 tubes in the "A" inlet, 450 tubes in the "A" outlet and 200 tubes in both the "B" inlet and outlet were examined from the sixth tube support through the tube sheet. The examination of approximately 160 tubes in both steam generator inlets and outlets at 25 KHZ was performed to determine sludge profiles on the secondary side of the tube sheets. The "A" steam generator was inspected prior to secondary side washing and the "B" steam generator after secondary side washing.

Results of these examinations are given in Figures (5) through (7) which includes the "A" inlet and the "B" inlet and outlet, respectively. There is not a figure for the "A" outlet due to the

fact that there were not any indications $\geq$ 20%. Table (1) of this report is included for comparison of the last four steam generator examinations.

All of the eddy current indications were within the first few inches of tubing directly above the tube sheet. These indications, with the exception of three, are postulated to be due to wastage, based on growth rates. The excepted three tubes, in the "A" inlet, due to their larger growth rates compared to the mean, may have been caused by concentration of caustics. Confirmation of this is not possible since the eddy current examination method cannot differentiate between indications resulting from either wastage or stress corrosion cracking, but can accurately measure the maximum defect penetration to within normal statistical variation. The indications are seen only in those areas where indications have been previously noted. There has been no expansion of the indication region to other areas of the steam generators. This inspection confirmed that the tube leak found in January 1976 was a random failure as reported in Reportable Occurrence 75-13.

Several things are noted from a comparison of results shown in Figures (5) through (7). First the A inlet, with 39 tubes $\geq$ 40% indications (present pluggable defect size) has shown only a 5% average growth rate over the past year considering tubes which had indications $\geq$20% for the last two inspections. Figure (8) is a histogram of the growth rate. Similarly, the "B" inlet has shown only small changes in degradation with the average growth rate over the past year, for tubes$\geq$ 20%, of a negative 1.72% and 2 pluggable tubes. A histogram for the "B" inlet indications is shown in Figure (9). This negative mean for changes in indication magnitude is attributed to statistical variations in the eddy current examination

method. The "A" outlet continues to be in excellent condition with only 10 indications of <20% and no reportable (≥20%) indications. The "B" outlet has a large number of indications< 20%. This large number is due to the increased number of inspected tubes and the differences in interpreters of the eddy current examination results. There were two indications ≥20% with both <25%.

The dent evaluation program performed on both steam generators, leads to the conclusion that there is not a denting problem in either steam generator. Those dents which were identified are probably the result of original fabrication, due to their insignificant size (<5 mils).

The small number of tubes in both inlets which have experienced deterioration, inconsistent with the average, are believed to have deteriorated from the concentration of residual phosphates in the secondary side sludge deposits. These concentrations of phosphates are caused by the remaining traces of sludge deposits formed during the period of phosphate control of the secondary system water chemistry before the conversion to AVT chemistry control in November 1974. Removal of residual phosphates from the secondary side over the past 18 months of operation has been accomplished by continuous steam generator blowdown and high pressure water lancing. The high pressure water lancing performed on the secondary side is designed to remove as much of the sludge as possible, which contains the undesirable residual phosphates and/or caustics. Blowdown samples taken during normal operation indicated only small amounts of phosphates present, although phosphates in the sludge could revert back into $PO^{4}\equiv$ and concentrate on the tube surfaces which, depending on the molar ratio, would result in acidic or caustic

attack of the tube. That the degradution was caused by pockets in the sludge is supported by the fact that 33 of the 39 pluggable tubes in the "A" inlet which deteriorated to $\geq$ 40% indications were in adjacent areas within the historical sludge kidney area. Figures (10) through (13) illustrate the sludge profiles for this most recent inspection.

Ginna Station adherence to AVT chemistry control has generally been within specifications during the past year as illustrated on Figures (14) and (15). The AVT chemistry specification for normal power operation and the limiting conditions are given on Table (2).

The series of modifications performed on the steam generators in March 1975 to decrease the area of the tube sheet which is susceptible to low flow conditions and sludge buildup have reduced the average sludge depth but has not significantly changed the area of the sludge deposition.

The corrective action taken to ensure the continued reliability of the steam generators includes the following:

a. All tubes with eddy current indications of wall penetration greater than or equal to 40% were plugged.

b. A thorough lancing of the secondary side of the tube sheets was performed in both steam generators to remove as much as possible any remaining phosphates and/or caustics contained within the sludge. Sludge lancing of both steam generators will be continued in an effect to keep sludge content to a minimum. The lancing, coupled with blowdown during startup and normal operation, should considerably reduce the probability of significant tube degraduation during the plants' subsequent operation.

c. In addition, a modification of the plant's secondary condensate system is under construction which is designed to insure that the feedwater entering the steam generators will be of the highest purity. This modification will add in-line demineralizers to the condensate system, and is scheduled to be placed in service following the next refueling outage in March 1977.

Because it has been established that all but 41 tubes from both steam generators had less than 40% defect indications; because there were only a few tubes which experienced comparatively rapid degradation; and because sludge lancing should further reduce the probability of phosphate and caustic pockets forming, the steam generators are considered acceptable for uninterrupted use until the planned refueling outage in the Spring of 1977, approximately 1 year from the expected date of return to service of Ginna Station. An eddy current examination of the steam generators in accordance with the Inservice Inspection Program shall be performed during the 1977 refueling outage.

TABLE (1)

STEAM GENERATOR POSITION	INDICATION SIZE(%)	EXAMINATION DATE			
		FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976
"A" INLET	< 20	329	631	655	230
	20-24	63	59	109	59
	25-29	50	46	63	47
	30-34	36	31	38	50
	35-39	14	25	27	31
	40-44	24	14	22*	19*
	45-49	12	5	14*	8*
	≥ 50	17*	2*	10*	12*
TOTAL "A" INLET TUBES EXAMINED AT EACH INSPECTION		3260	1655	2174	3192

STEAM GENERATOR POSITION	INDICATION SIZE(%)	EXAMINATION DATE			
		FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976
"A" OUTLET	< 20	58	278	1	10
	≥ 20	0	0	0	0
TOTAL "A" OUTLET TUBES EXAMINED AT EACH INSPECTION		516	430	442	3192

STEAM GENERATOR POSITION	INDICATION SIZE(%)	EXAMINATION DATE			
		FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976
"B" INLET	< 20	21	490	411	764
	20-24	4	3	13	25
	25-29	2	4	10	8
	30-34	0	1	9	9
	35-39	0	1	5	3
	40-44	0	0	1*	1*
	45-49	0	0	0	0
	≥ 50	0	0	10*	1*
TOTAL "B" INLET TUBES EXAMINED AT EACH INSPECTION		1098	675	1931	3247

STEAM GENERATOR POSITION	INDICATION SIZE(%)	EXAMINATION DATE			
		FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976
"B" OUTLET	< 20	0	0	0	1003
	≥ 20	0	0	0	2
TOTAL "B" OUTLET TUBES EXAMINED AT EACH INSPECTION		516	39	442	3247

NOTE: Two tubes in the "B" steam generator were explosively plugged in January 1976. These tubes are not shown in the above table.

