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**MATERIALS ENGINEERING AND INSPECTION SERVICES**

**FINAL EXAMINATION REPORT**  
**FOR THE**  
**1995 STEAM GENERATOR EDDY CURRENT INSPECTION**

**AT**  
**R. E. GINNA NUCLEAR POWER STATION**

**REVISION 0**  
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## **1.0 INTRODUCTION**

The following is a summary report of the results of the multifrequency eddy current examination performed during the 1995 Annual Refueling and Maintenance Outage at the R. E. Ginna Nuclear Power Station in Ontario, New York. The examinations were performed in both the "A" and "B" recirculating steam generators which are Westinghouse Series-44 design. Each generator contains 3260 Inconel 600 Mill Annealed U-Bend tubes having an outside diameter of 0.875" and a nominal wall thickness of 0.050".

The purpose of the eddy current examination was to assess any corrosion or mechanical damage that may have occurred during the cycle since the 1994 examination. Particular attention was given to the detection of:

- 1) Intergranular attack (IGA) and intergranular stress corrosion cracking (IGSCC) within the inlet tubesheet crevice region.
- 2) Intergranular attack (IGA) and intergranular stress corrosion cracking (IGSCC) within the outlet tubesheet crevice region (none detected).
- 3) Primary water stress corrosion cracking (PWSCC) at the inlet tubesheet roll transition.
- 4) Primary water stress corrosion cracking (PWSCC) at the outlet tubesheet roll transition (none detected).
- 5) Pitting and wastage between the tubesheet and first support plate.



- 6) Wear at the antivibration bar to tube intersections in the U-bend region.
- 7) Denting at tube support intersections.
- 8) Primary water stress corrosion cracking (PWSCC) in the Row 1 and Row 2 U-bend area (none detected).
- 9) Intergranular attack (IGA) and intergranular stress corrosion cracking (IGSCC) at hot leg support plate intersections (none detected).

The examination was performed by personnel from Rochester Gas and Electric (RG&E) and ABB-Combustion Engineering (ABB-CE). All personnel were trained and qualified in the eddy current examination method and have been certified to a minimum of Level I for data acquisition and Level II for data analysis. All examination activities were performed in accordance with MEIS NDE-500-17. In addition, all acquisition personnel were trained and qualified to site specific procedures and all analysis personnel were trained and qualified to the site specific "Steam Generator Data Analysis Guidelines - RG&E Ginna Station". These analysis guidelines were prepared in accordance with Revision 3 of the Electric Power Research Institutes (EPRI) "PWR Steam Generator Inspection Guidelines".

The data analysis was performed by two independent teams. For bobbin data evaluation, the primary analysis was performed manually utilizing the



Zetec EDDYNET Data Analysis System and the secondary analysis was performed utilizing the Computer Data Screening (CDS) capability of the EDDYNET system. Primary and secondary analysis of all other data (i.e., MRPC, Rotating Crosswound, Plus-Point, etc.) was performed manually utilizing the EDDYNET Data Analysis System. The results of all primary and secondary analyses were compared for discrepancies using the EDDYNET compare program. The typical data flow chart is shown on Figure 1 (Page 5). The following list describes some typical discrepancies between analysis teams requiring resolution by the Level III resolvers.

- o Any indication that is reported as  $\geq 20\%$  by either analyst and is not reported by the other or is sized at  $> 10\%$  difference.
- o Any indication spanning the repair limit, (39% vs. 41%).
- o Any difference of  $> 1$  inch in the axial location of a flaw.
- o Any tube which was analyzed by one analyst but not the other (may have been missed or improperly entered by one analyst).
- o Any difference in the reported test extent.
- o All indications identified as IGA and/or SCC regardless of whether one or both parties have reported it.
- o Any tube reported as restricted by one analyst but not the other (may have been missed or improperly entered by one analyst).





- o Any tube for which a retest was requested by one analyst but not the other.
- o All Roll Transition Indications reported by one analyst but not the other.

In addition to the above, all tubes requiring repair whether reported by one or both analysts were reviewed by the resolvers. In all cases, the removal of a repairable indication from the data base received the concurrence of two Lead Analyst personnel.

