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New York Power Authority

J. Phillip Bayne
Executive Vice President
Nuclear Generation

June 10, 1983
IPN-83-58

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing

Subject: Indian Point 3 Nuclear Power Plant
Docket No. 50-286
1982/1983 Steam Generator Tube Inspection and Repair Program

Dear Sir:

The New York Power Authority hereby submits the results of the steam generator tube inspection (Attachments 1 through 4) and tube repair (Attachments 5 through 7) programs that were implemented during the 1982/1983 maintenance and refueling outage. In addition, please find enclosed information (Attachment 8) relative to steam generator tube sleeving. This information is being provided since certain as built and field conditions were not described in the original "Steam Generator Sleeving Repair Report" Rev. 1, October 1982 (WCAP-10145).

This letter serves to satisfy the requirements of Technical Specification 4.9.2.

The inspection results provided by this report have been verbally presented to members of your staff at a meeting in Bethesda on September 21, 1982. The steam generator tube repair program has been implemented in accordance with the October 18, 1982 submittal, Proposed Steam Generator Surveillance Requirements (IPN-82-69).

Very truly yours,

G. M. Wilverding

J. P. Bayne
Executive Vice President
Nuclear Generation

cc: attached

A054
1/1

cc: Resident Inspector's Office
Indian Point Unit 3
U.S. Nuclear Regulatory Commission
P.O. Box 66
Buchanan, New York 10511

ATTACHMENT 1

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

E.C.T. PROGRAM DESCRIPTION

Steam Gen. No.	Leg	Inspection Sample	Extent	Additional Comments
31	Outlet	100%	2nd TSP	
31	Outlet	455 Tubes	U-Bend	Reg. Guide Inspection
31	Inlet	100%	2nd TSP	
31	Inlet	774 Tubes	6th TSP	Gauging
32	Outlet	100%	2nd TSP	
32	Inlet	100%	6th TSP	
33	Outlet	100%	6th TSP	
33	Inlet	100%	6th TSP	
34	Outlet	100%	2nd TSP	
34	Inlet	100%	2nd TSP	
34	Inlet	747 Tubes	6th TSP	Gauging

ATTACHMENT 2

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

DEGRADED TUBE TABULATION

Program Description	Number of Degraded Tubes <50%	≥ 50%	Total
31 Outlet	274	848	1122
32 Outlet	553	583	1136
33 Outlet	310	770	1080
34 Outlet	342	618	960

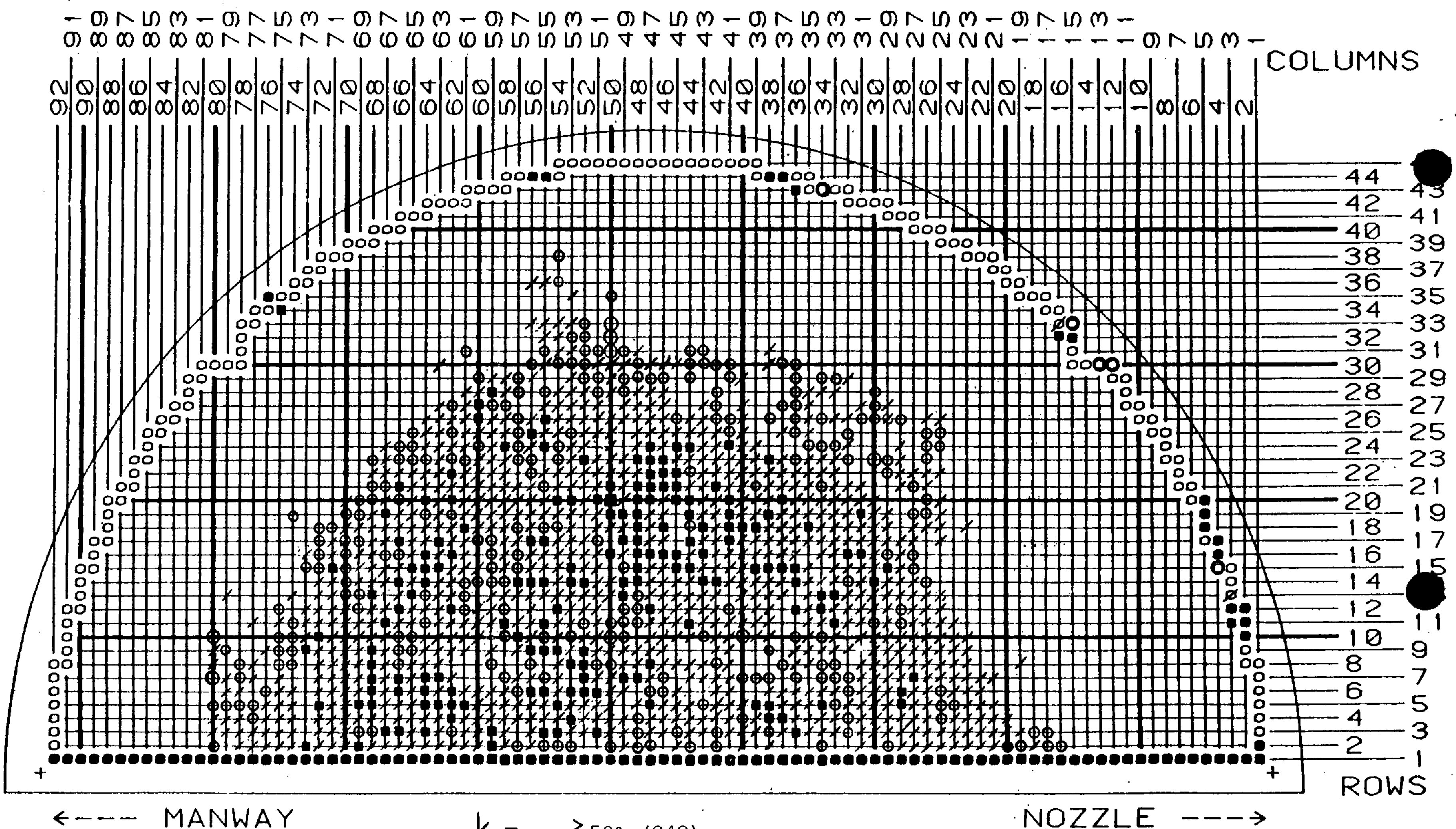
Program Description	Number of Degraded Tubes <40%	≥40%	Total
31 Inlet	25	26	51
32 Inlet	18	20	38
33 Inlet	69	12	81
34 Inlet	3	14	17

SERIES 44

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 31 OUTLET



+ = ≥50% (848)

⊕ = < 50% (274)

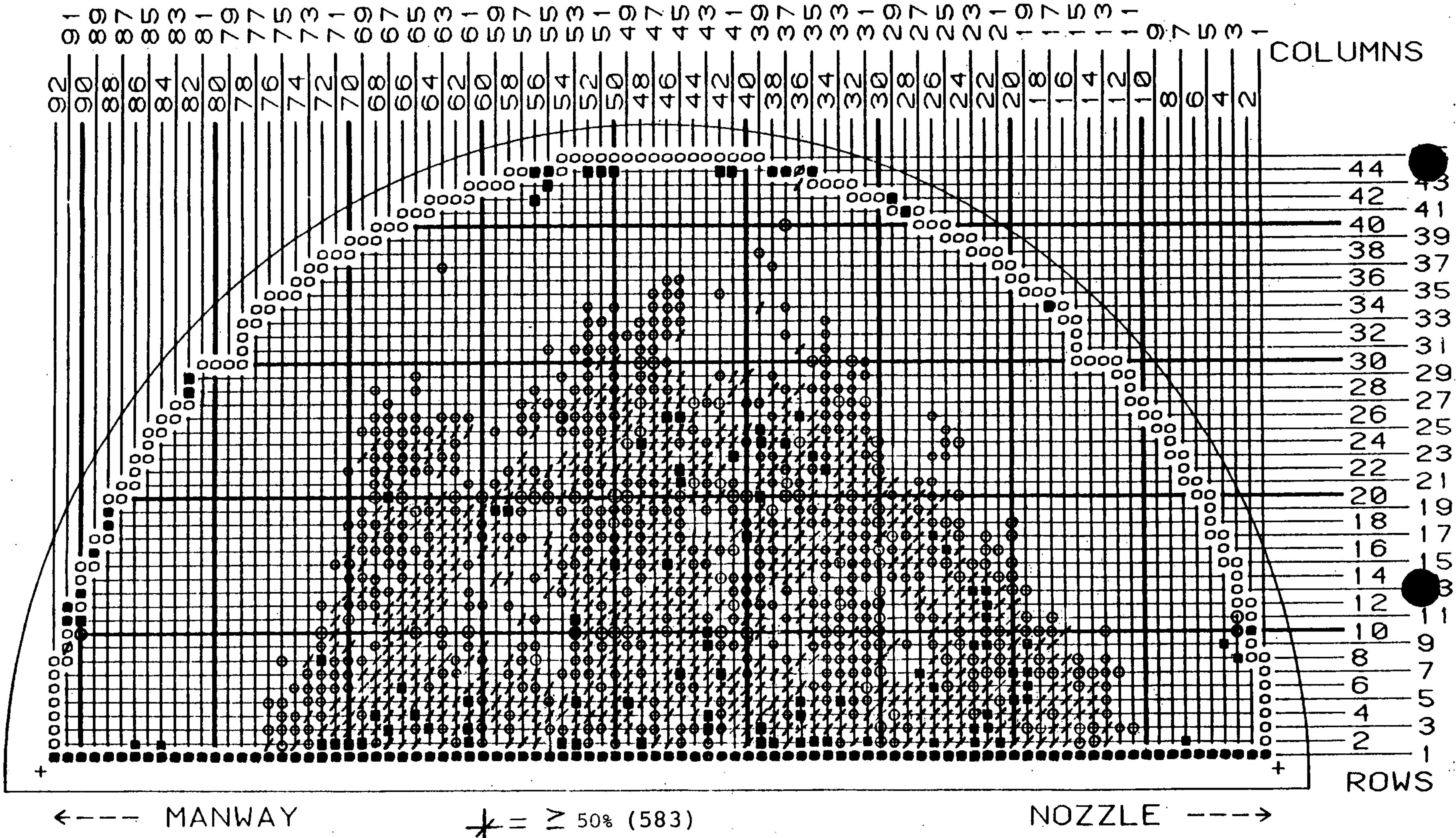
■ = PREVIOUSLY PLUGGED TUBES (285)