* TUBES WERE EXPLOSIVELY PLUGGED

TABLE (2)

AVT CHEMISTRY SPECIFICATIONS

Normal Power Operation

Blowdown Analysis Characteristic	Expected Value	Control Value
pH @ 25°C	8.5 - 9.0	8.5 - 9.0
Cation Conductivity (μMhos/cm)	<2.0	2.0
Free Hydroxide (ppm as $CaCO_3$)	<0.15	0.15
NH_3 (ppm)	<0.25	-
Na (ppm)	<0.10	-
Cl (ppm)	<0.15	-
SiO_2 (ppm)	<1.0	-
Suspended Solids (ppm)	<1.0	-
Blowdown Rate (gpm/SG)	Continuous as Required to Maximum	

Limiting Conditions

Blowdown Analysis Characteristic	Maximum Recommended Operating Period Before Shutdown		
	Two Weeks	24 Hours	Immediate Shutdown
pH @ 25°C	8.5 - 9.2	-	<8.5 or >9.2
Cation Conductivity (μMhos/cm)	>2.0 but ≤5	>5 but ≤7	>7
Free Hydroxide (ppm $CaCO_3$)	≤0.15	>0.15 but <1.0	≥1.0
Blowdown Rate	Maximum Available Capacity		

"A" S/G INLET

X -25Khz to 1st support
● -400Khz to 6th support

▨ -400Khz over U-bend
All tubes not marked-400Khz to 1st support

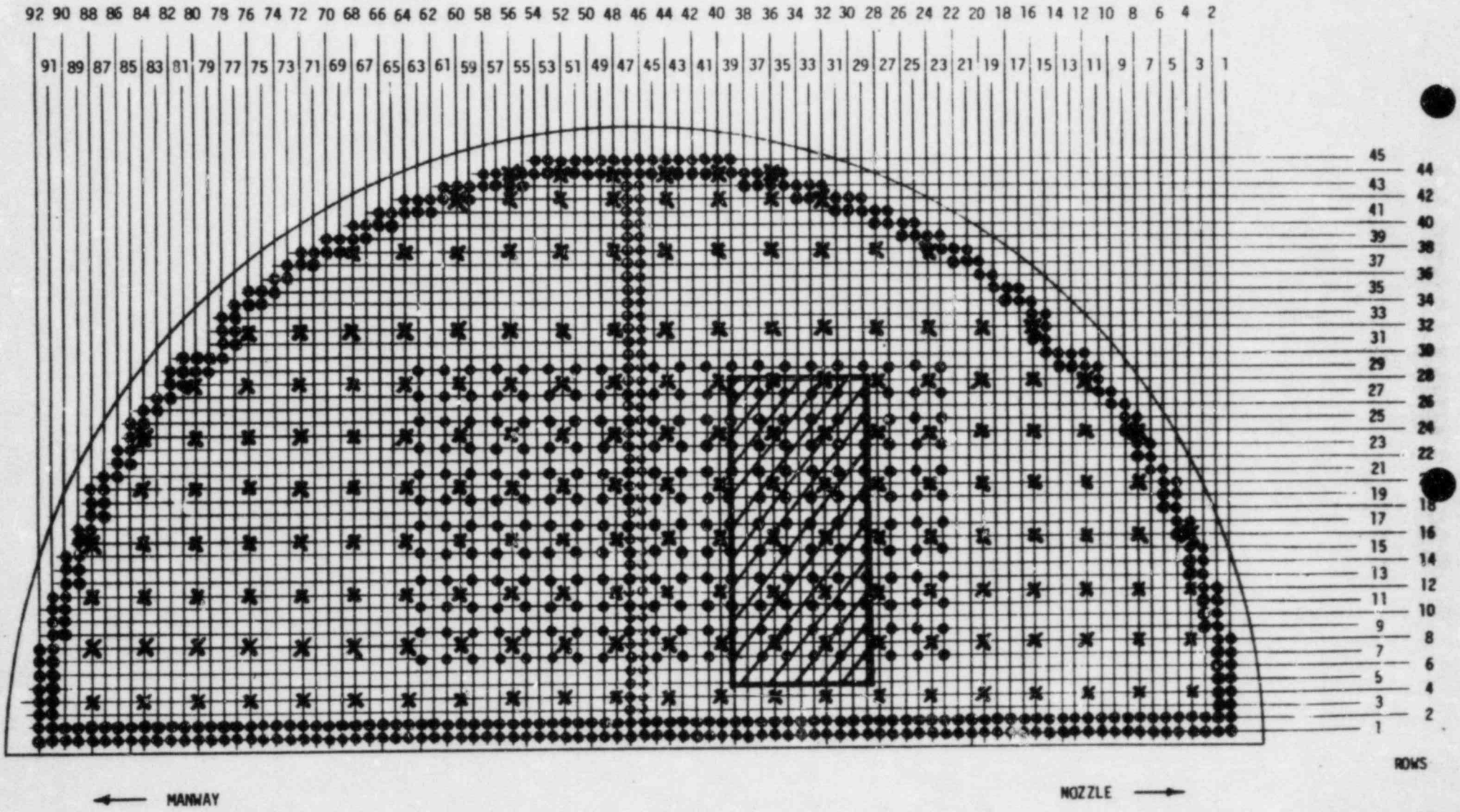


FIGURE (1)