# Typical Data Flow Chart

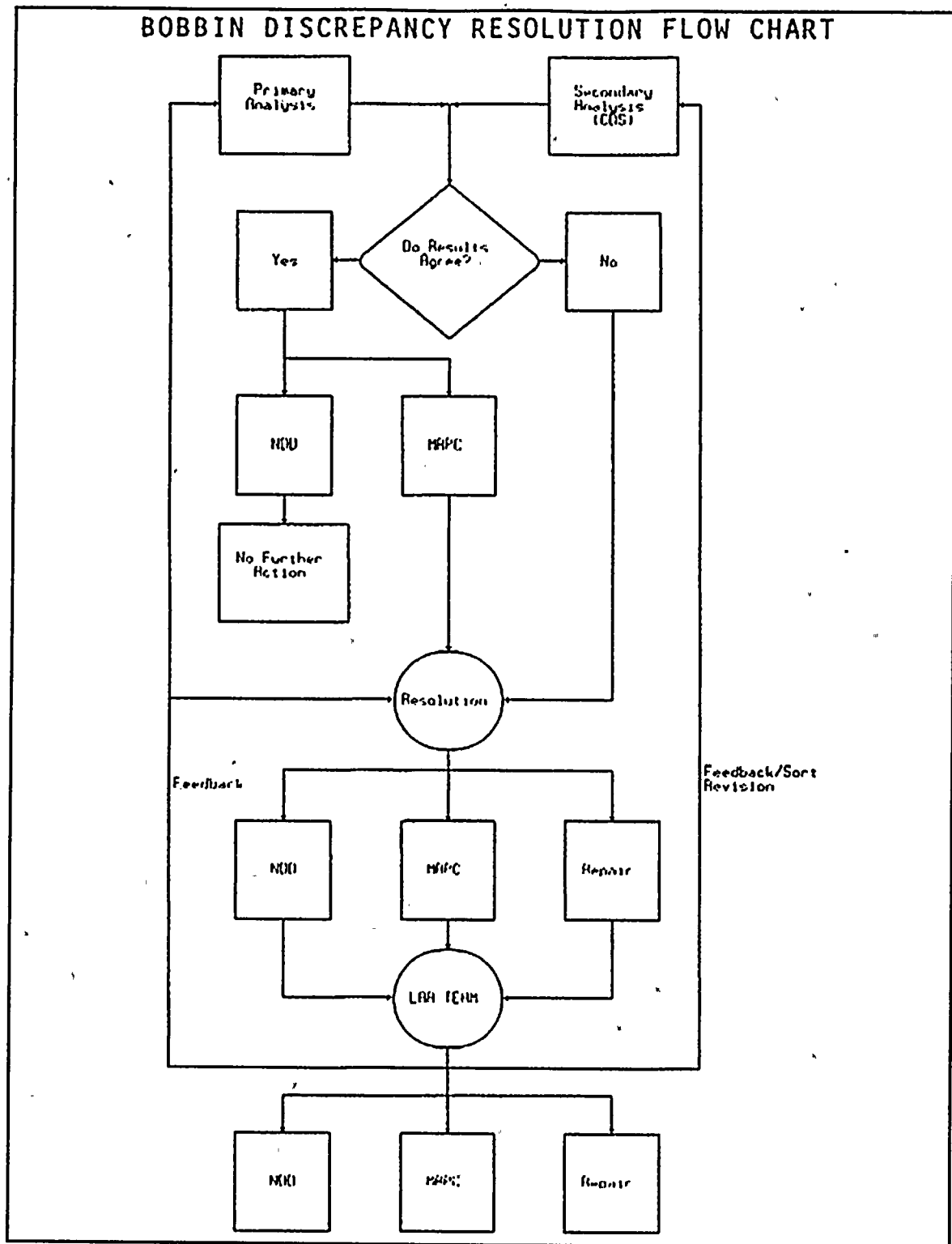


Figure 1



## **2.0 DATA ACQUISITION PROGRAM**

The initial eddy current examination of the "A" and "B" steam generators was performed utilizing a standard bobbin coil technique with data acquisition being performed with the EDDYNET Acquisition System. The frequencies selected were 400, 200, 100 and 25 kHz. The examination was performed primarily from the 1st tube support through the tubesheet region to examine open crevice, roll transition regions, and the area between the top of the inlet tubesheet to the 1st tube support plate. 20% of all open tubes were also examined throughout the full length of tubing.

Additional eddy current examinations of the "A" and "B" steam generators were performed utilizing the Zetec 3-coil Motorized Rotating Pancake Coil (MRPC) probe to examine the roll transition region, and selected crevices. The frequencies used for these examinations were 400, 300, 100, and 25 kHz. All row 1 and 2 U-bends were also examined with MRPC. All sleeve examinations (except for the B&W brazed and old style explosive sleeves) were performed using the Zetec "Plus-Point" probe. The B&W brazed sleeves and the old style explosive sleeves were examined using a saturation bobbin technique due to the magnetic permeability of the sleeve material.



Prior to examination of the steam generators, an inspection program was established for the inlet and outlet sides of both the "A" and "B" steam generators. The inlet or hot leg examination program plan was generated to provide the examination of 100% of each open unsleeved steam generator tube from the tube end through the first tube support plate, along with 20% of these tubes being selected and examined for their full length (20% random sample as recommended in the Electric Power Research Institute (EPRI) guidelines) with the bobbin coil. In addition, 20% of each type of sleeve was examined and the remaining tube examined full length. All Row 1 and Row 2 U-bend regions were examined with the Motorized Rotating Pancake Coil (MRPC) between the 06H and 06C from the cold leg side.

A number of supplemental examinations were also performed to assist in flaw characterization and confirmation and to continue to monitor for the onset of new damage mechanisms.

Tables 1-A and 1-B are breakdowns, by steam generator, of all tubes programmed for examination, numbers examined and the extent examined.





**STEAM GENERATOR "A"**  
**1995 EDDY CURRENT INSPECTION EXTENTS**  
**PRIOR TO CORRECTIVE ACTION**

Total Tubes	3260
Out of Service	215
Sleeved Tubes	<u>810</u>
Open Unsleeved Tubes	2235

	<u>REQ'D MIN<sup>1</sup></u>	<u>NUMBER PROGM'D</u>	<u>NUMBER INSPT'D</u>	<u>PERCENT COMPLETE<sup>2</sup></u>
Hot Leg to 1st TSP	2235	2235	2235	100.0%
Full Length (20% Random plus previous indications)	772	772	772	100.0%
Roll Transition MRPC	2235	2235	2235	100.0%
U-Bend MRPC (Rows 1& 2)	157	157	157	100.0%
Sleeves	216	216	216	100.0%
Full Crevice MRPC	36	36	36	100.0%
B&W Explosive Plugs	5	5	5	100.0%

Table 1-A

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<sup>1</sup> Per Appendix B requirement.

<sup>2</sup> % Complete = Tubes Inspected/Required Minimum.



**STEAM GENERATOR "B"**  
**1995 EDDY CURRENT INSPECTION EXTENTS**  
**PRIOR TO CORRECTIVE ACTION**

Total Tubes	3260
Out of Service	314
Sleeved Tubes	<u>1388</u>
Open Unsleeved Tubes	1558

	<u>REQ'D MIN<sup>1</sup></u>	<u>NUMBER PROGM'D</u>	<u>NUMBER INSPT'D</u>	<u>PERCENT COMPLETE<sup>2</sup></u>
Hot Leg to 1st TSP	1558	1558	1558	100.0%
Full Length (20% Random plus previous indications)	984	984	984	100.0%
Roll Transition MRPC	1558	1558	1558	100.0%
U-Bend MRPC (Rows 1 & 2)	133	133	133	100.0%
Sleeves	627	627	627	100.0%
Full Crevice MRPC	84	84	84	100.0%
B&W Explosive Plugs	19	19	19	100.0%

Table 1 -B

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<sup>1</sup> Per Appendix B requirement.

<sup>2</sup> % Complete = Tubes Inspected/Required Minimum.

### 3.0 DATA ANALYSIS RESULTS SUMMARY

The data analysis was performed using the Zetec EDDYNET System (Version 27).

For the MRPC examinations, all data was reviewed by displaying the 400 kHz or 300 kHz pancake coil data in the lissajous display along with the vertical component of the pancake and axial sensitive coils in strip chart form. Other frequencies and coils were selected as necessary for the evaluation of indications. No depth sizing was performed with the MRPC data. Any tube containing a flaw detected by the MRPC examination was repaired.

For the bobbin coil examination, all data was reviewed by displaying the 400 kHz in the lissajous display along with the vertical component of the differential and absolute mix outputs in strip chart form (where applicable). Other frequencies and their components were selected as necessary for the evaluation of indications.

All recordable indications were logged into the computer and stored on optical disk. The final report form summarizing all indications  $\geq 20\%$  TW (including IGA and PWSCC which is assumed to be  $>20\%$ ) for each generator can be found in Tables 2-A and 2-B. An explanation of the abbreviations and nomenclature used on these lists has been compiled for ease of interpretation.



## LIST OF >20% INDICATION AND CREVICE INDICATION NOMENCLATURE

### Top of List Information

ROW -	ROW number from the tube identification.
COL -	Column number from the tube identification.
VOLTS -	Amplitude of the measured indication signal response.
IND.DESC.-	Type of damage mechanism.
% TWD -	Percent through wall depth or code for non-measurable indications.
INDICATION LOCATION -	Reference point from which the indication was measured along with axial distance from that reference point.

### Information Under IND, DESC.

ADI -	Absolute Drift Indication Signal which is indicative of IGA.
ADS -	Absolute Drift Signal which may be indicative of IGA.
CRI -	Circumferential Roll Transition Indication
CPI -	Circumferential Plug Indication (B&W Plugs)
MAI -	Multiple Axial Indication - MRPC identified or verified crevice indication(s).
MBS -	Multiple Axial Indication below roll transition - Non-repairable MRPC signal below the roll transition
MRI -	Multiple Roll Indication - MRPC identified or verified axial roll transition indication(s).
NBI -	No braze in upper joint of B&W sleeve
NQI -	Non-Quantifiable Indication - Differential signal indicative of SCC
NQS -	Non-Quantifiable Indication - Differential signal which may be indicative of SCC.
PTF -	Parent Tube Flaw
SAI -	Single Axial Indication - MRPC identified or verified crevice indication.
SVI -	Repairable Sleeve Indication (Plus-Point Probe)
SVS -	Non-Repairable Sleeve Indication (Plus-Point Probe)
SRI -	Single Roll Indication - MRPC identified or verified axial roll transition indication.