SERIES 44

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 32 OUTLET



= ≥ 50% (583)

= < 50% (553)

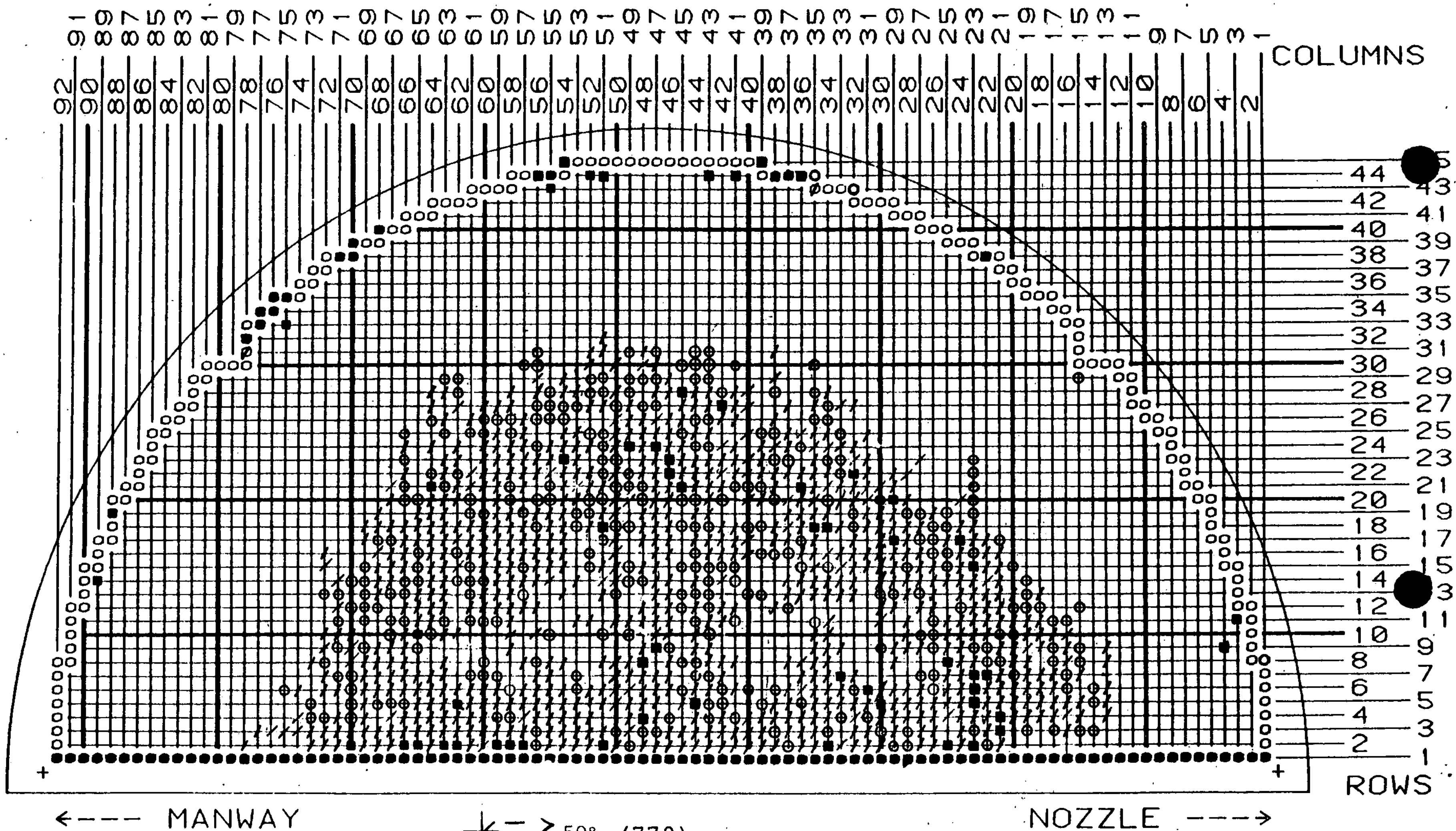
= PREVIOUSLY PLUGGED TUBES (198)

NEW YORK POWER AUTHORITY
INDIAN POINT 3

SERIES 44

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 33 OUTLET



= ≥ 50% (770)

= < 50% (310)

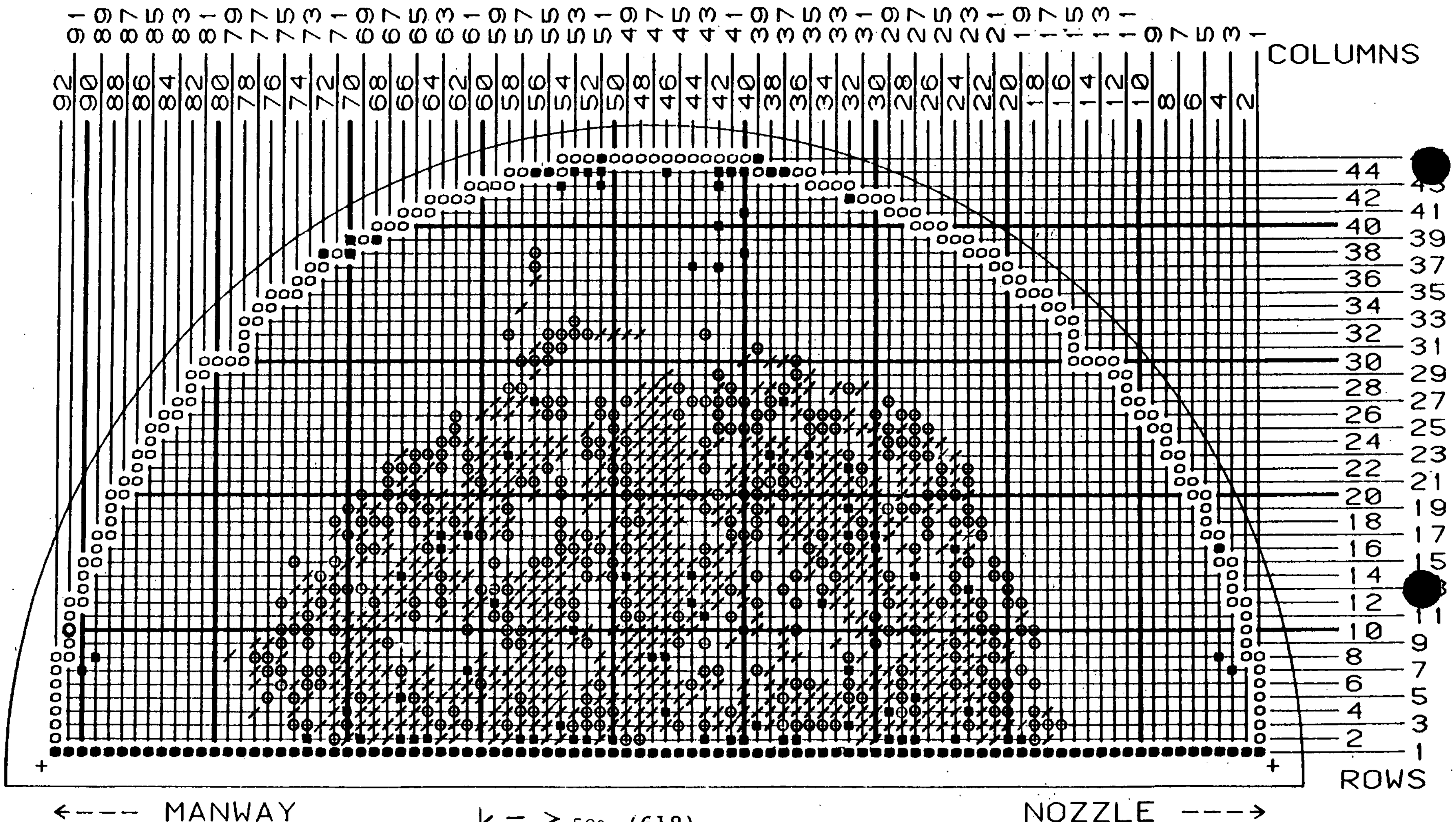
= PREVIOUSLY PLUGGED TUBES (167)