"A" S/G OUTLET

X -25Khz to 1st support
● -400Khz to 6th support

All tubes not marked-400Khz to 1st support

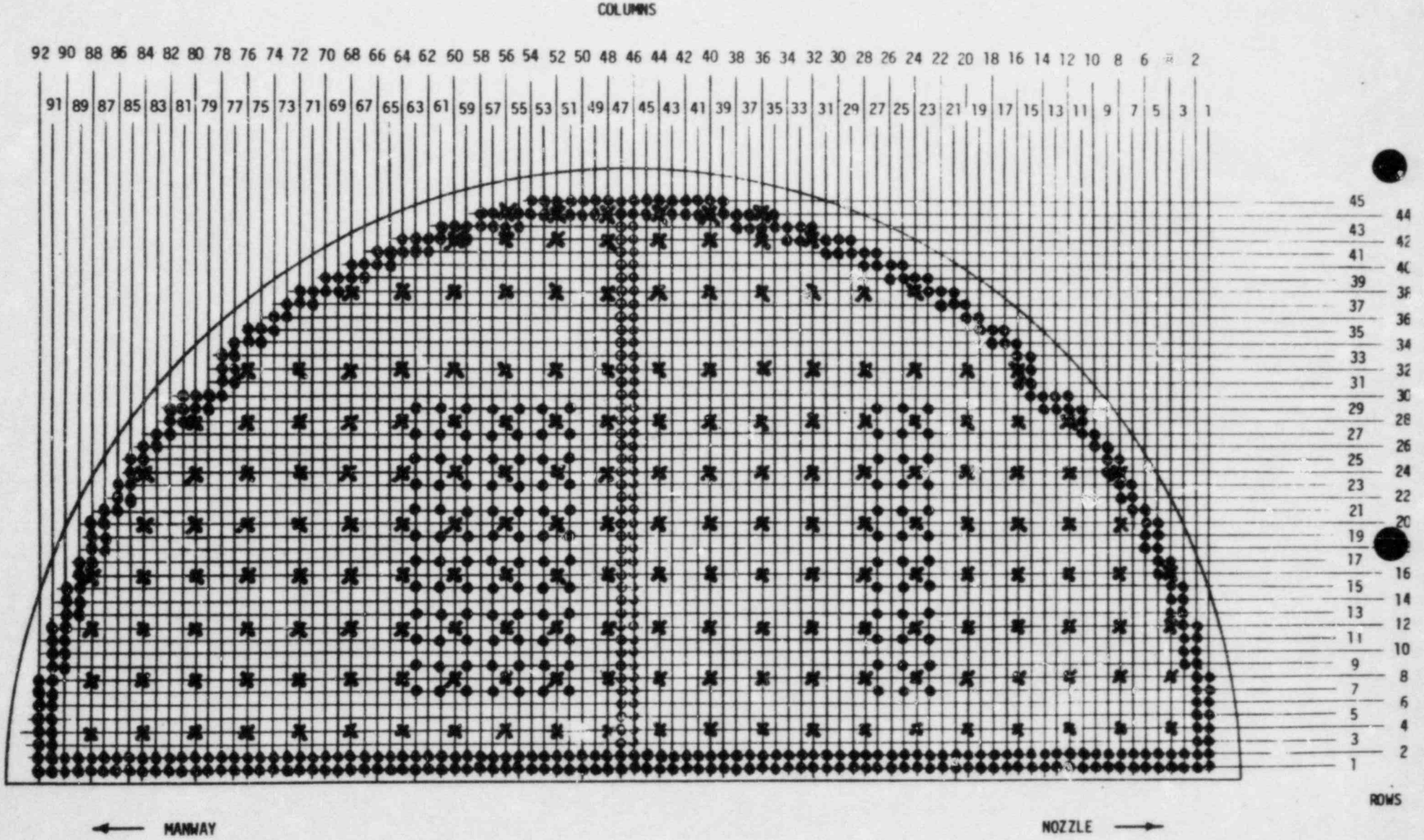
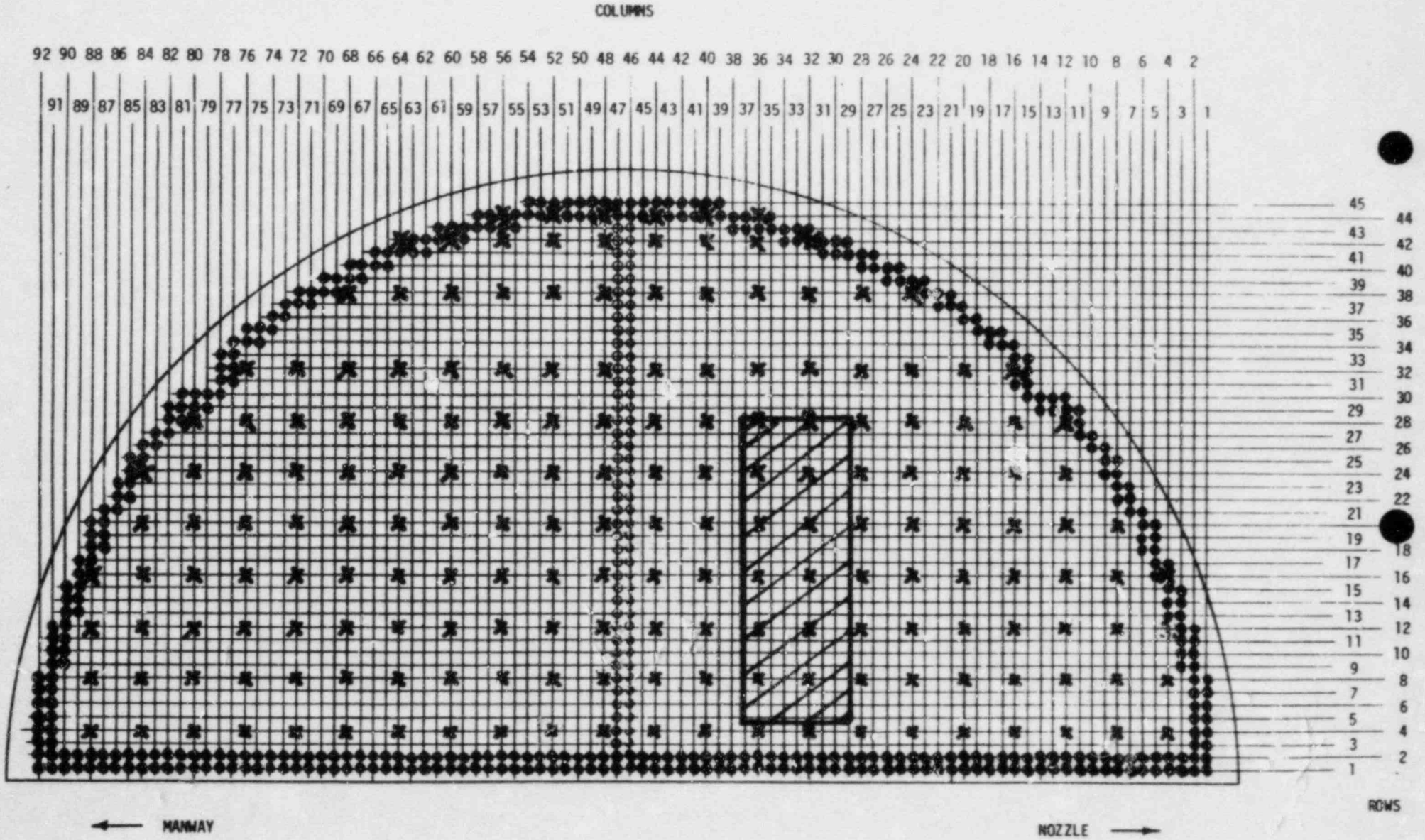


FIGURE (2)

"B" INLET

X -25Khz to 1st support
● -400Khz to 6th support

▨ -400Khz over U-bend
All tubes not marked-400Khz to 1st support



FIGURE(3)

"B" OUTLET

✕ -25Khz to 1st support
● -400Khz to 6th support

All tubes not marked-400Khz to 1st support

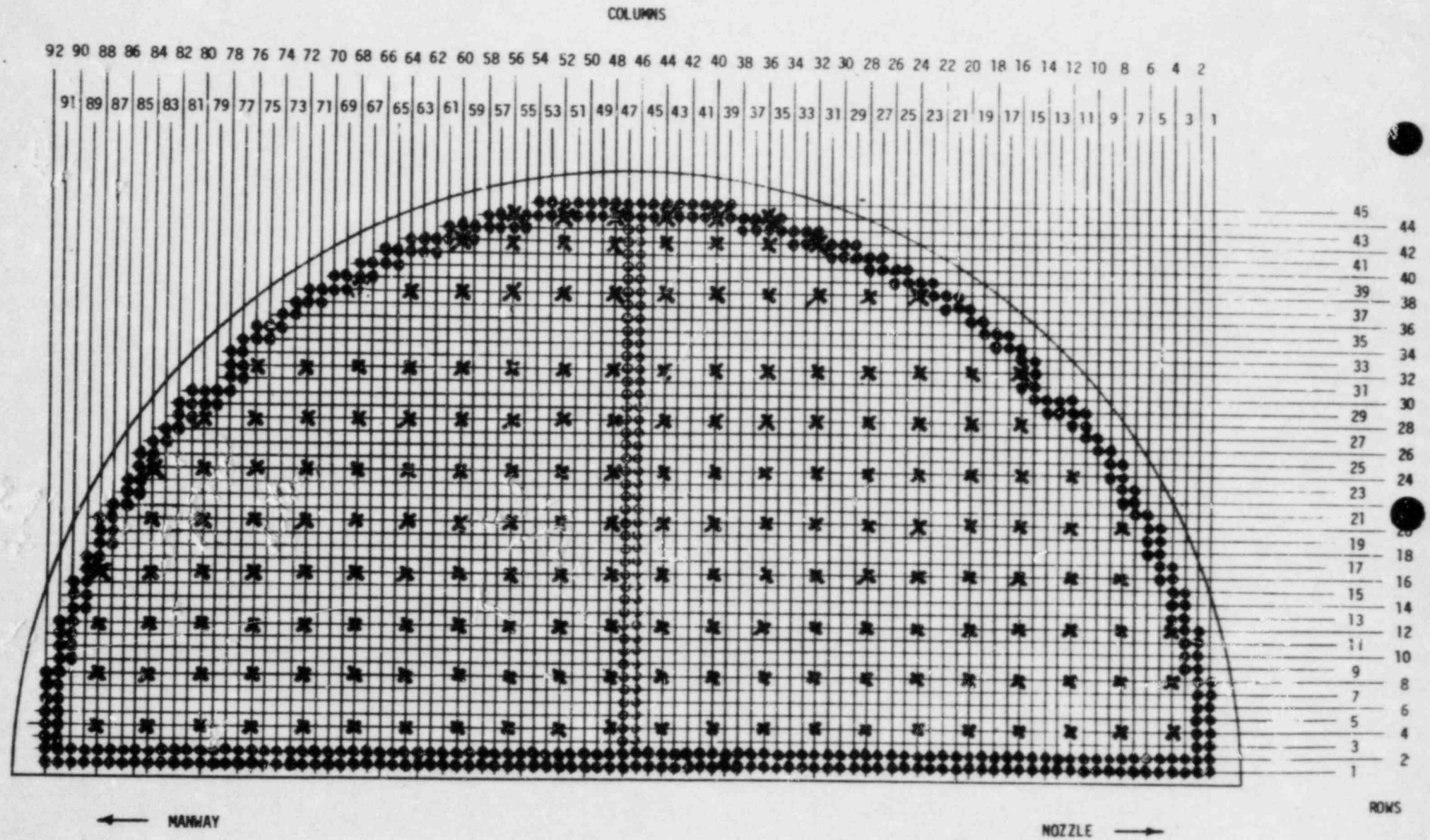


FIGURE (4)