**LIST OF >20% INDICATION AND CREVICE INDICATION NOMENCLATURE (CON'T)**

**Information Under % TWD**

**XX% -     The measured percent TW depth of the indication.**

**Information Under INDICATION LOCATION**

**TEH -     Hot Leg Tube End (Bottom).**

**TSH -     Top of inlet tubesheet.**

**TSP -     Tube Support Plate**

**TEC -     Cold Leg Tube End (Bottom).**

**TSC -     Top of outlet tubesheet.**

**AVB -     Antivibration Bars (Numbered from Hot Leg to Cold Leg).**

**-XX.X -   Axial distance below the secondary face of the tubesheet or support plates where the indication is located.**

**+XX.X -   Axial distance above the primary or secondary face of the tubesheet or support plates where the indication is located.**

**0XH -     Tube Support Plate Location Hot Leg 1-6**

**0XC -     Tube Support Plate Location Cold Leg 1-6**





## REPORTABLE INDICATIONS

Row	Col	Indication	Location
3	1	SRI	TEH + 2.7
12	5	SRI	TEH + 2.7
11	7	MRI	TEH + 2.9
12	18	NQS	TEH +11.2
		SAI	TEH +13.3 to 14.5
14	18	NQS	TEH + 4.6
8	19	ADS	TEH + 6.3
		SAI	TEH + 7.1
7	20	29 %	TSH + 2.6
11	20	33 %	TSH + 1.9
37	20	NQS	TEH + 5.3
7	21	CRI	TEH + 2.7
8	21	23 %	TSH + 1.7
10	21	39 %	TSH + 2.0
11	21	25 %	TSH + 1.2
		32 %	TSH + 2.0
13	21	22 %	TSH + 2.3
15	21	32 %	TSH + 1.4
16	21	23 %	TSH + 1.1
10	22	22 %	TSH + 3.0
11	22	20 %	TSH + 1.9
		29 %	TSH + 2.4
		27 %	TSH + 2.9

Table 2-A

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
12	22	25 %	TSH + 2.3
14	22	26 %	TSH + 2.1
		25 %	TSH + 2.8
23	22	29 %	TSH + 0.5
		20 %	TSH + 1.3
25	22	NQI	TEH + 4.9
		CRI	TEH + 3.0
		MAI	TEH + 4.1
10	23	26 %	TSH + 1.3
11	23	20 %	TSH + 2.7
12	23	26 %	TSH + 2.1
13	23	25 %	TSH + 2.1
		37 %	TSH + 3.0
14	23	20 %	TSH + 2.3
		27 %	TSH + 2.8
22	23	CRI	TEH + 3.0
25	23	NQS	TEH + 3.2
		MAI	TEH + 3.1 to 4.7
10	24	26 %	TSH + 2.0
11	24	24 %	TSH + 2.0
		26 %	TSH + 2.6
12	24	23 %	TSH + 2.9
13	24	27 %	TSH + 2.4
		34 %	TSH + 2.9

Table 2-A



R.G. &amp; E.

S/G A

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GINNA STATION

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
23	24	29 %	TSH + 1.5
12	25	26 %	TSH + 2.1
13	25	33 %	TSH + 2.4
14	25	37 %	TSH + 2.6
17	25	34 %	TSH + 2.2
23	25	22 %	TSH + 1.3
25	25	ADS	TEH + 3.7 to 12.4
24	26	NQS	TEH + 3.6 to 14.7
		35 %	TSH + 1.1
		CRI	TEH + 2.6
		SRI	TEH + 2.7
		MAI	TEH + 3.1 to 3.9
		SAI	TEH + 6.3 to 6.7
2	27	SRI	TEH + 2.7
17	27	32 %	TSH + 2.3
		30 %	TSH + 3.0
22	27	20 %	TSH + 1.3
		27 %	TSH + 2.1
		29 %	TSH + 2.6
23	27	23 %	TSH + 1.8
24	27	27 %	TSH + 1.5
23	28	25 %	TSH + 1.5
		26 %	TSH + 2.0
		33 %	TSH + 2.3
25	28	26 %	TSH + 0.9

Table 2-A



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S/G A

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GINNA STATION

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
14	29	ADS	TEH + 4.0
15	29	27 %	TSH + 3.0
24	29	26 %	TSH + 1.4
35	29	SRI	TEH + 2.9
23	30	30 %	TSH + 1.5
		22 %	TSH + 2.0
24	30	37 %	TSH + 1.6
25	30	20 %	TSH + 1.3
27	30	SRI	TEH + 2.7
14	31	ADS	TEH + 3.2 to 5.5
		ADS	TEH +13.3 to 16.1
23	31	34 %	TSH + 1.8
		33 %	TSH + 2.4
26	31	20 %	TSH + 0.8
20	32	36 %	TSH + 2.6
22	32	35 %	TSH + 1.4
		34 %	TSH + 2.0
23	32	27 %	TSH + 1.9
		31 %	TSH + 2.4
26	32	28 %	TSH + 0.6
21	33	20 %	TSH + 1.5
		27 %	TSH + 2.0
22	33	34 %	TSH + 2.1

Table 2-A

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
23	33	26 % 35 %	TSH + 1.9 TSH + 2.3
24	33	33 %	TSH + 1.7
25	33	ADI 27 % SAI	TEH + 4.4 TSH + 0.7 TEH + 3.6 to 4.1
11	34	ADI MAI	TEH + 3.7 to 6.7 TEH + 4.0 to 5.0
25	34	31 % SAI	TSH + 1.6 TEH + 4.4 to 4.7
26	34	SRI	TEH + 3.4
12	35	ADS MAI SAI SAI	TEH + 3.7 to 10.3 TEH + 3.8 to 10.4 TEH +12.8 TEH +15.6
20	35	24 %	TSH + 2.2
21	35	20 % 20 %	TSH + 1.0 TSH + 2.1
23	35	28 %	TSH + 2.3
26	35	31 % 20 %	TSH + 1.3 TSH + 2.5
4	36	ADS SAI	TEH + 3.2 to 8.2 TEH + 6.0
12	36	21 %	TSC + 3.0
20	36	23 %	TSH + 2.8
23	36	SAI	TEH + 4.2 to 4.6

Table 2-A





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## REPORTABLE INDICATIONS

Row	Col	Indication	Location
26	36	36 %	TSH + 0.2
38	36	MRI	TEH + 3.1
3	37	ADS	TEH + 3.5 to 5.5
12	37	ADS MAI	TEH + 4.0 to 5.7 TEH + 3.1 to 4.2
22	37	24 %	TSH + 1.6
23	37	20 % 23 %	TSH + 1.3 TSH + 2.3
25	37	36 % 21 %	TSH + 1.1 TSH + 2.2
42	37	NQS	TEH +17.5 to 10.9
10	38	ADS SAI	TEH + 6.3 to 9.5 TEH + 9.2 to 10.1
19	38	26 % 20 %	TSC + 3.0 TSH + 2.3
22	38	MRI	TEH + 3.1
23	38	21 % 21 %	TSH + 1.7 TSH + 2.2
25	38	27 % 34 %	TSH + 0.3 TSH + 1.2
26	38	21 % 28 %	TSH + 1.5 TSH + 2.1
18	39	23 %	TSH + 2.6