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 34 OUTLET

SERIES 44



= ≥ 50% (618)

= < 50% (342)

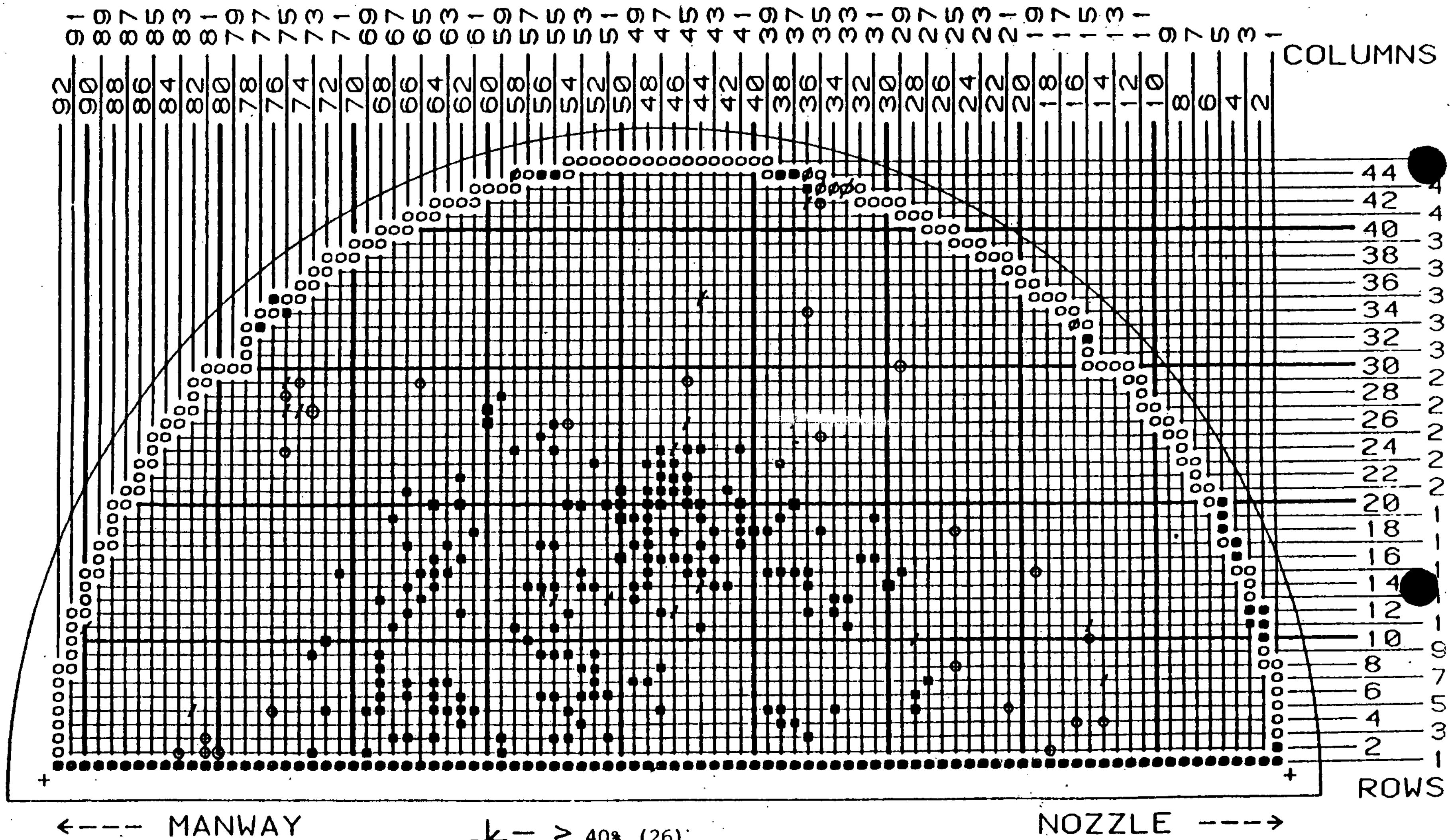
= PREVIOUSLY PLUGGED TUBES (182)

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 31 INLET

SERIES 44



= ≥ 40% (26)

= < 40% (25)

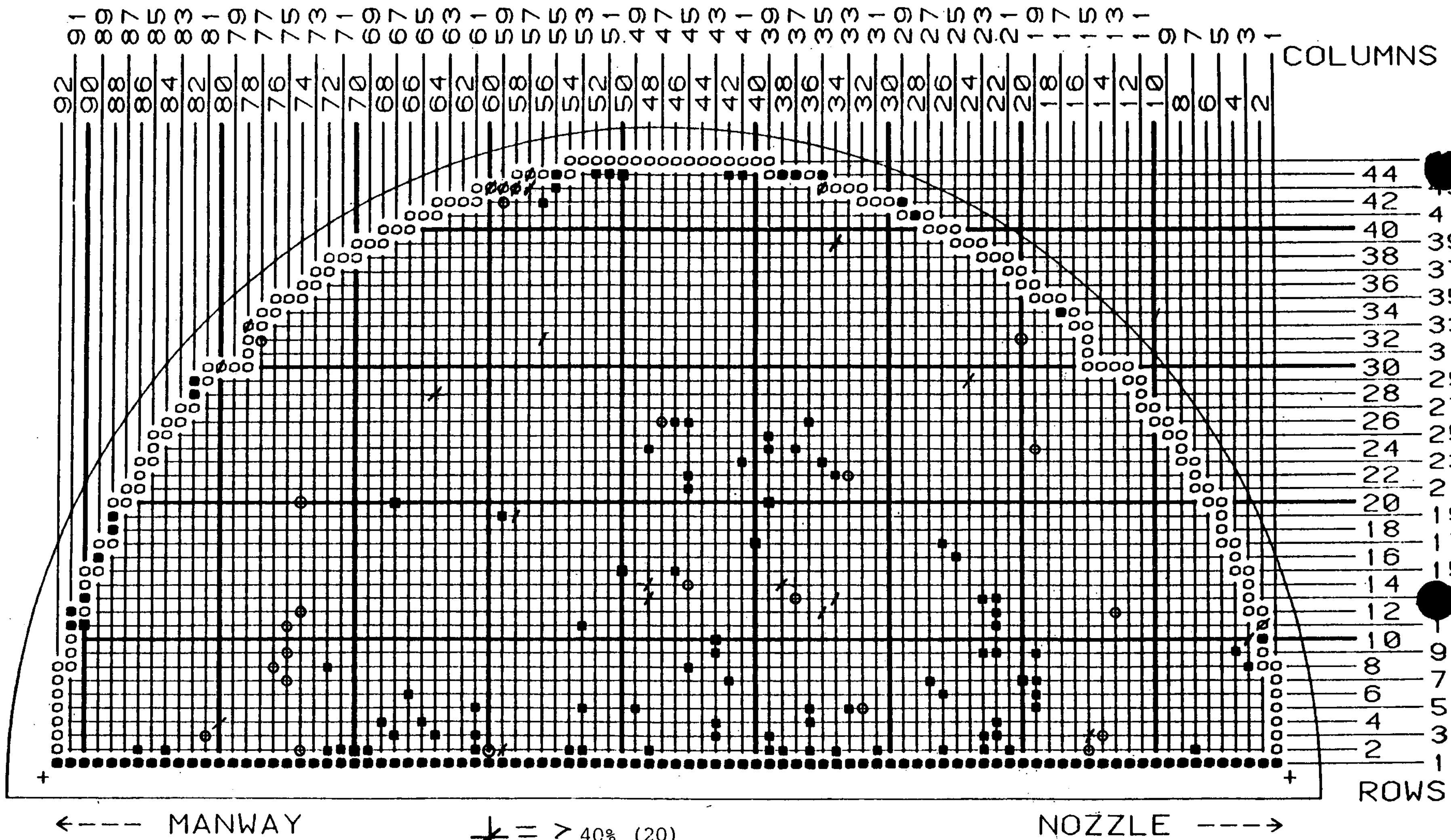
= PREVIOUSLY PLUGGED TUBES (286)

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 32 INLET

SERIES 44



$\not$ = ≥ 40% (20)

⊕ = < 40& (18)