"A" INLET
EDDY CURRENT INDICATIONS

X 20% to 39%
● 40% to 59%
△ 60% to 79%
□ 80% to 100%

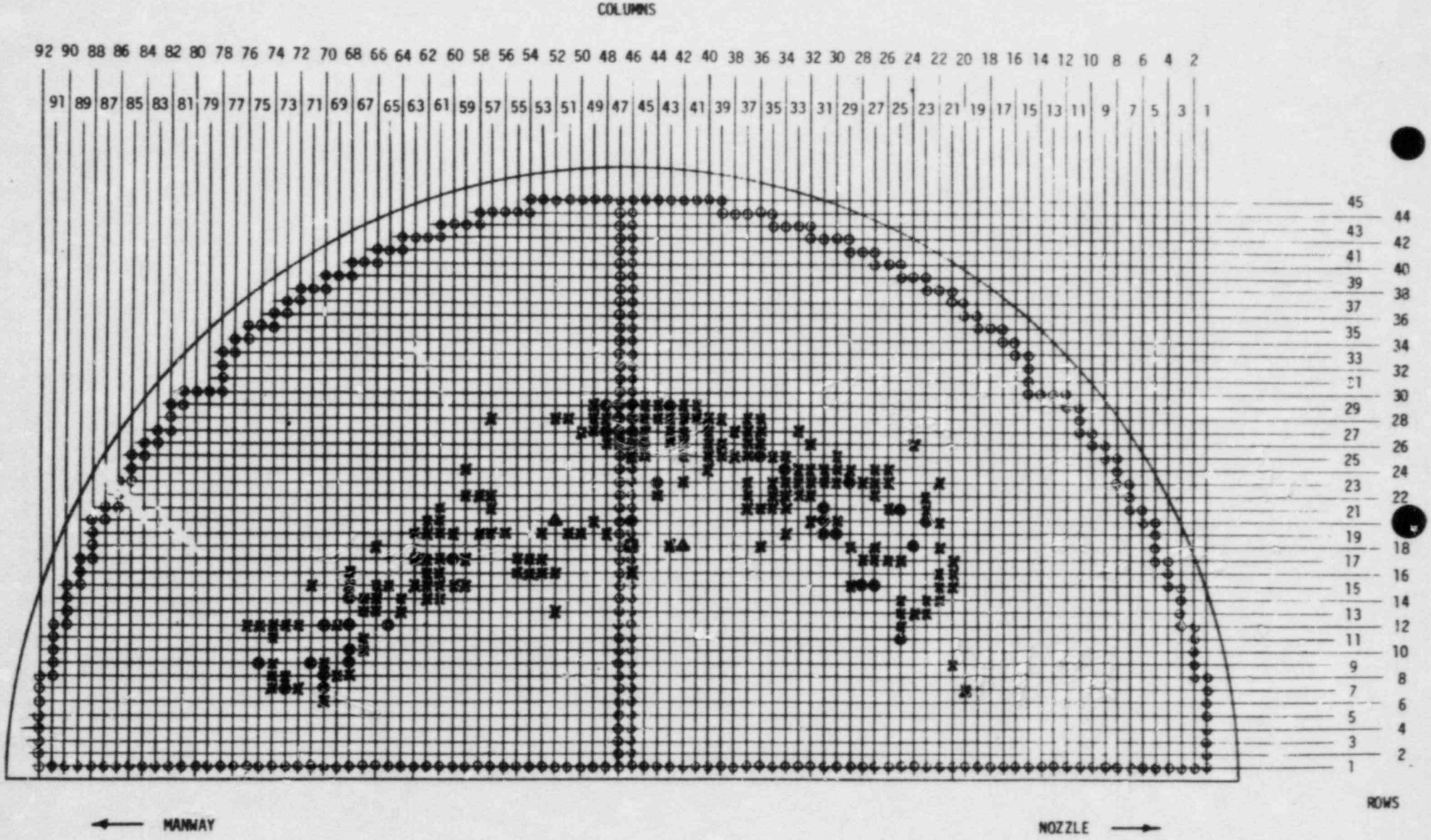


FIGURE (5)

"B" INLET
EDDY CURRENT INDICATIONS

X 20% to 39%
● 40% to 59%
△ 60% to 79%
□ 80% to 90%

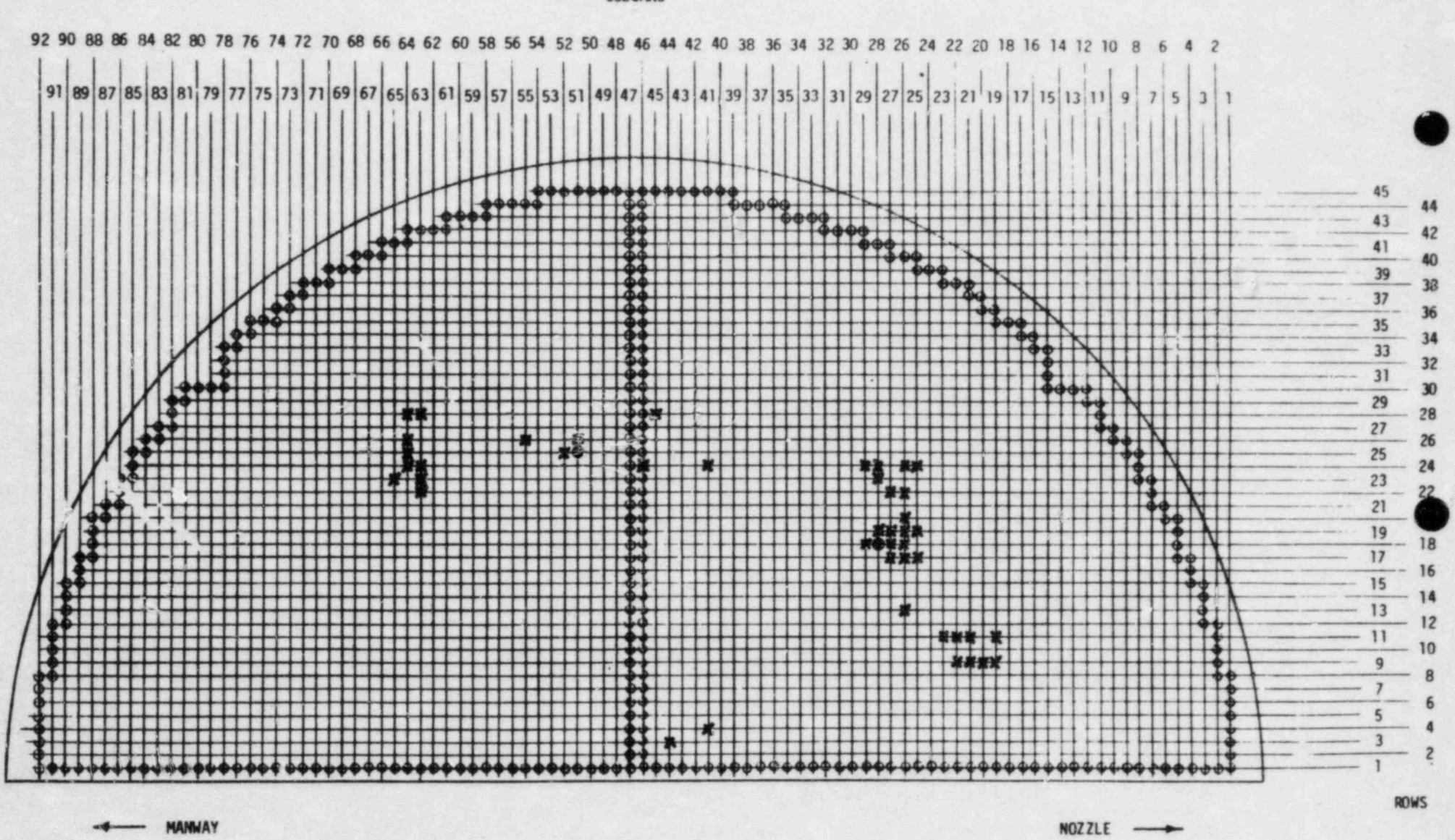


FIGURE (6)