Table 2-A

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
25	39	23 %	TSH + 0.9
		20 %	TSH + 1.4
		20 %	TSH + 2.0
26	39	24 %	TSH + 1.5
		26 %	TSH + 2.5
31	39	SRI	TEH + 3.0
8	40	SRI	TEH + 2.8
18	40	30 %	TSH + 2.3
24	40	27 %	TSH + 1.6
26	40	23 %	TSH + 2.2
		20 %	TSH + 2.8
35	40	SRI	TEH + 3.0
19	41	NQS	TEH + 4.6 to 7.7
		MAI	TEH + 3.2 to 5.8
22	41	23 %	TSH + 0.9
24	41	26 %	TSH + 1.7
25	41	31 %	TSH + 1.1
		23 %	TSH + 2.0
26	41	27 %	TSH + 1.6
		26 %	TSH + 2.0
29	41	21 %	TSH + 2.6
34	41	SAI	TEH + 4.7
42	41	ADS	TEH + 5.6
3	42	ADS	TEH + 3.6 to 6.1

Table 2-A

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S/G A

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GINNA STATION

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
16	42	CRI	TEH + 2.6
25	42	20 %	TSH + 0.8
		20 %	TSH + 1.6
26	42	26 %	TSH + 1.8
27	42	21 %	TSH + 1.6
		21 %	TSH + 2.2
29	42	27 %	TSH + 1.2
		20 %	TSH + 1.8
37	42	21 %	AV1 - 0.2
		38 %	AV2 - 0.1
		31 %	AV3 - 0.1
		27 %	AV4 - 0.1
21	43	20 %	TSC + 2.1
25	43	ADS	TEH + 8.3
33	43	SRI	TEH + 3.0
34	43	SRI	TEH + 3.0
42	43	SRI	TEH + 3.0
22	44	NQS	TEH + 4.4
		SRI	TEH + 2.7
		SAI	TEH + 4.4
33	44	SRI	TEH + 2.8
38	44	MRI	TEH + 2.8
40	44	SRI	TEH + 3.1
41	44	SRI	TEH + 3.0

Table 2-A

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
4	45	NQI SAI	TEH + 3.9 TEH + 3.6 to 4.1
12	45	35 %	TSH + 2.0
19	45	34 %	TSH + 3.4
25	45	21 %	TSH + 1.3
29	45	30 % 30 % 34 %	TSH + 0.2 TSH + 0.8 TSH + 1.3
31	45	NQI SAI PTF	TEH + 4.0 TEH + 4.0 to 4.7 TEH +17.1
35	45	SRI	TEH + 3.1
1	46	ADS	TEH + 3.9
25	46	26 % SAI	TSH + 1.0 TEH + 4.3 to 4.8
26	46	37 % 23 %	TSH + 1.1 TSH + 1.9
24	47	SAI	TEH + 3.2 to 3.5
31	47	20 %	TSH + 0.5
32	47	NQS CRI PTF	TEH + 5.5 TEH + 2.4 TEH +17.0
24	48	ADS	TEH + 3.4 to 6.9
28	48	21 % 29 %	TSH + 0.5 TSH + 1.4

Table 2-A

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
34	48	NQS	TEH + 6.3
28	49	21 %	TSH + 0.3
		27 %	TSH + 1.4
42	49	ADS	TEH + 4.2 to 6.4
27	50	23 %	TSH + 0.4
		27 %	TSH + 1.3
28	50	29 %	TSH + 1.2
19	51	26 %	TSH + 1.6
28	51	NQS	TEH + 6.8
		21 %	TSH + 1.0
29	51	23 %	TSH + 0.8
2	52	CRI	TEH + 3.4
13	52	32 %	TSH + 1.6
11	53	CRI	TEH + 3.1
16	53	20 %	TSH + 4.6
2	55	CRI	TEH + 3.4
15	55	SRI	TEH + 3.3
16	55	28 %	TSH + 3.9
		CRI	TEH + 3.2
17	55	26 %	TSH + 4.1
27	55	21 %	TSH + 1.4
		27 %	TSH + 1.9
28	55	SRI	TEH + 2.7

Table 2-A



R.G. &amp; E.

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GINNA STATION

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
35	55	MRI	TEH + 3.3
37	55	SRI	TEH + 3.0
13	56	CRI	TEH + 3.2
16	56	CRI	TEH + 3.3
29	56	21 %	TSH + 0.8
22	57	27 %	TSH + 1.4
1	58	ADS	TEH + 4.4 to 10.6
7	58	MRI	TEH + 3.4
12	58	CRI	TEH + 3.1
19	58	28 %	TSH + 1.7
22	58	24 %	TSH + 1.5
23	58	31 %	TSH + 1.4
24	58	24 %	TSH + 1.4
31	58	SRI	TEH + 2.9
10	59	CRI SAI	TEH + 3.3 TEH + 4.0
15	59	20 %	TSH + 2.4
18	59	23 %	TSH + 1.5
24	59	28 %	TSH + 1.0
25	59	20 %	TSH + 1.3

Table 2-A





## REPORTABLE INDICATIONS

Row	Col	Indication	Location
28	59	ADS MAI	TEH + 3.0 to 7.9 TEH + 2.9 to 5.3
3	60	SRI	TEH + 2.9
15	60	23 %	TSH + 2.0
9	61	21 %	TSC + 0.3
15	61	23 %	TSH + 2.0
16	61	34 %	TSH + 1.9
17	61	24 %	TSH + 1.5
19	61	29 %	TSH + 1.4
27	61	MRI	TEH + 2.6
15	62	21 %	TSH + 1.8
19	62	23 %	TSH + 1.9
28	62	SRI	TEH + 2.8
13	63	24 %	TSH + 2.1
18	63	20 %	TSH + 1.4
19	63	23 %	TSH + 1.5
26	63	NQS	TEH + 5.3
2	64	ADS	TEH + 2.7 to 10.3
14	64	26 %	TSH + 1.5
18	64	21 %	TSH + 1.4

Table 2-A



## REPORTABLE INDICATIONS

Row	Col	Indication	Location
19	64	32 % 21 %	TSH + 1.2 TSH + 1.5
20	64	29 %	TSH + 1.3
6	65	SRI	TEH + 2.7
10	65	24 %	TSH + 0.6
15	65	34 %	TSH + 1.6
24	65	SRI	TEH + 2.8
25	65	MAI	TEH + 4.1 to 4.8
7	66	MRI	TEH + 2.9
10	66	20 % 26 %	TSH + 0.4 TSH + 0.8
11	66	21 % 21 %	TSH + 1.0 TSH + 1.6
14	66	29 %	TSH + 1.8
18	66	21 %	TSH + 1.6
19	66	20 %	TSH + 1.7
22	66	ADS SAI	TEH + 3.8 to 10.3 TEH + 4.6 to 5.7
28	66	MAI	TEH + 3.0 to 4.6
10	67	24 %	TSH + 1.0
11	67	20 %	TSH + 1.2
13	67	29 %	TSH + 1.7