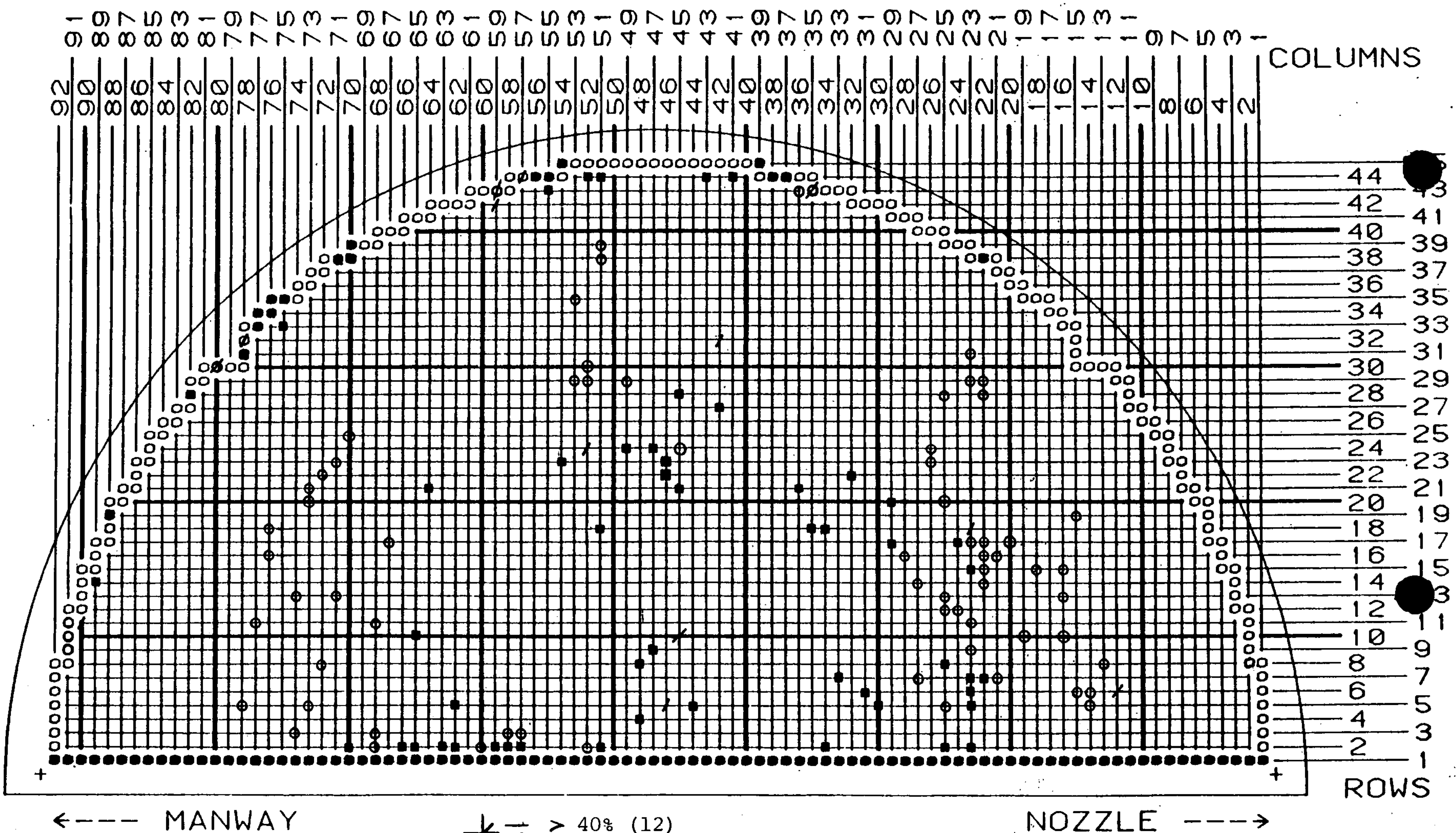
■ = PREVIOUSLY PLUGGED TUBES (198)

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 33 INLET

SERIES 44



≥ 40% (12)

< 40% (69)

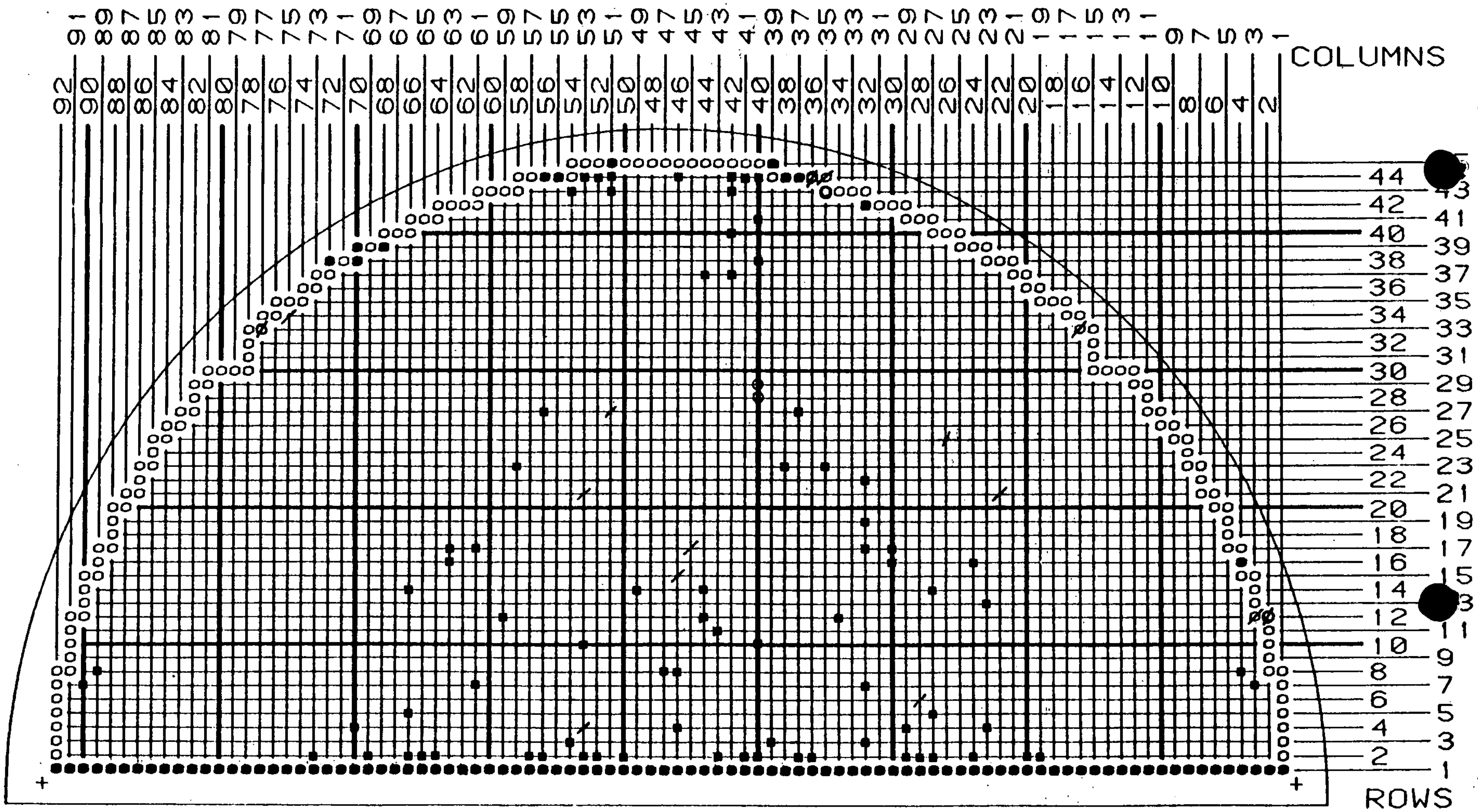
PREVIOUSLY PLUGGED TUBES (167)

NEW YORK POWER AUTHORITY
INDIAN POINT 3

SERIES 44

1982 STEAM GENERATOR E.C.T. SUMMARY

TUBESHEET MAP - 34 INLET



ATTACHMENT 4

NEW YORK POWER AUTHORITY
INDIAN POINT 3

1982 STEAM GENERATOR E.C.T. SUMMARY

.610" and .540" E.C.T. PROBE RESTRICTIONS

31 Outlet		31 Inlet	
.610	.540	.610	.540
None	None	Row 33 - Col. 75 Row 35 - Col. 75	None

32 Outlet		32 Inlet	
.610	.540	.610	.540
None	None	Row 33 - Col. 19 Row 34 - Col. 30 Row 33 - Col. 75	None

33 Outlet		33 Inlet	
.610	.540	.610	.540
Row 40 - Col. 58 Row 10 - Col. 88 Row 13 - Col. 88 Row 9 - Col. 89 Row 8 - Col. 90	Row 42 - Col. 56 Row 41 - Col. 56	Row 10 - Col. 5 Row 38 - Col. 36	None

34 Outlet		34 Inlet	
.610	.540	.610	.540
None	None	Row 10 - Col. 4 Row 11 - Col. 5 Row 12 - Col. 5 Row 3 - Col. 40 Row 43 - Col. 40	None

Attachment 5

NEW YORK POWER AUTHORITY
INDIAN POINT 3

STEAM GENERATOR TUBE PLUGGING/SLEEVING SUMMARY

STEAM GENERATOR No.	No. TUBES PLUGGED	No. TUBES SLEEVED	EFFECTIVE% PLUGGED TUBES*
31	483	768	16.0%
32	286	651	9.8%
33	231	850	8.4%
34	227	701	8.0%
TOTALS	1227	2970	10.5%

* Based upon the sleeve thermal hydraulic degradation estimate provided by paragraph 6.7.1 of WCAP-10145 (Revision 1), THE INDIAN POINT 3 STEAM GENERATOR SLEEVING REPORT.

