Ginna Station

Steam Generator Inspection

Final Report

May 11, 1977

Rochester Gas and Electric Corporation performed a planned inspection of Ginna Station steam generators from April 16, 1977 through April 23, 1977 in accordance with the Inservice Inspection Program as part of the annual refueling and maintenance outage. This inspection consisted of eddy current examinations at 400 KHz and 100 KHz to detect defects from corrosion or cracking, 400 KHz for dent evaluation, 25 KHz for sludge profiling and 3.5 KHz to verify support plate integrity.

The inspection included the following:

Leg	Tubes	Frequency	Concern	Support
A-Inlet	195	25 KHz	Sludge	1st
	1731	400 KHz	Defect	1st
	148	400 KHz	Defect	6th
	125	400 KHz	Defect	U-bend
	100	400 KHz	Dent	6th
	207	3.5 KHz	Supports	6th
	60	100 KHz	Defect	U-bend
A-Outlet	195	25 KHz	Sludge	1st
	268	400 KHz	Defect	6th
	100	400 KHz	Dent	6th
	207	3.5 KHz	Supports	6th

Leg	Tubes	Frequency	Concern	Support
B-Inlet	195	25 KHz	Sludge	1st
	1252	400 KHz	Defect	1st
	148	400 KHz	Defect	6th
	125	400 KHz	Defect	U-bend
	70	400 KHz	Dent	6th
	100	3.5 KHz	Support	6th
	60	100 KHz	Defect	U-bend
B-Outlet	195	25 KHz	Sludge	1st
	208	400 KHz	Defect	6th
	100	400 KHz	Dent	6th
	100	3.5 KHz	Support	6th

Results of these examinations are given in Figures 1 through 3 which includes the "A" inlet and the "B" inlet and outlet, respectively. Tables (1) and (2) of this report are included for comparison of the last five steam generator inspections.

All of the eddy current indications were within the first few inches of tubing directly above the tube sheet with the exception of one in the U-bend area of the "B" steam generator. This indication in the "B" steam generator U-bend area was on a periphery tube and appears to be a one-of-a-kind construction-type defect of very small volume, 95% through the tube wall. The other indications with the exception of two, are postulated to be due to wastage, based on growth rates. The excepted two

tubes, in the "A" inlet, due to their large growth rate compared to the mean, may have been caused by concentrations 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, with the exception of the indication in the "B" steam generator U-bend area. There has been no expansion of the indication region to other areas of the steam generators. This inspection verified that there are not any other tubes with ID Indication in the periphery tubes associated with the wedge areas where there had been a leak in April 1976 (see Licensee Event Report 76-15).

The dent evaluation program performed on both steam generators revealed no dents above 10 mils with only a few of the tubes in each generator being involved. Along with the dent evaluation program, a support plate integrity examination was performed which did not reveal any problems.

The small number of tubes in the "A" inlet 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 31 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 $PO^{\equiv}_4$ and concentrate on the tube surfaces which, depending on the molar ratio, would result in acidic or caustic attack of the tube.

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 effort 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 degradation 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 in August of this year.

Because it has been established that all but 14 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 1978, 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 1978 refueling outage.

TABLE (1)

STEAM GENERATOR POSITION	INDICATION SIZE(%)	EXAMINATION DATE FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976	APR. 1977
	< 20	329	631	655	230	730
	20-24	63	59	109	59	39
"A"	25-29	50	46	63	47	37
	30-34	36	31	38	50	23
INLET	35-39	14	25	27	31	8
	40-44	24	14	22*	19*	0
	45-49	12	5	14*	8*	11*
	≥ 50	17*	2*	10*	12*	2*
Total "A" Inlet Tubes Examined At Each Inspection at 400KHZ		3260	1655	2174	3192	2003

STEAM GENERATOR POSITION	INDICATION SIZE(%)	EXAMINATION DATE FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976	APR. 1977
"A"	< 20	58	278	1	10	113
OUTLET	≥ 20	0	0	0	0	0
Total "A" Outlet Tubes Examined At Each Inspection at 400KHZ		516	430	442	3192	268

* tubes were explosively plugged

TABLE (2)

STEAM GENERATOR POSITION	INDICATION SIZE(%)	EXAMINATION DATE FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976	APR. 1977
	< 20	21	490	411	764	719
	20-24	4	3	13	25	12
"B"	25-29	2	4	10	8	8
	30-34	0	1	9	9	0
INLET	35-39	0	1	5	3	1
	40-44	0	0	1*	1*	0
	45-49	0	0	0	0	0
	≥ 50	0	0	10*	1*	
Total "B" Inlet Tubes Examined At Each Inspection at 400 KHZ		1098	675	1931	3247	1525