Table 2-A



## REPORTABLE INDICATIONS

Row	Col	Indication	Location
18	67	27 %	TSH + 2.0
22	67	MAI PTF	TEH + 3.6 to 4.6 TEH +18.9
28	67	SAI	TEH + 3.3 to 3.7
8	68	ADS SAI SAI SAI	TEH + 3.0 to 7.8 TEH + 3.8 to 4.0 TEH + 3.1 to 3.8 TEH + 4.8
11	68	21 %	TSH + 1.6
12	69	24 %	TSH + 1.6
19	69	20 % CRI	TSH + 0.8 TEH + 3.0
22	69	NQS CRI MAI	TEH + 4.0 to 10.4 TEH + 2.3 TEH + 3.6 to 6.8
11	70	20 %	TSH + 1.2
14	70	21 %	TSH + 1.8
27	70	SRI	TEH + 2.8
4	71	SRI	TEH + 2.3
13	71	21 %	TSH + 1.8
16	71	SVS	TEH +25.3
5	72	21 %	TSH + 0.6
8	72	23 % 31 %	TSH + 1.0 TSH + 1.6

Table 2-A



R.G. &amp; E.

S/G A

95MAR

GINNA STATION

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
12	72	20 %	TSH + 1.1
15	72	SRI	TEH + 2.6
19	72	SAI	TEH + 3.8 to 4.5
25	72	SRI	TEH + 2.6
6	73	20 %	TSH + 0.7
8	73	24 %	TSH + 0.9
12	73	30 %	TSH + 1.3
16	73	CRI	TEH + 2.8
23	73	MRI	TEH + 3.2
28	73	SAI	TEH + 3.3 to 4.5
8	74	26 %	TSH + 0.7
12	74	29 %	TSH + 0.6
		24 %	TSH + 1.2
4	75	SRI	TEH + 2.2
10	75	20 %	TSH + 1.1
12	75	CRI	TEH + 2.3
18	75	NQI	TEH + 3.8
		SAI	TEH + 4.0
2	76	SAI	TEH + 2.6 to 3.9
12	76	23 %	TSH + 0.5
15	76	SRI	TEH + 2.9

Table 2-A





R.G. &amp; E.

S/G A

95MAR

GINNA STATION

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
23	76	SRI	TEH + 2.8
28	79	ADS	TEH + 4.8 to 4.3
9	87	SRI	TEH + 2.9
18	87	ADS	TEH +13.5
1	89	31 %	TSH +11.4
15	90	ADS	TEH + 5.2 to 3.5
11	91	28 %	TSH + 0.9

Number of Tubes: 259  
Number of Indications: 356

Table 2-A

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
7	9	MAI	TEH + 4.3
2	15	SVS	TEH +24.1
10	15	NQS SAI	TEH + 6.3 TEH + 6.3 to 6.8
3	16	NQI MAI PTF	TEH + 4.3 TEH + 3.8 to 4.9 TEH +18.5
5	16	NQS SAI PTF	TEH + 4.0 TEH + 3.8 to 4.9 TEH +18.1
28	16	NQI MAI	TEH + 3.3 TEH + 2.6 to 3.6
7	17	NQS MAI	TEH + 3.3 to 6.7 TEH + 3.2 to 4.6
8	17	NQI SRI SAI MAI PTF	TEH + 4.1 TEH + 2.9 TEH + 3.4 to 3.7 TEH + 4.0 to 4.4 TEH +18.0
10	17	22 %	TSH + 0.7
11	17	22 %	TSH + 0.6
14	17	NQS SAI	TEH + 4.3 TEH + 4.1
21	17	MAI	TEH + 3.3 to 3.9
24	17	ADS	TEH + 3.1 to 6.4
3	18	ADS	TEH + 4.0 to 5.4
24	18	SVS	TEH +21.3
29	18	SVS	TEH +21.8
5	19	NQI	TEH + 3.3 to 8.2
6	19	NQS	TEH + 5.0

Table 2-B



## REPORTABLE INDICATIONS

Row	Col	Indication	Location
8	19	CRI	TEH + 2.9
14	19	NQI	TEH + 3.1 to 4.3
		MAI	TEH + 3.0 to 5.2
24	19	SAI	TEH + 3.1 to 5.2
31	19	SVS	TEH + 21.8
33	19	NQS	TEH + 4.3
		MAI	TEH + 3.9
5	20	23 %	TSH + 1.4
10	20	NQS	TEH + 5.3
		MAI	TEH + 5.0 to 7.2
11	20	20 %	TSH + 1.0
12	20	25 %	TSH + 1.0
14	20	ADS	TEH + 3.1 to 6.5
		MAI	TEH + 3.1 to 4.9
16	20	ADS	TEH + 3.1 to 6.5
19	21	ADS	TEH + 3.5 to 5.2
8	22	SAI	TEH + 4.1 to 4.9
12	22	SAI	TEH + 4.8
19	22	ADS	TEH + 3.2 to 7.3
		MAI	TEH + 3.2 to 7.5
5	23	NQI	TEH + 7.3
11	23	22 %	TSH + 4.0
		ADS	TEH + 3.2 to 6.9
		CRI	TEH + 2.3
15	23	34 %	TSH + 1.0
		20 %	TSH + 1.7
16	23	25 %	TSH + 0.9

Table 2-B



## REPORTABLE INDICATIONS

Row	Col	Indication	Location
19	23	ADS	TEH + 3.5 to 5.7
		MAI	TEH + 2.7 to 4.5
22	23	SRI	TEH + 2.5
26	23	CRI	TEH + 2.6
12	24	MAI	TEH + 3.2 to 4.8
15	24	MAI	TEH + 3.7 to 4.8
20	24	22 %	TSH + 1.1
21	24	ADS	TEH + 2.5 to 6.0
22	24	21 %	TSH + 1.4
5	25	21 %	TSH + 0.3
13	25	ADS	TEH + 3.5 to 7.7
		SAI	TEH + 3.8 to 5.0
20	25	28 %	TSH + 1.2
21	25	NQI	TEH + 4.8
22	25	CRI	TEH + 2.5
16	26	21 %	TSH + 1.3
17	26	28 %	TSH + 1.0
		30 %	TSH + 1.4
18	26	29 %	TSH + 1.2
19	26	32 %	TSH + 1.2
20	26	25 %	TSH + 1.2
21	26	MRI	TEH + 3.7
24	26	35 %	TSH + 1.2
		SRI	TEH + 2.6
26	26	26 %	TSH + 0.9
6	27	20 %	TSH + 0.2