INDIAN POINT 3

STEAM GENERATOR 31 TUBE STATUS

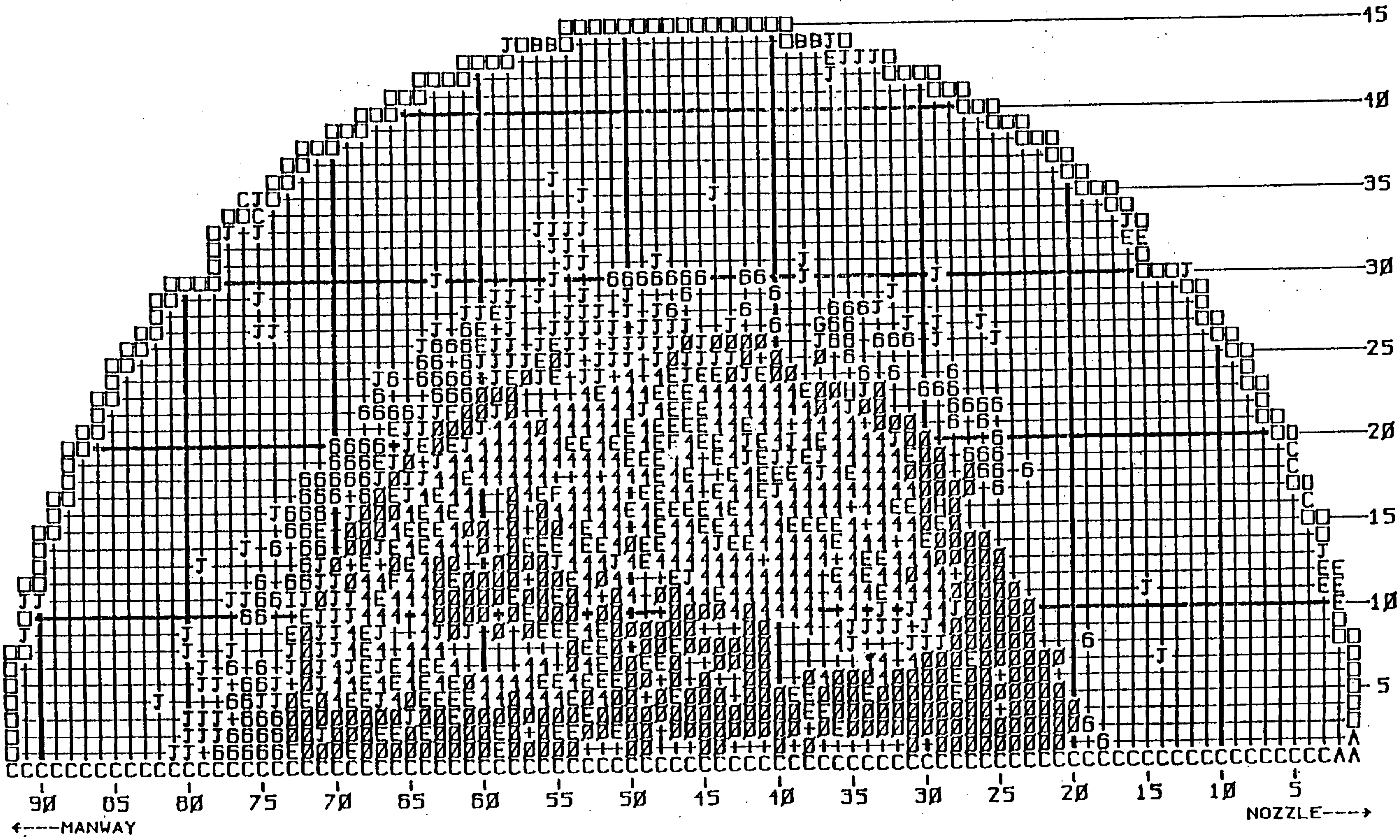
Attachment 6
Page 1 of 4

SERIES 44

INT-31

WESTINGHOUSE PROPRIETARY

A	3	8/78; TUBES PLUGGED
B	4	3/79; TUBES PLUGGED
C	95	11/79; TUBES PLUGGED
D	2	11/79; TUBES PLUGGED
E	177	10/81 MECH PLUGGED
F	4	10/81 M/P HL; W/R CL
G	1	01/83; 36-IN SLV CL, M/P HL
H	2	01/83; SLEEVE STUB CUT, M/P
I	1	01/83; SLEEVE PLUG
J	194	01/83; MECH PLUGGED
4	285	01/83; 44-INCH SLEEVE
0	365	01/83; 40-INCH SLEEVE
6	118	01/83; 36-INCH SLEEVE



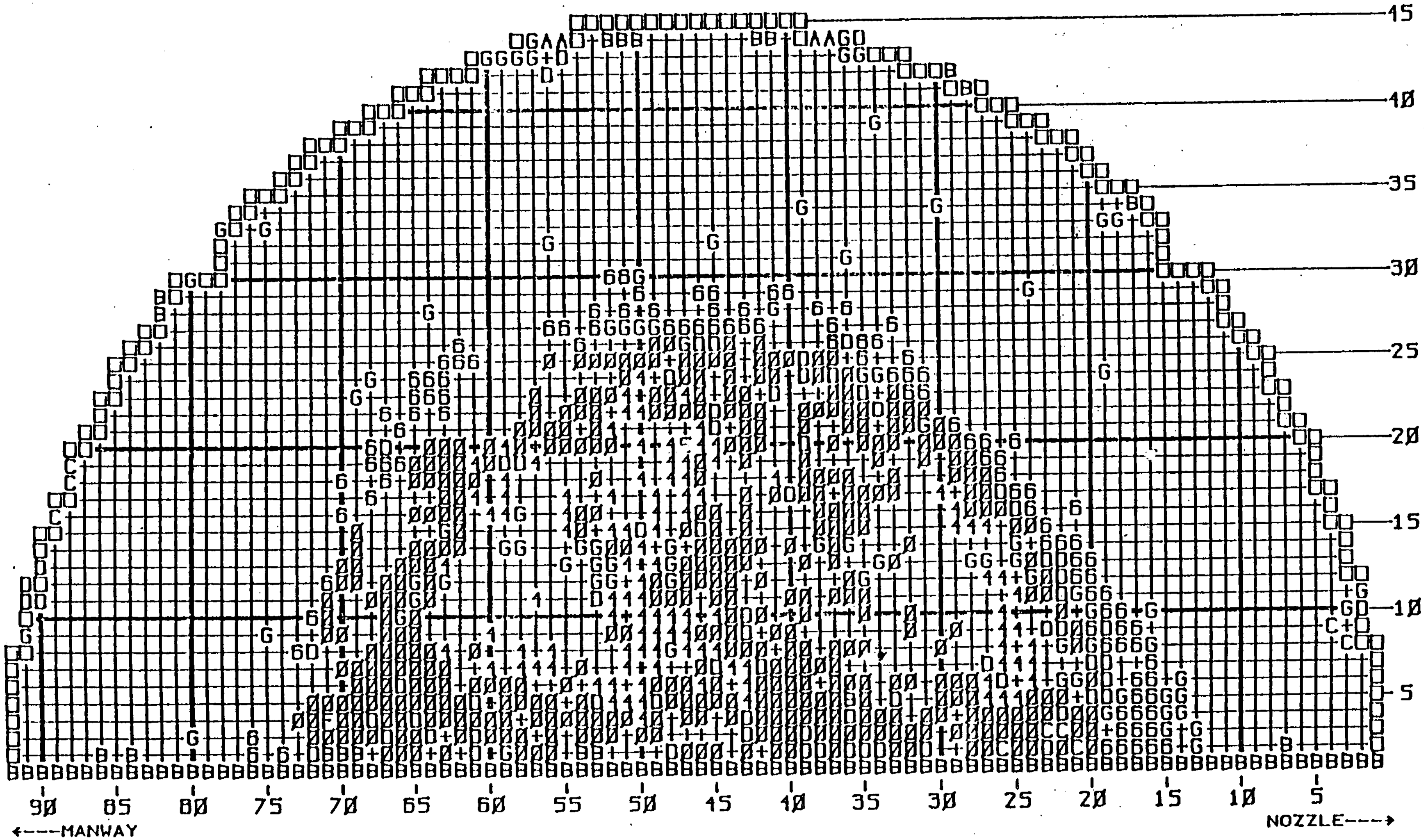
INDIAN POINT 3
STEAM GENERATOR 32 TUBE STATUS