"B" OUTLET
EDDY CURRENT INDICATIONS

X 20% to 39%
● 40% to 59%
△ 60% to 79%
□ 80% to 90%

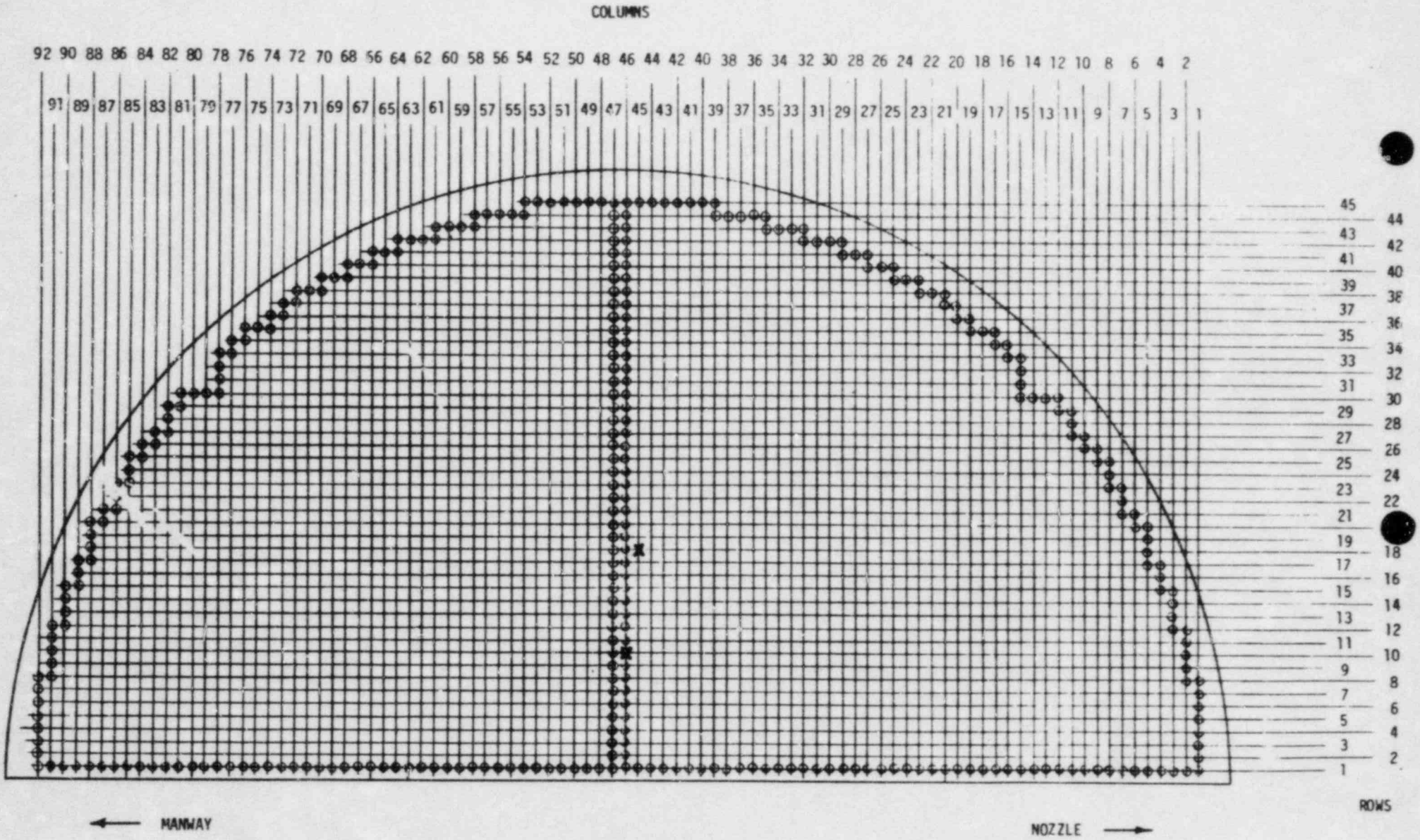


FIGURE (7)

"A" HOT LEG
NO. OF TUBES
VS.
CHANGE IN EDDY CURRENT READINGS (only those tubes with indications ≥20% in both March 1975 and Feb. 1976 examinations are considered)

MEAN = 5.00%

STANDARD DEVIATION = 7.63%

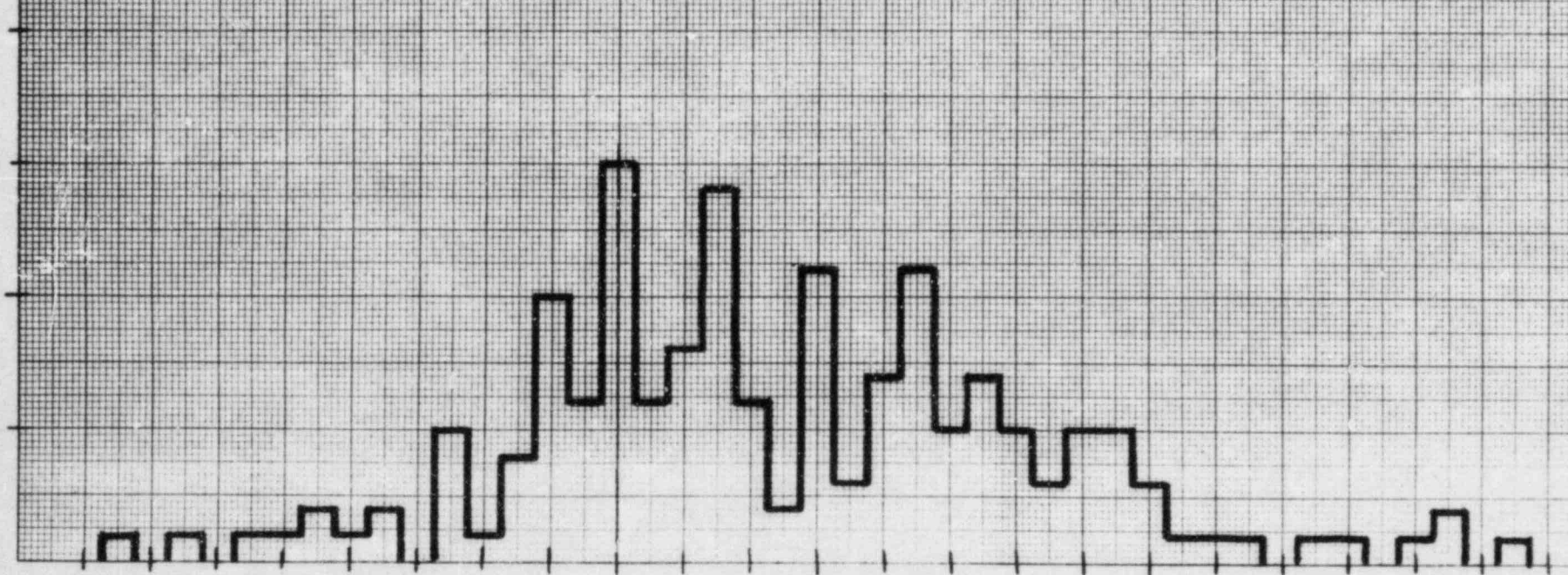


FIGURE (8)