Table 2-B

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
8	27	NQI	TEH + 6.2
23	27	31 %	TSH + 1.5
27	27	NQI	TEH + 4.4
		CRI	TEH + 2.4
		SAI	TEH + 3.9
27	28	26 %	TSH + 0.6
23	29	22 %	TSH + 1.3
1	30	ADS	TEH + 4.4 to 9.4
17	30	21 %	TSH + 2.1
21	30	SRI	TEH + 3.2
6	31	NQS	TEH + 3.5 to 11.3
34	31	NQI	TEH + 5.4
		MAI	TEH + 4.4 to 4.9
9	32	SRI	TEH + 2.3
12	32	MAI	TEH + 4.1 to 4.9
18	32	ADS	TEH + 5.0 to 8.2
3	33	ADS	TEH + 6.7 to 8.2
1	34	ADS	TEH + 2.4 to 5.1
7	34	MAI	TEH + 3.1 to 4.4
40	34	ADS	TEH + 2.5 to 4.3
		MAI	TEH + 2.8 to 3.9
42	34	SAI	TEH + 3.2
3	35	ADS	TEH + 2.5 to 8.3
6	35	SRI	TEH + 2.3
7	35	ADS	TEH + 7.5
12	35	89 %	TEH + 2.5

Table 2-B



## REPORTABLE INDICATIONS

Row	Col	Indication	Location
20	35	NQS MAI	TEH + 8.7 to 13.3 TEH +11.5 to 14.1
9	36	CRI	TEH + 2.6
22	36	SVS	TEH +23.9
22	37	SRI	TEH + 2.6
5	38	SRI	TEH + 2.3
7	38	SAI	TEH + 3.8 to 5.3
24	39	NQI 27 %	TEH + 3.5 TSH + 0.8
45	39	33 %	TSH +42.1
8	40	ADS MAI	TEH + 3.8 to 10.6 TEH + 3.9 to 11.1
13	40	SRI	TEH + 2.5
24	40	ADS 27 %	TEH + 2.8 to 8.4 TSH + 1.2
25	40	25 %	TSH + 2.3
34	40	SVI	TEH +24.4
4	41	22 %	TSH + 0.4
23	41	21 %	TSH + 1.5
24	41	39 % 29 %	TSH + 0.9 TSH + 1.4
2	42	ADS	TEH + 2.4 to 11.6
4	42	ADI MAI	TEH + 3.2 to 6.5 TEH + 3.0 to 4.8
5	42	SAI	TEH + 4.2
6	42	ADI	TEH + 3.5 to 6.9
25	42	NQS	TEH + 3.0 to 8.7

Table 2-B

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
25	43	SAI	TEH + 3.8
27	44	22 %	TSH + 2.3
5	45	ADS MAI	TEH + 5.4 TEH + 2.8 to 9.6
3	46	MRI	TEH + 2.5
13	46	NBI	TEH +34.5
10	47	SAI	TEH + 4.4
25	48	24 %	TSH + 3.4
36	48	NQS MAI	TEH + 3.2 to 7.0 TEH + 3.1 to 8.2
38	49	ADS SAI	TEH + 3.6 to 6.5 TEH + 3.3 to 4.2
39	49	ADS	TEH + 3.9 to 6.6
25	50	NQS 26 %	TEH + 3.1 to 6.7 TSH + 3.2
43	50	ADS	TEH + 3.2 to 4.7
2	51	SVS	TEH +22.5
6	51	21 %	TSH + 0.3
7	51	SRI	TEH + 2.7
8	52	20 %	TSH + 0.4
33	52	ADS MAI	TEH + 3.4 to 9.1 TEH + 3.0 to 10.0
36	52	NQI MAI	TEH + 3.3 to 4.9 TEH + 3.7
37	52	NQI CRI	TEH + 5.6 TEH + 2.7
41	52	ADS	TEH + 3.8

Table 2-B



## REPORTABLE INDICATIONS

Row	Col	Indication	Location
43	52	ADS SAI	TEH + 3.0 to 3.7 TEH + 3.3
5	53	NQS	TEH + 8.0
7	53	SAI	TEH + 4.8
12	53	SRI SAI	TEH + 2.9 TEH + 5.1 to 5.3
25	53	22 %	TSH + 4.0
36	53	NQS	TEH + 4.4
41	53	SRI	TEH + 2.9
42	53	SRI	TEH + 2.9
1	54	OBS	
31	54	94 %	TEH + 2.7
38	54	OBS	
18	55	NQS 39 % MAI	TEH + 5.7 TSH + 1.8 TEH + 4.6 to 7.4
37	55	NQI	TEH + 3.3 to 12.1
5	56	MRI	TEH + 2.5
36	56	NQI	TEH + 3.3 to 7.1
37	56	NQI	TEH + 3.6 to 8.9
39	56	NQS	TEH + 8.4
1	57	OBS	
16	57	NQS	TEH +11.3
37	57	NQS	TEH + 3.1 to 6.1
30	58	CRI	TEH + 2.8
2	59	SVI	TEH +22.6

Table 2-B



## REPORTABLE INDICATIONS

Row	Col	Indication	Location
11	59	NQI NQI	TEH + 4.7 TEH + 6.8
37	59	NQS	TEH + 3.8 to 4.9
16	60	CRI SAI	TEH + 2.3 TEH + 5.0
30	60	CRI	TEH + 2.9
34	60	NQI	TEH + 3.4 to 4.4
36	60	NQI	TEH + 3.5 to 4.9
3	61	ADS	TEH + 3.4 to 9.1
5	61	ADS	TEH + 3.1 to 6.8
14	61	NQS SAI	TEH + 6.8 TEH + 7.1
16	61	ADS	TEH + 4.7 to 7.4
5	62	ADS	TEH + 3.3 to 9.4
20	62	ADS MAI	TEH + 7.1 to 15.3 TEH + 7.3 to 14.7
21	62	ADS MAI	TEH + 7.3 to 9.9 TEH + 7.1 to 9.6
13	63	NQS	TEH + 5.6
22	63	22 %	TSH + 1.8
23	63	21 % MRI	TSH + 2.0 TEH + 2.7
29	63	ADS 20 % MAI	TEH + 4.9 to 9.1 TSH + 1.2 TEH + 4.9 to 9.7
37	63	ADS	TEH + 5.4 to 10.2
15	64	ADS	TEH + 4.9 to 8.9
26	64	24 %	TSH + 1.9

Table 2-B

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
37	64	ADS	TEH + 6.7
5	65	ADS	TEH + 3.6 to 7.9
14	65	NQS SAI	TEH + 4.9 TEH + 4.4 to 5.0
22	65	MRI	TEH + 2.8
38	65	NQI MAI	TEH + 3.5 TEH + 3.4 to 4.2
16	66	ADI MAI	TEH + 3.8 to 15.7 TEH + 3.2 to 4.9
19	66	NQI MAI	TEH + 3.9 to 7.3 TEH + 4.3 to 4.6
22	66	ADS	TEH + 3.3 to 5.3
26	66	SAI	TEH + 3.5 to 4.1
18	67	SAI	TEH + 3.7 to 4.3
20	67	NQS	TEH + 5.9
23	67	NQI	TEH +11.0 to 17.6
29	67	SRI	TEH + 2.5
21	68	NQI	TEH + 4.5
29	69	MRI	TEH + 3.1
4	70	ADS	TEH + 2.9 to 7.1
2	71	SVS	TEH +24.7
13	71	NQI	TEH + 4.9
16	71	ADS	TEH + 3.8 to 6.9
19	72	ADS MAI	TEH + 3.5 to 16.6 TEH + 3.7 to 9.9