SERIES 44

INT-32

WESTINGHOUSE PROPRIETARY

A	4	3/79; TUBES PLUGGED
B	111	11/79; TUBES PLUGGED
C	9	10/80; MECH PLUGGED
D	74	10/81; MECH PLUGGING
E	1	01/83; SLEEVE PLUG
F	1	01/83; SLEEVE STUB CUT, M/P
G	86	01/83; MECH PLUGGED
4	106	01/83; 44-INCH SLEEVE
0	435	01/83; 40-INCH SLEEVE
6	110	01/83; 36-INCH SLEEVE



INDIAN POINT 3

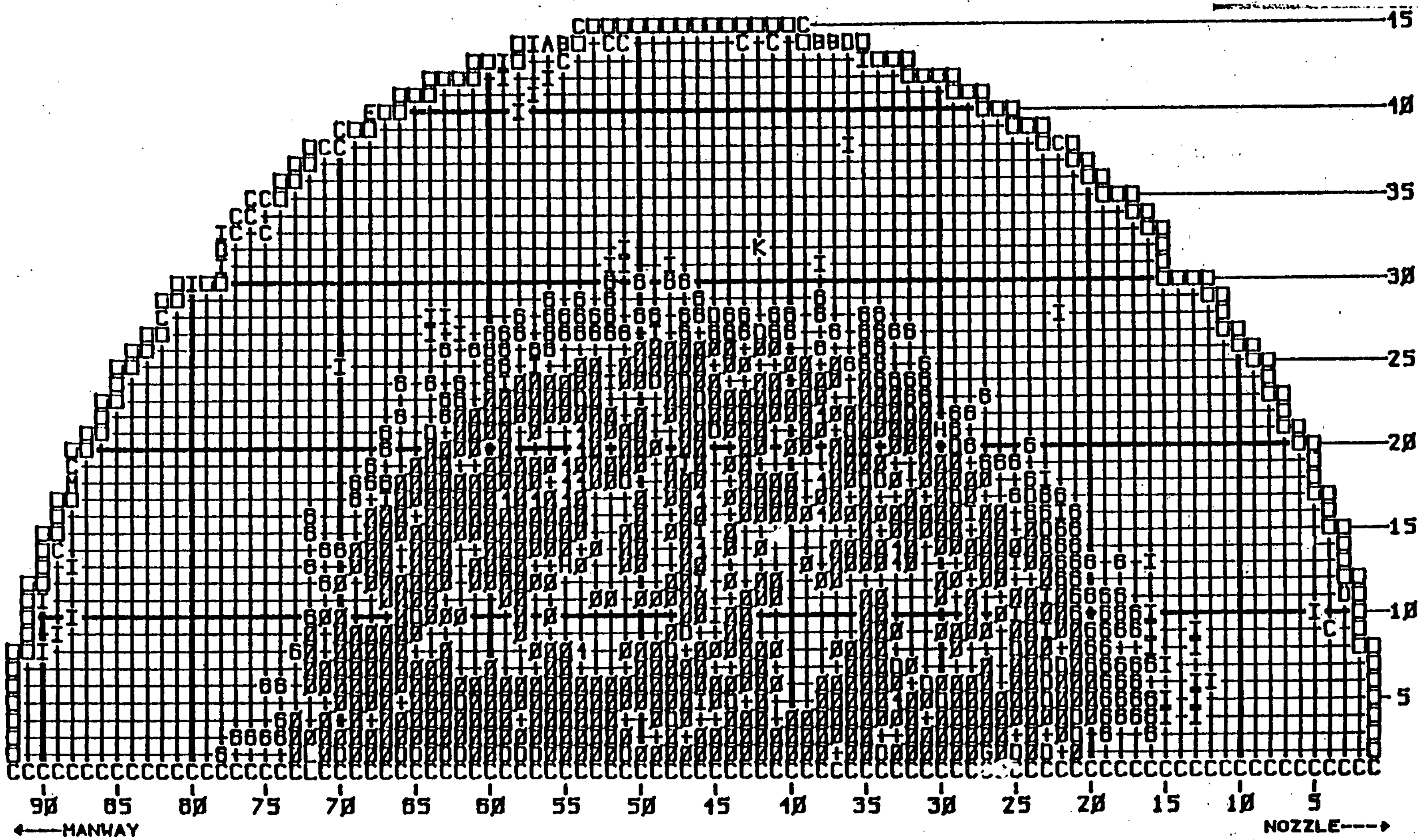
STEAM GENERATOR 33 TUBE STATUS

SERIES 44

INT-33

WESTINGHOUSE PROPRIETARY

A	1	12/78; TUBE PLUGGED
B	3	3/79; TUBES PLUGGED
C	113	11/79; TUBES PLUGGED
D	49	10/81; MECH PLUGGED
E	1	4/82;M/P'S & W/P'S INSTALLED
G	1	01/83; SLEEVE STUB CUT, M/P
H	2	01/83; SLEEVE PLUG
I	56	01/83; MECH PLUGGED
J	2	04/82; T/P & W/R CL, M/P HL
K	1	04/82; T/P & W/R HL, M/P CL
L	1	04/82; T/P(EDM)&W/R CL, M/P HL
M	1	04/82; M/P (STUCK PROBE)
4	17	01/83; 44-INCH SLEEVE
0	676	01/83; 40-INCH SLEEVE
6	157	01/83; 36-INCH SLEEVE



INDIAN POINT 3

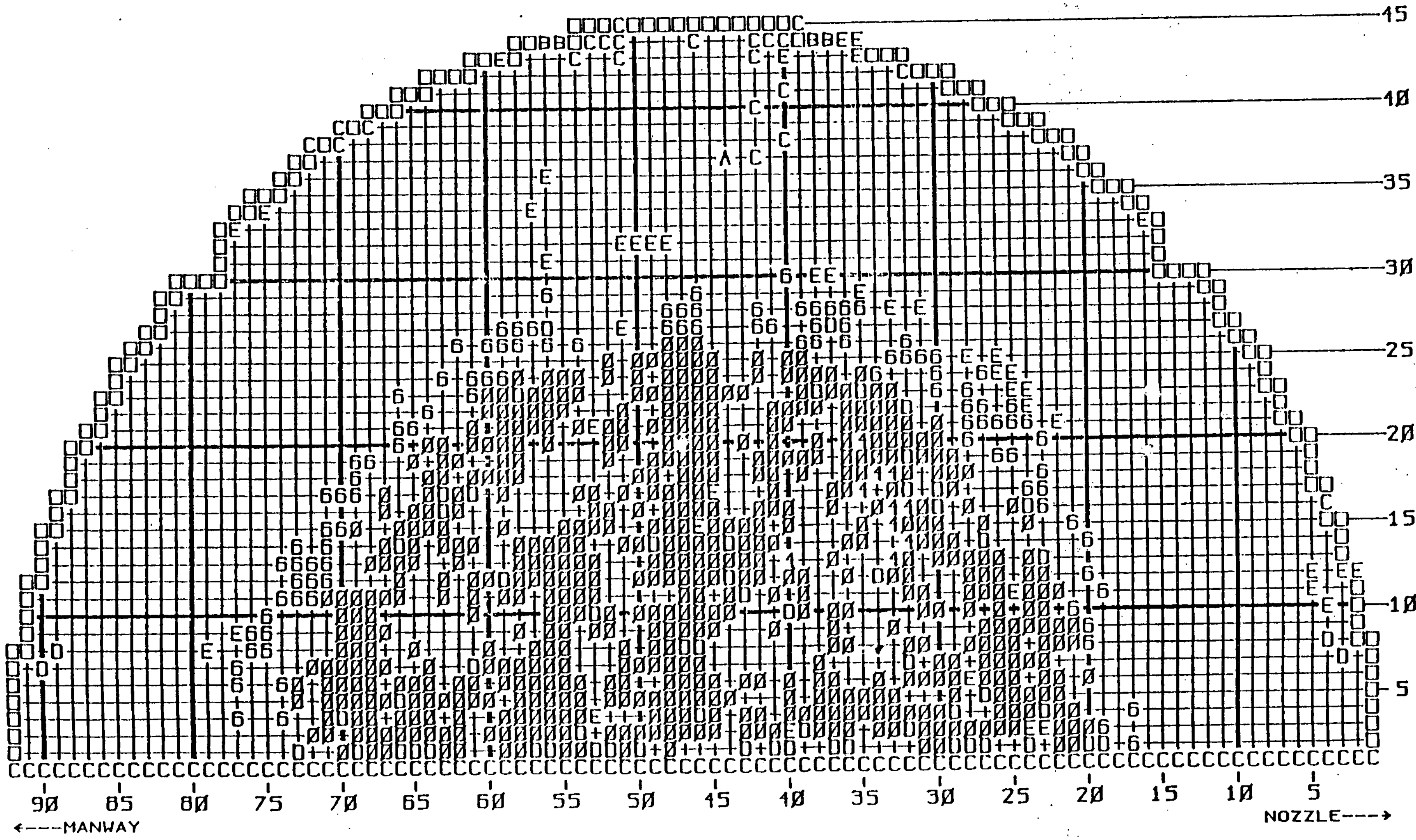
STEAM GENERATOR 34 TUBE STATUS

SERIES 44

INT-34

WESTINGHOUSE PROPRIETARY

A	1	HOLE OMITTED; MANUF. ERROR
B	4	3/79; TUBES PLUGGED
C	114	11/79; TUBES PLUGGED
D	63	10/81; MECH PLUGGED
E	45	01/83; MECH PLUGGED
4	10	01/83; 44-INCH SLEEVE
0	584	01/83; 40-INCH SLEEVE
6	107	01/83; 36-INCH SLEEVE