STEAM GENERATOR POSITION	INDICATION SIZE (%)	EXAMINATION DATE FEB. 1974	NOV. 1974	MAR. 1975	FEB. 1976	APR. 1977
"B"	< 20	0	0	0	1003	90
OUTLET	≥ 20	0	0	0	2	1*
Total "B" Outlet Tubes Examined At Each Inspection at 400 KHZ		516	39	442	3247	268

NOTE: Two tubes in the "B" steam generator were explosively plugged in January 1976 and fifteen in April 76

* TUBES WERE EXPLOSIVELY PLUGGED

"A" INLET

EDDY CURRENT INDICATIONS

X - 20% TO 39%
⊗ - 40% TO 59%
△ - 60% TO 79%
□ - 80% TO 90%

RG&E Steam Generator

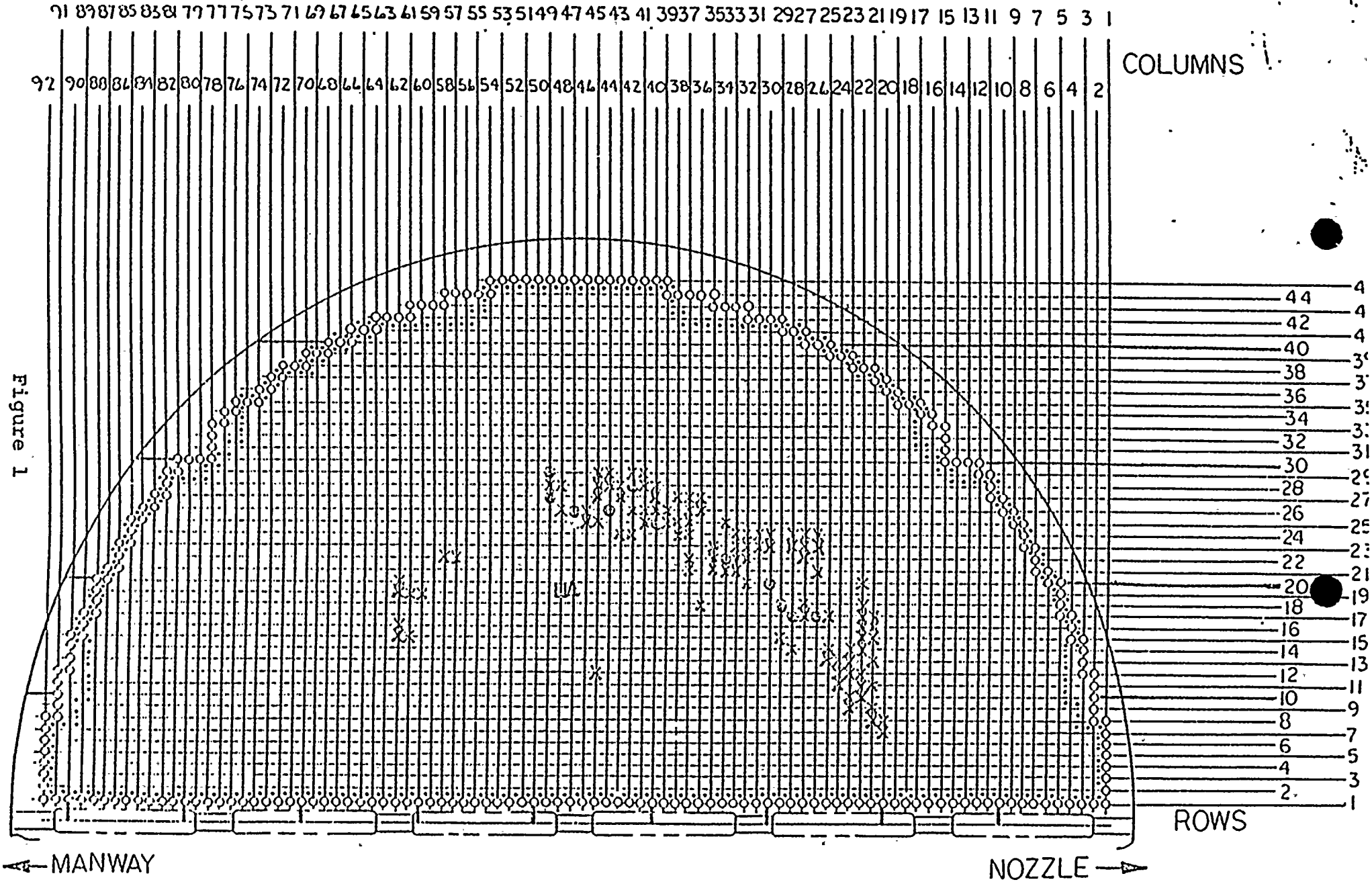

Figure 1