Table 2-B

## REPORTABLE INDICATIONS

Row	Col	Indication	Location
16	74	ADS CRI SAI	TEH + 4.7 TEH + 2.9 TEH + 3.9 to 5.1
24	74	ADS	TEH + 3.2 to 6.0
29	74	ADS	TEH + 4.5
6	75	ADI	TEH + 4.9 to 7.4
10	75	20 %	TSH + 0.7
1	76	ADS SAI	TEH + 3.6 to 11.3 TEH + 3.5 to 4.3
15	76	NQS SAI	TEH + 4.6 to 8.9 TEH + 4.9 to 6.0
32	76	SAI	TEH + 3.4
33	76	ADS	TEH + 5.5
23	77	ADS	TEH + 7.0
5	78	ADS	TEH + 3.2 to 7.2
10	78	ADS MAI	TEH + 3.2 to 9.0 TEH + 3.4 to 9.4
5	79	ADS SAI	TEH + 3.1 to 6.3 TEH + 3.0 to 7.9
4	80	ADS	TEH +11.0
6	80	ADS	TEH + 3.5 to 6.0
21	81	ADS	TEH + 7.8
11	82	ADS	TEH + 3.5 to 5.7
6	83	SAI	TEH + 2.8
7	83	NQS	TEH + 3.5 to 15.1
8	83	ADS SAI	TEH + 4.8 to 11.9 TEH + 9.9 to 10.7

Table 2-B





## REPORTABLE INDICATIONS

Row	Col	Indication	Location
18	84	ADS	TEH + 5.5 to 12.4
8	88	ADS	TEH + 4.1 to 20.2
12	88	MBS	TEH + 0.4 to 1.2
13	88	MBS	TEH + 0.5 to 1.5
14	88	MBS	TEH + 0.3 to 1.3
15	88	MBS	TEH + 0.3 to 1.3
16	88	MBS	TEH + 0.2 to 1.0
17	88	MBS	TEH + 0.0 to 1.4
14	89	MBS	TEH + 0.5 to 1.3
4	90	ADS	TEH + 3.7 to 6.8
8	91	ADS	TEH + 7.2 to 22.0
1	92	25 %	TSH +10.8
6	92	29 %	TSH + 5.9

Number of Tubes: 217  
Number of Indications: 280

#### 4.0 OBSERVATIONS

The results of the examination indicate that IGA and IGSCC continue to be active within the tubesheet crevice region on the inlet side of each steam generator. As in the past, IGA/SCC is much more prevalent in the "B" steam generator with 80 new crevice indications reported. In the "A" steam generator, 35 new crevice indications were reported.

The majority of the inlet tubesheet crevice corrosion indications are IGA/SCC of the Mill Annealed Inconel 600 tube material. This form of corrosion is believed to be the result of an alkaline environment forming in the tubesheet crevices. This environment has developed over the years as deposits and active species such as sodium and phosphate, have reacted, changing a neutral or inhibited crevice into the aggressive environment that presently exists. Table 3 shows the steam generator IGA/SCC history.



# Ginna Steam Generators

## Crevice Corrosion Indication History

	Not Sizeable		1-25%		26-50%		51-75%		76-100%		TOTAL	
	A	B	A	B	A	B	A	B	A	B	A	B
Mar 1979	0	0	0	0	0	0	0	2	0	0	0	2
Dec 1979	0	0	0	0	0	6	0	5	0	0	0	11
Apr 1980	0	19	0	1	0	2	0	7	0	2	0	31
Nov 1980	0	2	0	0	0	0	0	1	0	0	0	3
Apr 1981	0	0	0	5	0	4	0	5	0	0	0	14
Feb 1982	0	1	0	0	0	1	0	6	0	5	0	13
Oct 1982	0	27	0	4	0	5	1	7	0	16	1	59
Apr 1983	3	11	1	3	0	15	0	7	0	15	4	51
Mar 1984	0	5	0	0	1	0	0	1	0	2	1	8
Mar 1985	0	23	0	4	0	6	1	9	1	27	2	69
Feb 1986	2	3	2	9	0	1	1	14	0	25	5	52
Feb 1987	17	82	0	1	1	8	3	16	13	46	34	153
Feb 1988	3	22	0	0	0	1	2	7	2	11	7	41
Mar 1988	0	1	0	0	0	0	0	1	0	4	0	6
Mar 1989	14	150	0	0	0	4	2	35	8	79	24	268
Apr 1990	16	108	2	1	3	8	6	8	11	32	38	157
Apr 1991	14	42	0	1	0	6	2	12	14	18	30	79
Apr 1992	33	104	0	0	0	0	0	2	1	12	34	118
Mar 1993	114	110	0	0	0	1	3	3	4	9	121	123
Mar 1994	160	132	0	0	0	0	0	1	1	0	161	133
Mar 1995	88	106	0	0	0	0	0	0	0	0	88	106
TOTALS:	464	948	5	29	5	68	21	149	55	303	550	1,497

TABLE 3



Along with IGA/SCC in the crevices, there appears to have been a slight decrease in PWSCC at the roll transition during the last operating cycle. This mechanism was first addressed in 1989 and this year there were 32 Roll Transition (PWSCC) indications in "B" steam generator and 60 Roll Transition (PWSCC) indications in "A" steam generator. These numbers include tubes that may have PWSCC in combination with IGA or SCC in the crevice.

A large volume, typically <20% TW, wastage type condition exists just above the tubesheet secondary face of both generators. A small percentage of the tubes, generally toward the center of the bundle, have this condition. A number of these tubes did have penetrations >20% TW but have not shown an increase in the growth rate for several cycles. It is believed that these wastage indications were caused by the original water chemistry when phosphate was used as a buffering medium.

Small indications of probable copper deposits were also found in the tubesheet crevice region randomly located throughout each steam generator.

Minor denting has been detected at the tubesheet secondary face for many years in both steam generators, primarily on the inlet side. Denting was also detected at the 1st, 2nd and 6th tube support plates randomly throughout the

generator, and in most cases was of greater magnitude in size than that at the tubesheet secondary side face. In general, minor distortions of most of the tube support signals were seen.

The denting phenomenon and minor distortions at the tubesheet and support plates can be attributed to secondary side corrosion product buildup in the annular region between the tube outside surface and the carbon steel support member. Comparison with previous data indicates no changes in the denting have been observed since previous inspections.

Eleven (11) indications in the CE welded sleeves (1 in S/G "A" and 10 in S/G "B") were reported as a consequence of the use of the Zetec, Inc. "Plus-Point" probe. This probe provides improved resolution characteristics which enable the data analysis personnel the capability of readily determining the existence of degradation in either the parent tube or the sleeve. The indications in question resembled blowhole type indications which had been previously reported at Zion during early 1995. Subsequent visual examination of the indications verified two (2) blowholes, one of which (the indication in S/G "A") was left in service due to the fact that it was located in the upper region of the weld. Eight (8) of the remaining indications in S/G "B" were determined to be a result of "weld tail-off" when examined visually. The indication in Row 34, Column 40 was found to be a result of an "arc strike" and an incomplete





weld in the upper expansion zone. (Subsequent review of the "Plus-Point" eddy current data confirmed the absence of a heat affected zone). As a result of the discovery of the incomplete weld in Row 34, Column 40, additional visual and ultrasonic examinations were performed on an expanded sample of CE welded sleeves. One (1) additional sleeve (Row 41, Col 42) was found with an incomplete weld and six (6) sleeves were determined by ultrasonics to contain welds with incomplete fusion. The result of the expanded inspections was that a total of ten (10) CE welded sleeves were plugged. In addition, two (2) B&W brazed sleeves were repaired with PWSCC indications at the lower joint and one (1) B&W brazed sleeve was found to be without a braze in the upper joint.