ATTACHMENT 7

NEW YORK POWER AUTHORITY
INDIAN POINT 3

STEAM GENERATOR TUBE PLUGGING/SLEEVING EXPOSURE SUMMARY

Activity	Exposure (Man-Rem)
Pre-Sleeving Checks	17.2
S/G Decon	32.5
Area & Equipment Set-up	6.0
Automatic Sleeving	189.7
Manual Sleeving	357.1
Eddy Current Testing	12.5
Tube Plugging	25.5
Mandril Loading	3.0
Equipment Maintenance	39.0
Honing Filter System	3.1
Health Physics Support	26.5
Decon/Rad Waste	7.6
Quality Assurance/Engineering	5.3
Reaning	8.5
Total	733.4

ATTACHMENT 8

NEW YORK POWER AUTHORITY

INDIAN POINT 3

REPORT OF ACTUAL SLEEVE CONDITIONS

AND

TUBE DENT REAMING

1.0 INTRODUCTION

Several as-built sleeve conditions are not completely described by the Indian Point 3 Steam Generator Sleeving Report (WCAP 10145, Revision 1). These issues are:

a) Overlapping Hardroll and Hydraulic Expansion Transitions, Upper Joint
b) Full Length Expansion
c) Roll-Out
d) Incomplete Sleeve Insertion
e) Tube Dent Reaming
f) Pressure Increase - Primary to Secondary Hydrostatic Test

2.0 OVERLAPPING HARDROLL AND HYDRAULIC EXPANSION TRANSITIONS, UPPER JOINT

2.1 Description

The upper hardrolls have been mislocated above the planned position for 132 sleeves. The hardroll upper transition overlaps the hydraulic expansion upper transition such that there is no discernible (with eddy current testing techniques) upper land which separates the rolled region from the hydraulically expanded region of the joint.

2.2 Extent

Steam Generator 31.....0
Steam Generator 32.....132 Sleeves
Steam Generator 33.....0
Steam Generator 34.....0

2.3 Discussion

During sleeve installation in the first steam generator at PASNY, the hard roll transition and hydraulic expansion transition were determined to be overlapped. This determination was made by E.C. testing and it was found that the transition was overlapped due to mislocation of the upper roller, tool tolerances, and/or position of the tool in the tube. Subsequent E.C. testing and evaluation indicated that of the 144 sleeves which had been rolled with the roller mislocated, 132 of the sleeves had been installed where the transition was either overlapped or where the distance between the transitions could not be determined by E.C. testing. This was discovered for the first group of installed sleeves. Changes were instituted to locate the upper rall at the correct elevation. After this correction was made, subsequent sleeve installations were performed in accordance to WCAP 10145 without overlapping.

The overlapped transition condition had not been tested during the stress corrosion cracking evaluations during sleeve qualification. In order to determine if there was any reduction in stress corrosion crack margin from the reference design, a corrosion test program was performed.

Magnesium chloride ($Mg\ Cl_2$) tests were conducted on hybrid expansion joints (HEJ) of various geometries to evaluate residual stress levels. The HEJ's were manufactured using mill annealed Inconel 600 for the outer tube and 304 stainless steel for the sleeve. The test program evaluated the residual stress levels on the ID of the sleeve for joints where the hardroll and hydraulic expansion transitions overlapped. Austenitic stainless steels are susceptible to stress corrosion cracking in $MG\ Cl_2$ solutions if tensile stresses are present above a threshold value. The time to initiate cracks is related to the magnitude of the tensile stress with the time to initiate cracking being shorter as the tensile stresses increase. Thus $Mg\ Cl_2$ testing provides a rapid method for determining the relative levels of residual stresses by determining the relative times to initiate cracking or by comparing the degree of cracking for the various expansion geometries after a given exposure period.

Short lengths of type 304 stainless steel tubing, were hydraulically expanded and hard rolled into mill annealed Inconel 600 tubing to form upper HEJ. The parameters for hydraulic expansion pressure and hardroll torque were selected to simulate field expansion parameters. The location of the hard roll relative to the hydraulic expansion location was varied to duplicate the field geometries as determined by eddy current. Additional geometries were tested for comparison.

The I.D. of the expanded sleeve was exposed to a boiling 42 percent $Mg\ Cl_2$ aqueous solution, using procedures outlined in ASTM Recommended Practice G36. The specimens were removed from the test solution periodically for visual and dye penetrant inspection of the I.D. of the sleeve for the presence of cracks. When detected, the location, and orientation of the cracks as well as the $Mg\ Cl_2$ exposure times were recorded. Duplicate specimens for each geometry were tested with one being removed after 94.5 hours of exposure for destructive examination. The other specimens have continued in test for a total of 210 hours with no additional I.D. cracking based on dye penetrant testing.

2.4 Conclusion(s)

The special qualification testing that was performed demonstrated that there was no observable degradation in the SCC performance characteristics for those test coupons that were formed with transition overlap, on the basis of time to cracking data. Therefore, it is concluded that the overlapped sleeve joints will perform as well as the standard joint and are acceptable for service.

3.0 FULL LENGTH EXPANSION

3.1 Description

The upper and lower sleeve joints are formed by hard rolling within a four (4) inch hydraulically expanded region located at the upper and lower extremities of the sleeve. There are numerous sleeves that, during the expansion process, were expanded along their entire length.

3.2 Extent

Steam Generator 31.....1 Sleeve
Steam Generator 32.....19 Sleeves
Steam Generator 33.....106 Sleeves
Steam Generator 34.....29 Sleeves

3.3 Discussion

The standard sleeve design that has been described in the sleeving repair report requires a four (4) inch hydraulically expanded region at the upper and lower extremities of the sleeve prior to rolling. During the expansion process on approximately six (6) percent of the installed sleeves, the expansion mandrel inboard seals leaked. The leaking seals then allowed the expansion pressure to expand the entire length of the affected sleeves.

The two concerns that arise as a result of sleeve installation in this condition are:

- The potential for further degradation of the existing tube due to hydraulic expansion of the sleeve in a degraded (pitted) region of the tube.

- A compromise in the eddy current inspectability of the sleeve between the upper and lower joints.

Qualification testing has demonstrated that sleeve hydraulic expansion within degraded sections of the parent tube is not expected to cause unacceptable tube damage. Specifically, complete upper hybrid expansion joints were formed in tube/sleeve coupons that had conservatively sized artificial degradation machined in the tubes in the hydraulically expanded regions. Acceptable joints were formed without further degradation of the surrounding tubes.

Laboratory testing has also verified that the eddy current inspectability of the affected sleeves has not been compromised as a result of full length expansion. Two full length expansion test coupons were fabricated for demonstration purposes:

- An artificially degraded sleeve in a sound tube.

- A sound sleeve in an artificially degraded tube.

The pieces were eddy current tested utilizing the 730 Khz technique that is used in the field for inspection of the unexpanded sleeve regions. There was no observable degradation in eddy current inspectability due to the full length expansion condition:

- The detectability of flaws in the sleeve was not changed.
- Flaws in the surrounding tube were not detected with the 730 Khz frequency, therefore, it is not expected that tube degradation will result in erroneous information regarding sleeve integrity.
- Copper placed around the tube had no effect on the 730 Khz channel, therefore, it is not expected that copper deposition on the tubes at Indian Point 3 will result in undesirable signal distortion.

3.4 Conclusion(s)

The sleeves that have been hydraulically expanded along the entire length are acceptable for service based on the following:

- Full length expansion will not to further degrade the condition of the existing tubes.
- The eddy current inspectability of these sleeves, utilizing the same technique that is employed in the inspection of the standard installations, is uncompromised.
- Sleeve performance based upon leakage and structural considerations is equal to the standard design.