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

"B" INLET
EDDY CURRENT INDICATION

RG&E Steam Generator

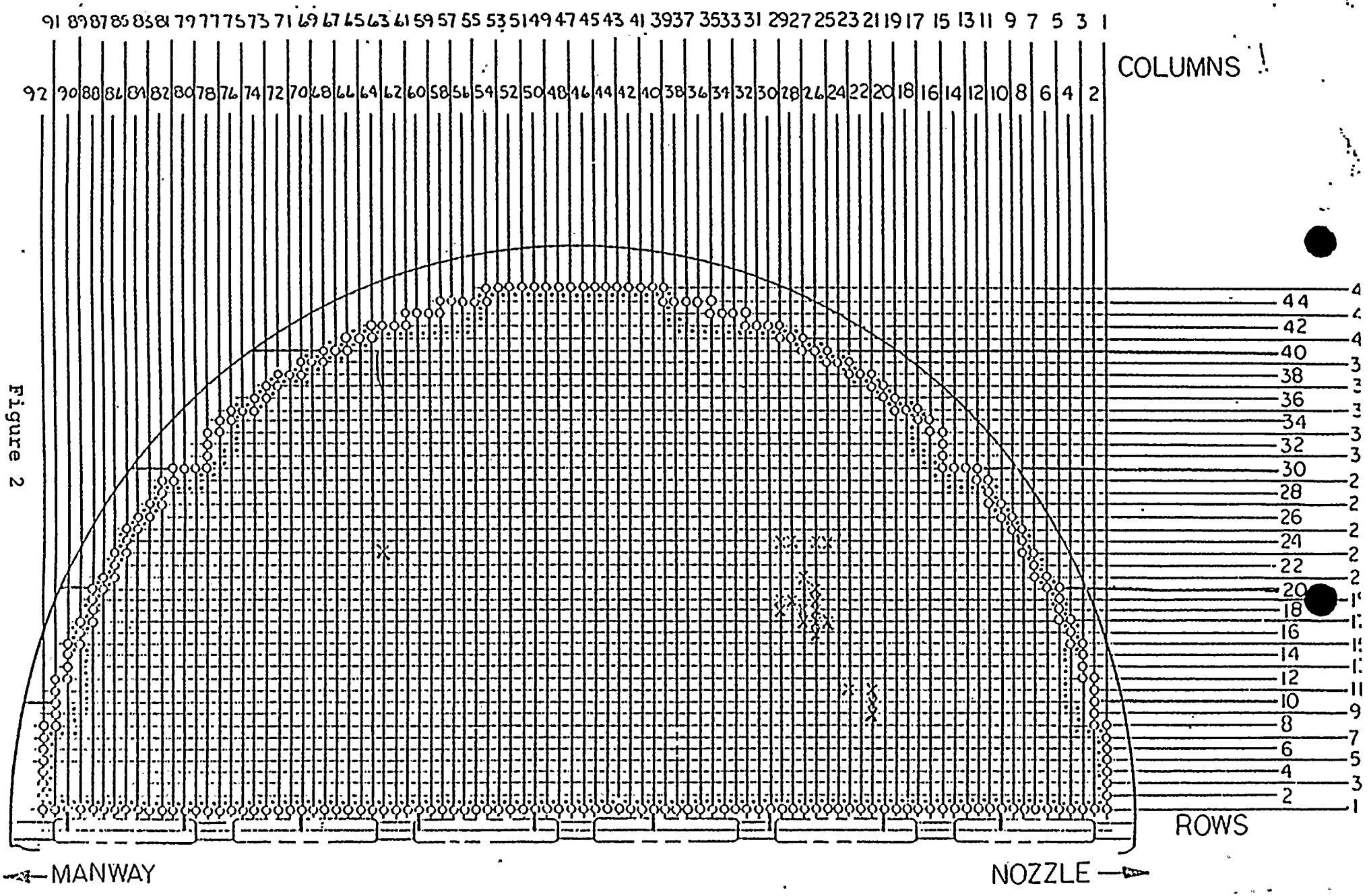

Figure 2

X-20% TO 39%
⊕-40% TO 59%
△-60% TO 79%
□-80% TO 90%

EDDY CURRENT INDICATION

RG&E Steam Generator

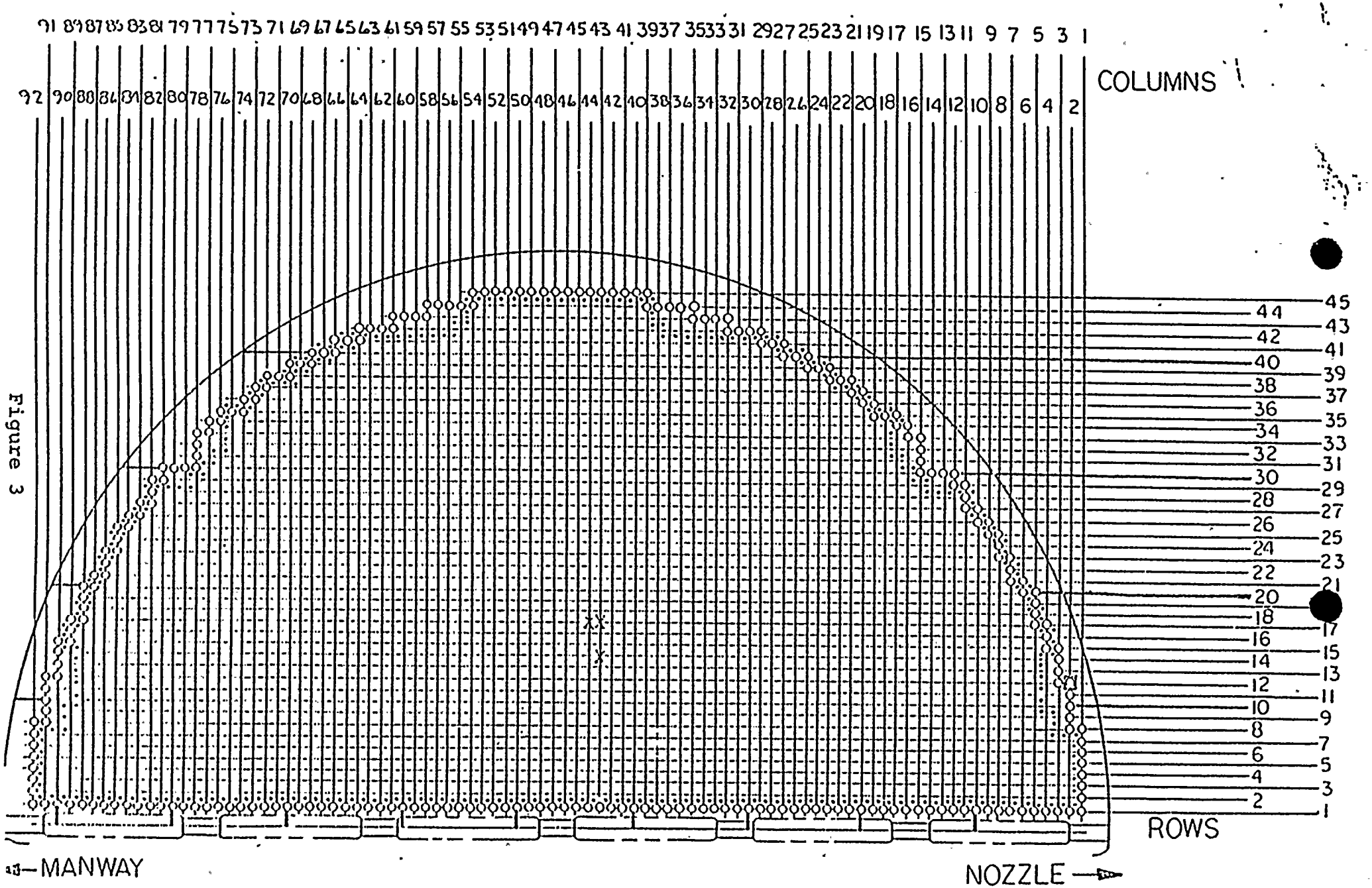

Figure 3