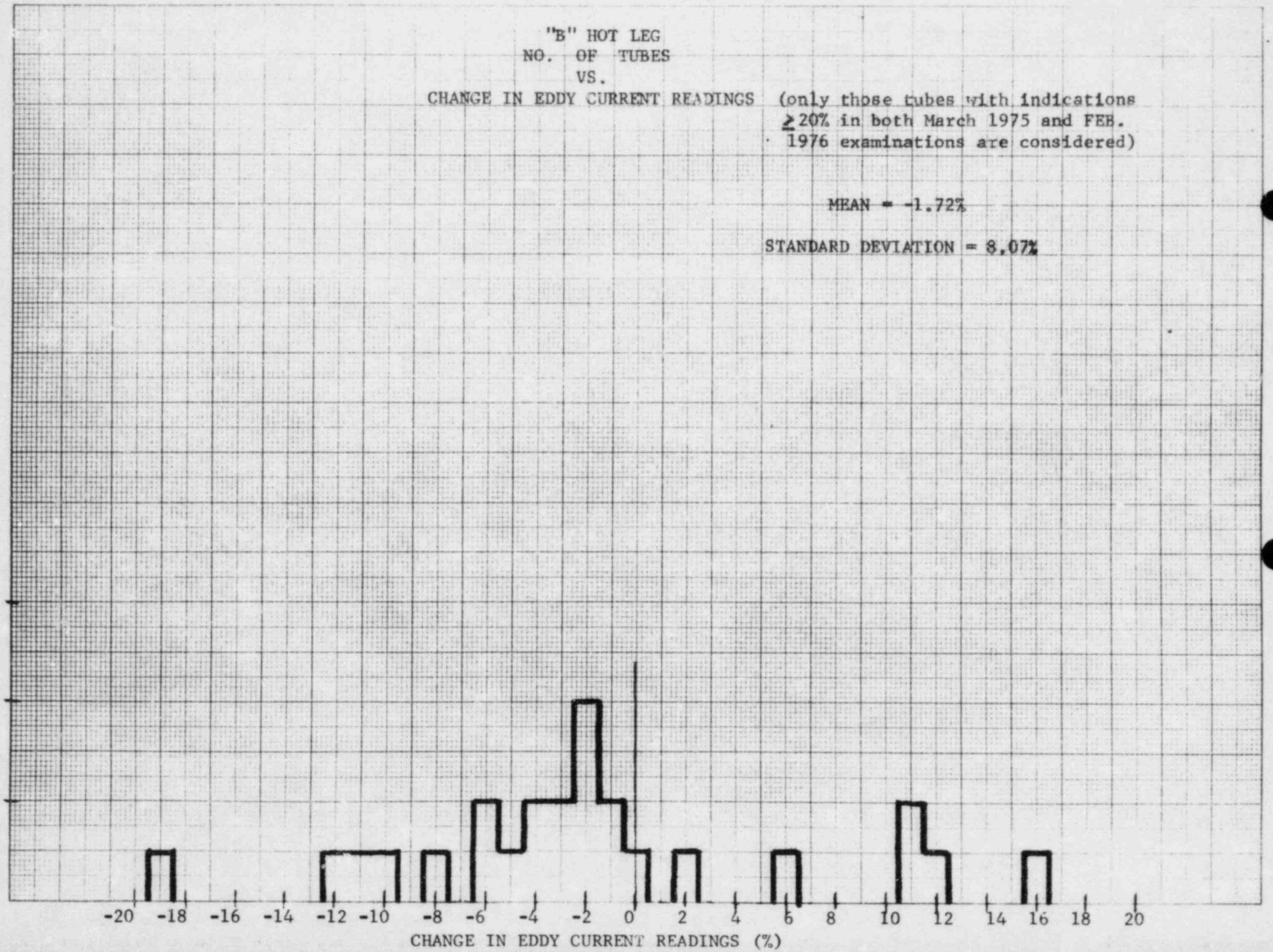

"B" HOT LEG
NO. OF TUBES
VS.
CHANGE IN EDDY CURRENT READINGS
(only those tubes with indications ≥20% in both March 1975 and FEB. 1976 examinations are considered)
MEAN = -1.72%
STANDARD DEVIATION = 8.07%
6
4
2
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20
CHANGE IN EDDY CURRENT READINGS (%)

FIGURE (9)

"A" S/G INLET
SLUDGE PROFILE

□ = 2 inches

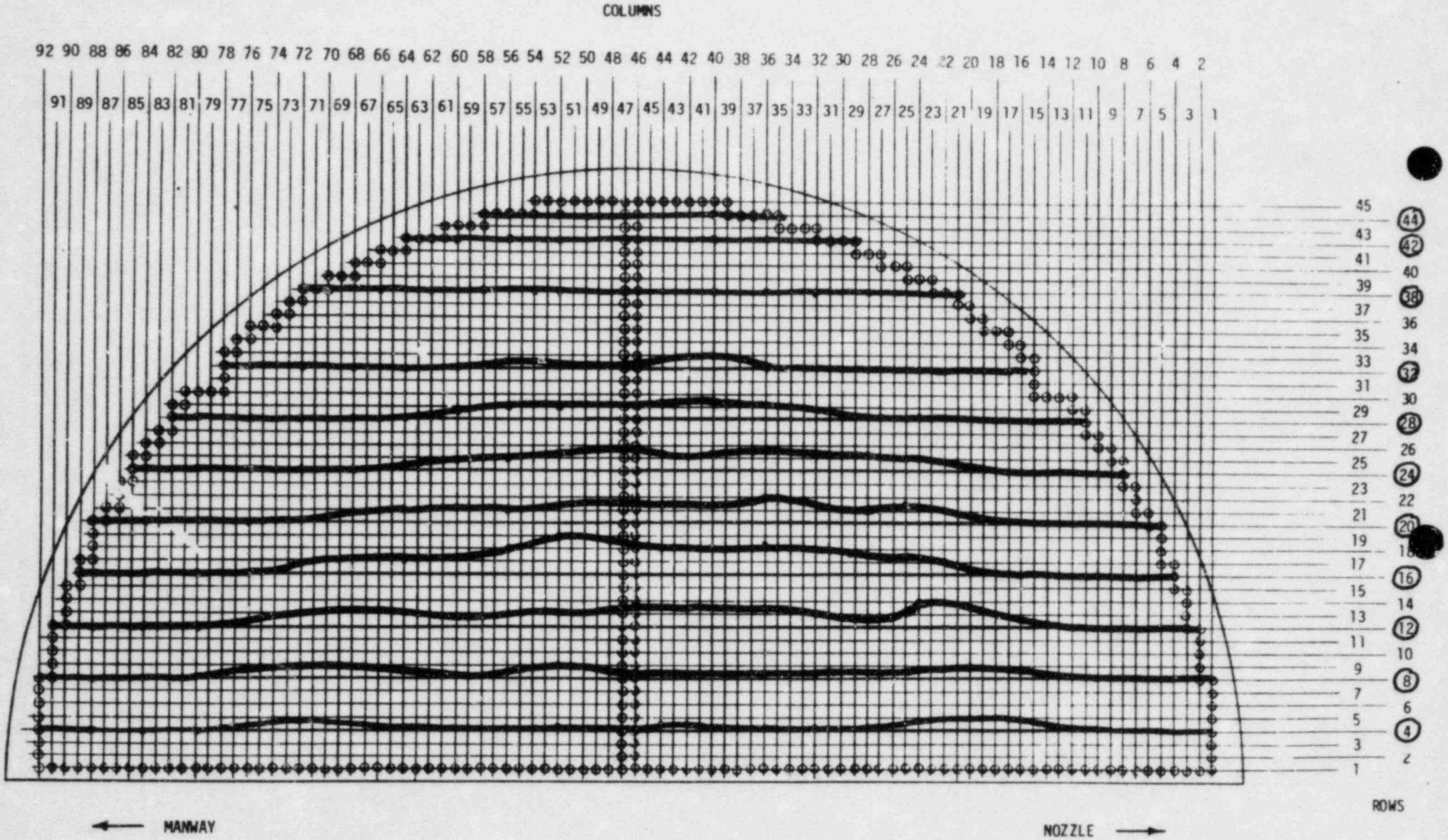


FIGURE (10)