4.0 UPPER JOINT ROLL-OUT

4.1 Description

The roll-out phenomenon, which occurs during certain conditions of upper hardroll tool removal, results in an extension of the lower transition of the upper roll.

4.2 Extent

Steam Generator 31.....43 sleeves
Steam Generator 32.....147 sleeves
Steam Generator 33.....20 sleeves
Steam Generator 34.....33 sleeves

4.3 Discussion

The upper joint is formed by the hydraulic expansion of a four (4) inch section at the upper extremity of the sleeve, which is followed by the placement of a hardroll within the expanded region. Upon completion of the rolling process, a reverse torque is applied in order to retract the hardrolling tool. If the rollers are not fully retracted prior to tool withdrawal, the tool will continue to dilate the sleeve below the rolled region, resulting in the roll-out phenomenon.

This condition was most prevalent in the first steam generator to be sleeved, for those units installed utilizing the manual rolling process. Manual upper rolling operations in subsequent steam generators were performed with a mandrel retaining fixture which reduced the frequency of tool withdrawal prior to roller retraction, thereby significantly reducing the frequency of the roll-out phenomenon.

Roll-out essentially extends the lower transition of rolled region. If such an extension is of sufficient length, the sleeve/tube dilation caused by the roller's may potentially fall to within a degraded region of the surrounding tube, with perhaps, questionable effects on the existing tube and the integrity of the formed joint. Therefore, testing was performed to evaluate the effects of extending the rolled region to within degraded (pitted) regions of the parent tube.

Test coupons were fabricated by forming sleeve joints within artificially degraded steam generator tubing material such that various portions of the rolled regions were positioned directly over the flawed areas. These tests indicated that there was no deterioration of the tube in the simulated defect area. Furthermore, it was found that eddy current was capable of detecting the minute degrees of local bulging which occurred in the stimulated defect area. The test was considered conservative in that the flawed regions of the test coupons were dilated to the full roll diameter, whereas the roll-out phenomenon actually results in an extension of the roll taper.

4.4 Conclusion(s)

Sleeves with the roll-out condition that is confined within the hydraulically expanded region are acceptable for service for the following reasons:

- Roll-out does not effect the integrity of the upper joint.

- A conservative test effort has indicated that there are no deliterious effects on the surrounding tube which could lead to a degradation of joint integrity.

- Eddy current testing is capable of detecting small degrees of anomalous tube/sleeve conditions, such that potentially unacceptable conditions would be readily identified.

In addition, it is to be noted that the roll-out conditions were present in the sample joints that were tested as part of the design qualification program.

5.0 INCOMPLETE SLEEVE INSERTION

5.1 Description

There is a small population of sleeves installed at Indian Point No. 3 that have varying degrees of lower joint transition overlap (Figure 4). This condition is somewhat similar to that which is detailed in paragraph 2.0.

5.2 Extent

Steam Generator 31.....5 sleeves
Steam Generator 32.....0
Steam Generator 33.....5 sleeves
Steam Generator 34.....1 sleeve

5.3 Discussion

During the sleeve insertion/expansion process at Indian Point No. 3, a small number of sleeves were pulled down by the expansion mandrel during tool withdrawal. The approved repositioning procedure was used to reinsert the sleeve to the proper location within the tube, however, in some cases complete sleeve insertion was not possible (as much as two inches extended below the existing tube ends).

The approved disposition for the affected units was to complete the sleeve installation as follows:

1. Upper joint formation (hardrolling) was completed.

2. The protruding sleeve ends were measured and subsequently removed.

3. The reduced sleeve lengths (due to the removal of the protruding ends) was evaluated to assure that the degraded region of the existing tubes would be spanned.

4. Lower joint formation (hardrolling) was completed.

The overlapping of the lower joint transitions occurs as a result of the decrease in elevation of the expansion transition (due to incomplete sleeve insertion) such that there is intersection with the hardroll transition. For the most extreme cases of protruding sleeve end removal, the resulting overlapping transitions are addressed by the test that was performed in order to qualify the upper joint overlapping condition.

5.4 Conclusion(s)

The eleven sleeves that were not completely inserted, and were subsequently end-faced (protruding ends removed) and hardrolled are acceptable for service based on the following:

- The acceptability of the resulting transition overlap has been demonstrated.

- The reduced sleeve lengths and eddy current flaw locations have been evaluated to assure the spanning of the degraded regions of the existing tubes.

6.0 TUBE DENT REAMING

6.1 Introduction

During the eddy current inspection program that was performed in May, 1982, a significant probe restriction phenomenon was identified in the outlet legs of the steam generators. Inspection of steam generator 34, the most affected unit, resulted in the identification of 275 tubes that restricted the insertion of a .740 inch eddy current probe at an elevation corresponding to the top of the tubesheet. Subsequent go-gauge and profilometry testing indicated the following:

- The restricted tubes were dented at the top of the tubesheet.

- Tube dents were characterized at 2-3 inches in length and uniform (concentric) in orientation.

- The maximum (minimum diameter) dent measured had an ID of .730 inches.

- There would be a severe impact in the installation of .740 inch OD sleeves in steam generator 34:

  a) A large population of tubes that could not be sleeved due to the dents would have to be plugged.

b) The personnel radiation exposure would be significantly increased in an attempt to sleeve a steam generator in this condition due to the large population of sleeves that would become stuck in the partially inserted position.

6.2 Process Description

It was decided to develope an automated process that would remove the tube restrictions which would maximize the number of sleeves that could be installed in steam generator 34 in a manner that was ALARA efficient. The basic process involved utilizing the coordinate transport equipment and a .750 inch OD end cutter that would actuate upon contact with a tube restriction that was less than the tool OD. Then the cutter would remove tube wall material, and thus enlarge the tube opening to .750 inch ID which would be acceptable for the insertion of a .740 inch sleeve.

6.3 Process Evaluation and Qualification

6.3.1 Vibration Induced Wear and Fatigue Evaluation

An evaluation of the potential for vibration induced wear and fatigue has been performed. The worst case condition of removal of wall material from only on side of the tube was considered. On the basis of the analysis performed, the following conclusions were reached:

1. Vibration induced stresses would be very small; therefore, fatigue damage would be negligible.

2. Maximum lateral support reaction on the sleeve would be very small; there would be almost no relative axial movement. Therefore, wear at the support interface will also be negligible.

6.3.2 Qualification Tests

A qualification test program was developed and implemented utilizing artificially dented tube samples (which closely resembled the dent characteristics observed at Indian Point 3) in order to:

1. Verify that the process will not cause through wall degradation of the dented region of the tube.

2. Insure that a 0.740" OD sleeve can be inserted into the dented tube after reaming.

3. Obtain the optimum machining process by adjusting process parameters such as reamer rotation speed and translation speed.

4. Assure that the process would not cause unacceptable gouging or scratches in the "clean" areas of tubes.

5. Evaluate the impact of a reamed tube region on eddy current inspection.

6.4 Reaming Program Selection

The results of an extensive go-gauging test program were used to identify those tubes to be reamed. Utilizing a standard eddy current probe drive and a set of gauges that were built to simulate sleeve insertion, all of the tubes that were sleeving candidates were tested in order to:

- Identify those tubes that required dent reaming for sleeve insertion.

- Avoid material removal in those tubes that were dented, but not to be extent such that sleeve insertion would be restricted without reaming.

- Control the maximum degree of wall reduction that would result from the reaming process (it was decided that any tube which restricted a .730 inch gauge would not be reamed and would have to be plugged; for a tube dented to a .730 inch ID from one side that was reamed with a .750 inch tool, the resulting wall reduction would be 40 percent; for the uniform (concentric) configuration that has been observed at Indian Point 3, the resulting wall reduction is 20 percent).

6.5 Conclusion(s)

After the process and tooling was qualified, and the reaming program was established, the process was used to ream 275 tubes on steam generator 34. Tubes with dents from .750" to .730" were reamed with the qualified reaming process. After reaming, the standard sleeving process was used to install sleeves.

Since the sleeve qualification testing and analysis was performed assuming that a tube was completely degraded and the tube/sleeve attachment joint is not included in the reamed portion of the tube, the installation of sleeves within tubes that have been reamed by the forementioned process is within the scope of sleeving program specified in WCAP 10145.

7.0 PRIMARY TO SECONDARY HYDROSTATIC TEST DISCUSSION

7.1 Discussion

The ASME Boiler and Pressure Vessel Code, Section III, Paragraph NB6221(a) specifies the minimum required hydrostatic test pressure be not less than 1.25 times the system design pressure. The maximum design primary to secondary differential pressure for the Indian Point 3 steam generators is 1550 psig. Therefore, the minimum required test differential pressure is 1937 psig which exceeds the 1900 psig requirement specified in Paragraph 9.0 of the Indian Point 3 Steam Generator Sleeving Report.

7.2 Conclusions

The primary to secondary hydrostatic pressure test shall be performed at 1950 psid in order to satisfy the Code requirement of 1937 psid. Testing at 1950 PSID will not exceed code allowables.