"A" S/G OUTLET
SLUDGE PROFILE

□ = 2 inches

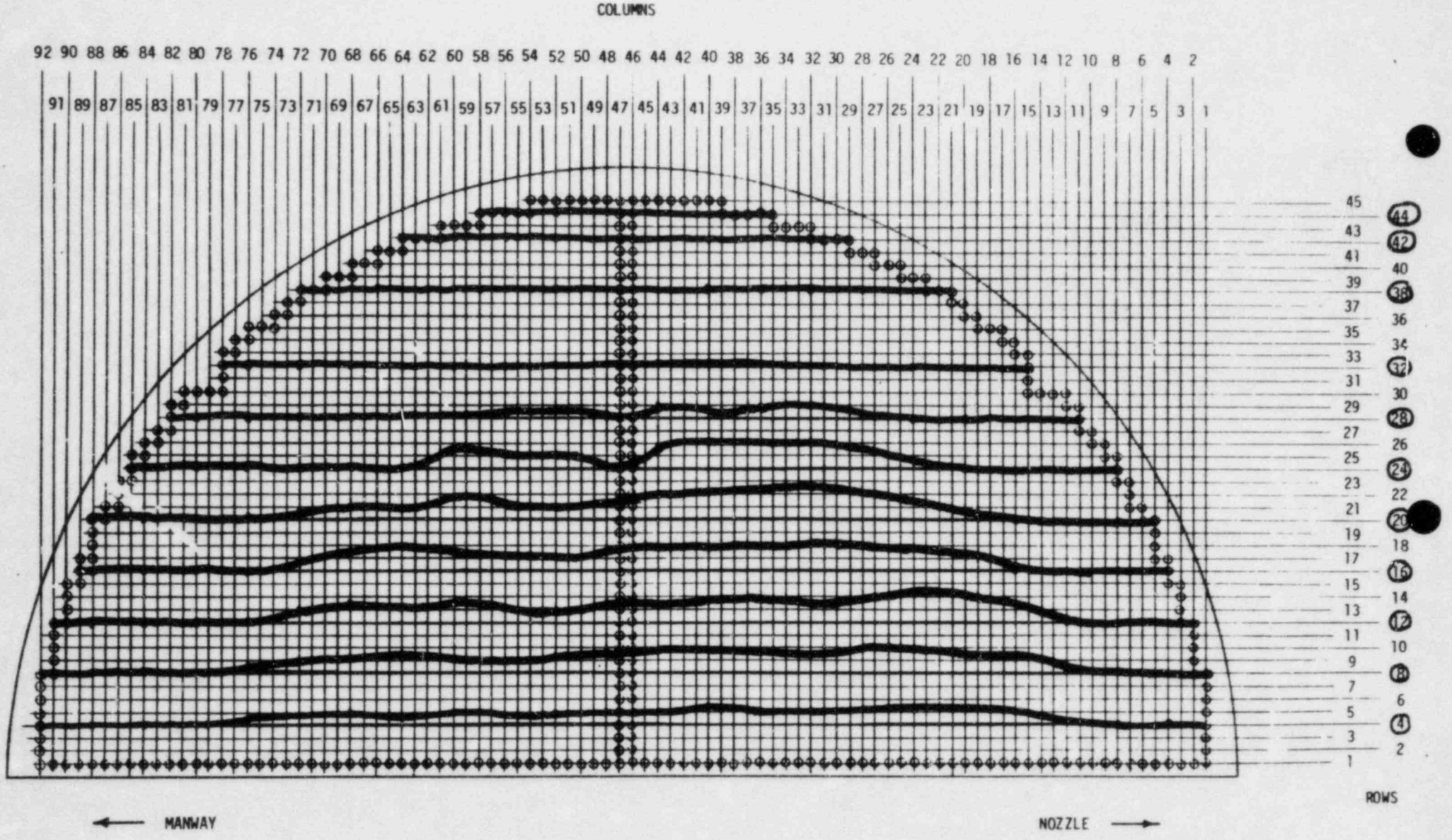


FIGURE (11)

"B" S/G INLET
SLUDGE PROFILE

□ = 2 inches

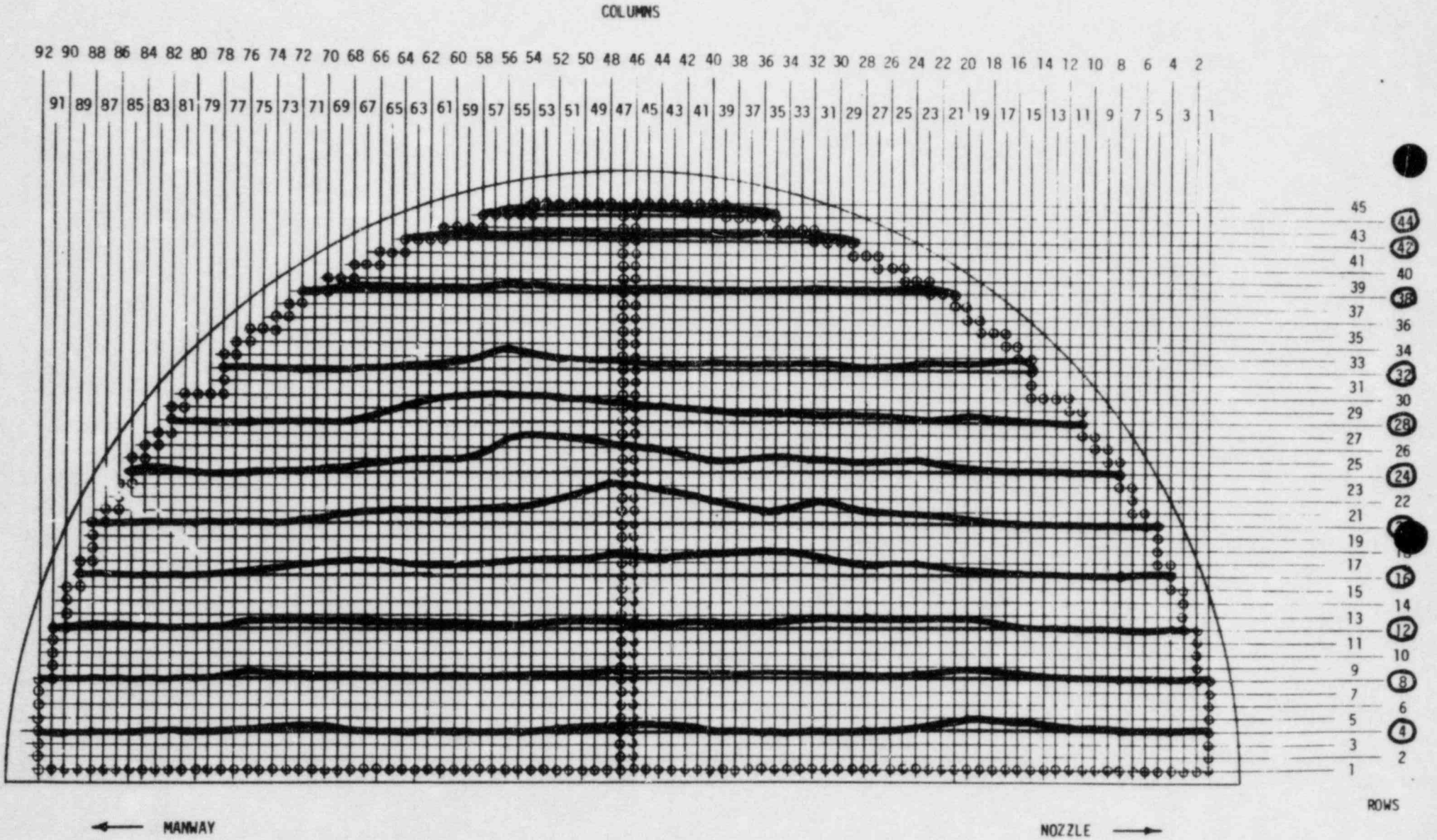


FIGURE (12)

"B" S/G OUTLET
SLUDGE PROFILE

□ = 2 inches

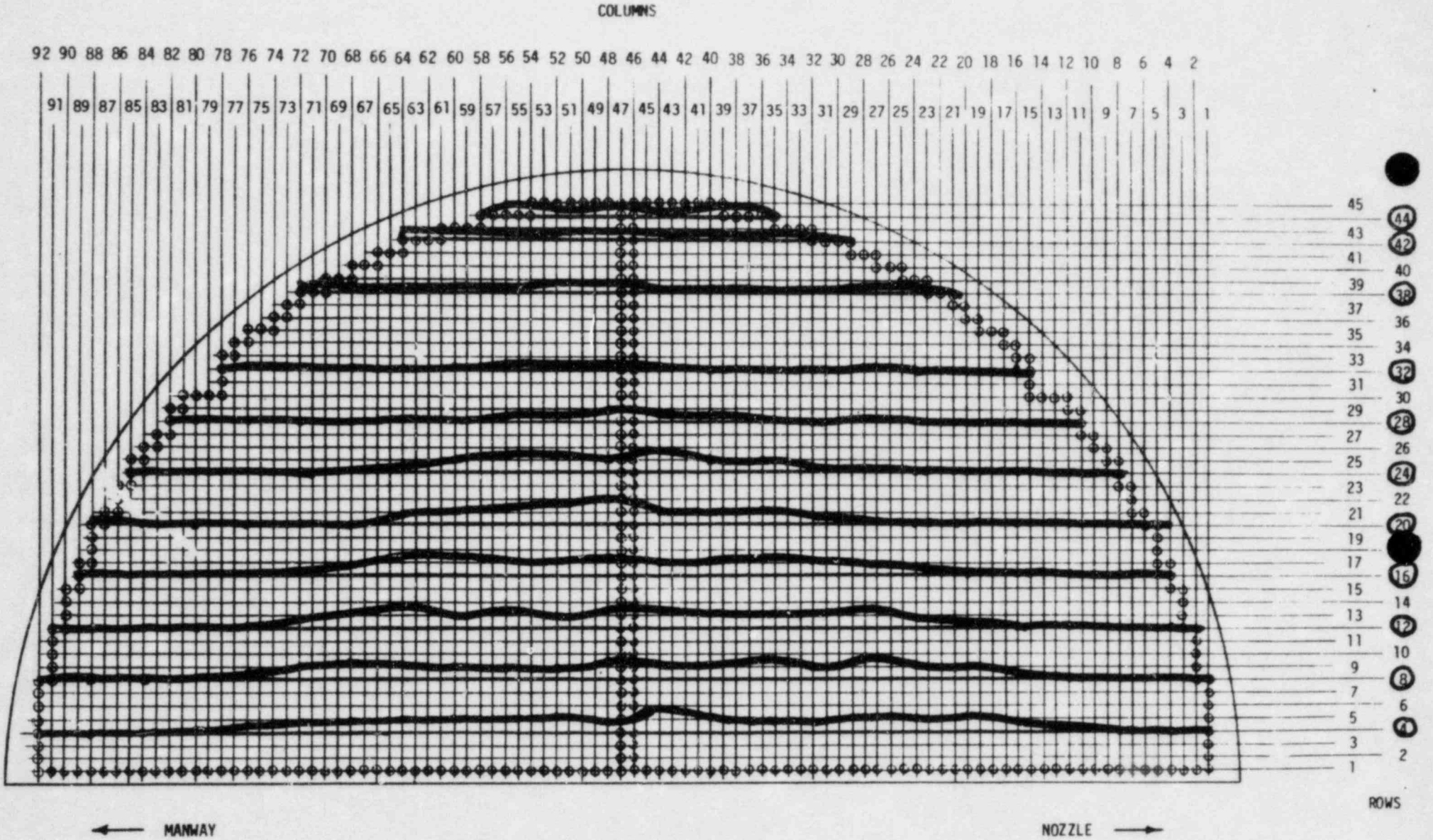


FIGURE (13)

R. E. GINNA STATION 1975 "A" STEAM GENERATOR CHEMISTRY

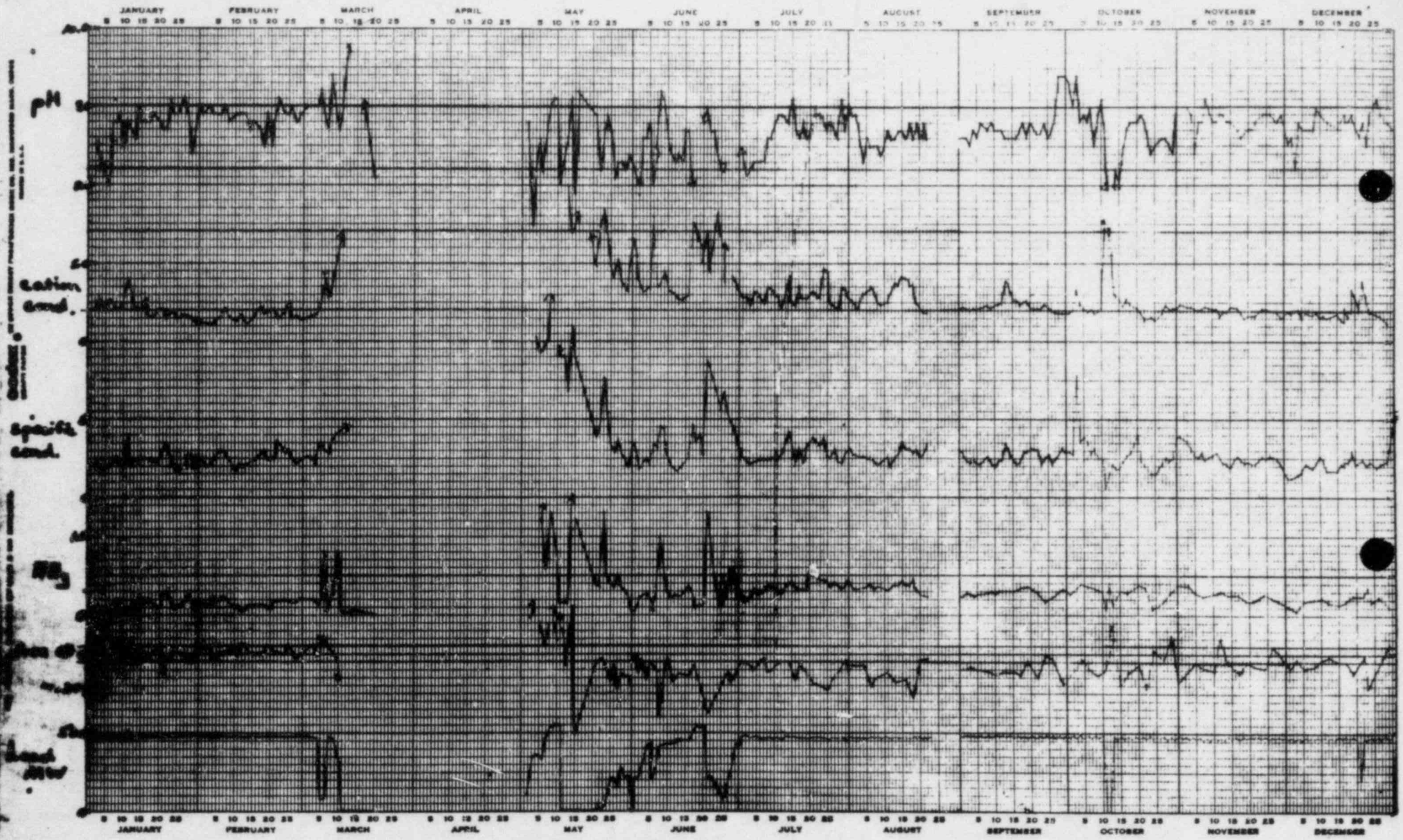


FIGURE (14)

R. E. GINNA STATION 1975 "B" STEAM GENERATOR CHEMISTRY

FIGURE (15)