In summary, the "A" Steam Generator had 88 tubes that were found to have "new" tubesheet crevice indications (60 PWSCC, 35 IGA/SCC, 7 both IGA/SCC and PWSCC). The "B" Steam Generator had 106 "new" tubesheet crevice indications (32 PWSCC, 80 IGA/SCC, 6 both IGA/SCC and PWSCC). Additionally 14 sleeved tubes were plugged (3 obstructed, 2 with PWSCC, 1 "blowhole", 2 unwelded and 6 unfused), accounting for a total of 120 repairs in the "B" Steam Generator.

A Non-Conformance Report (NCR) was written on the ABB-CE sleeves containing incomplete welds or incomplete fusion and a 10CFR50.59 Safety

Evaluation was performed. This evaluation coupled with structural analysis and mechanical testing data provided by ABB-CE determined that the absence of a complete weld or complete fusion in the subject sleeves did not constitute a substantial safety hazard and did not require reporting pursuant to 10CFR50.72. Additional information regarding this condition is contained in NCR's 95-029 dated 4/15/95.



## **5.0 CORRECTIVE ACTION**

Table 4 has been generated to identify tubes with crevice indications or with indications which exceed the repair criteria. This table also shows the axial location of the indication and what corrective action was taken on these tubes. Tubes requiring repair due to hot leg tubesheet crevice indications were identified by the appropriate codes:

- a) quantifiable and non-quantifiable IGSCC indications on the 400/100 kHz differential mix data
- b) roll transition or crevice indications as identified from the MRPC examination

The breakdown of corrective action (repairs) performed are as follows:

The A steam generator had a total of 88 tubes with indications identified by eddy current, providing a total of 88 repairs.

The B steam generator had a total of 106 tubes with indications identified by eddy current. Three (3) sleeved tubes were obstructed, two (2) sleeved tubes had eddy current indications representative of PWSCC, one (1) sleeved tubes had a blowhole indication in the lower portion of the weld, two (2) sleeved

tubes had incomplete welds and six (6) sleeved tubes had welds with incomplete fusion and all were subsequently plugged. A total of 120 repairs were made in B steam generator.

A Ginna Steam Generator Tube Inspection and Corrective Action History has been tabulated on page 68 as Table 5.



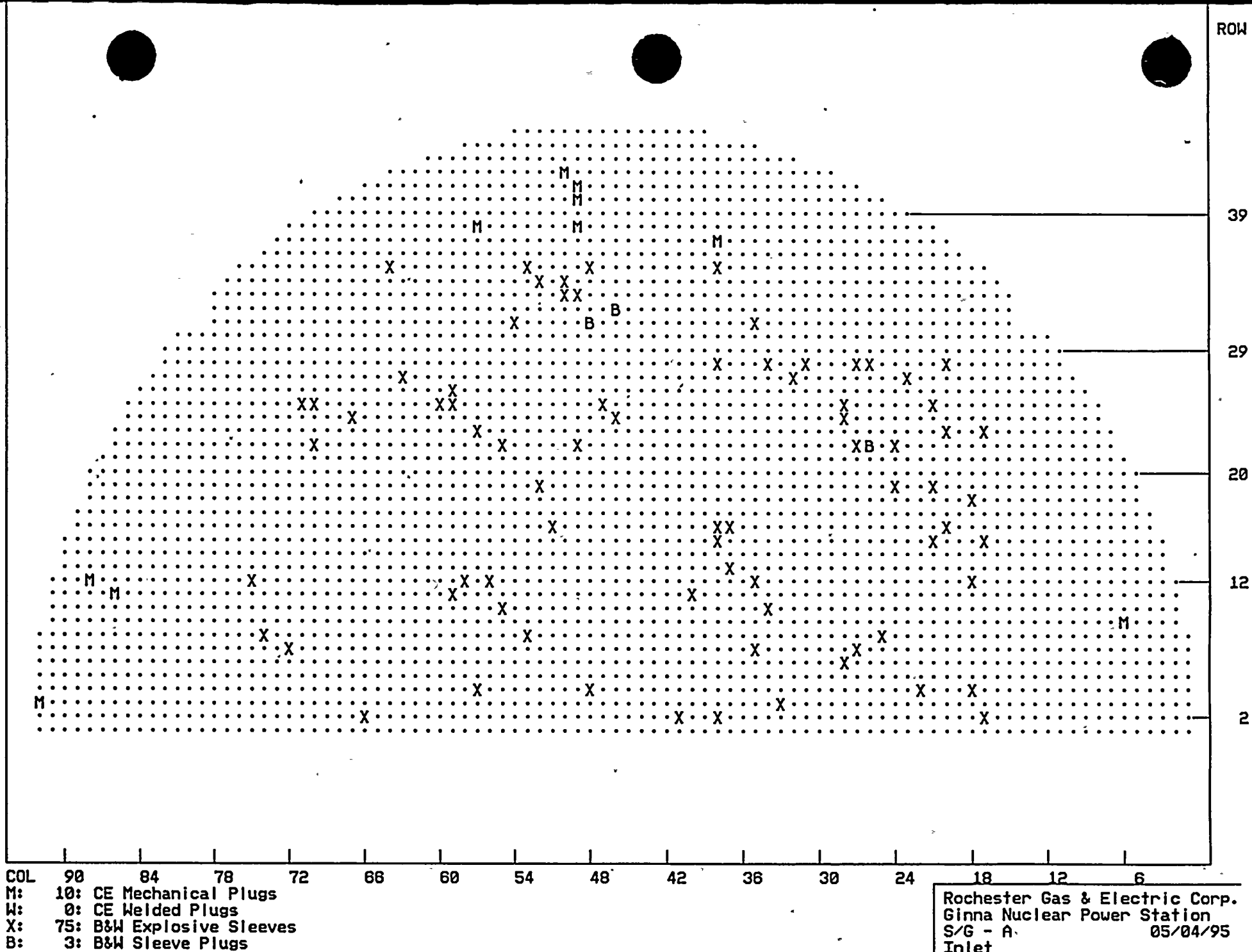


FIGURE 2

ACRI ISIS Tubes





## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
3	1	SRI	TEH + 2.7	CE Mech Pl
12	5	SRI	TEH + 2.7	CE Mech Pl
11	7	MRI	TEH + 2.9	CE Mech Pl
12	18	SAI	TEH +13.3 to 14.5	B&W Sleeve
8	19	SAI	TEH + 7.1	B&W Sleeve
7	21	CRI	TEH + 2.7	B&W Sleeve
25	22	NQI	TEH + 4.9	B&W Sleeve
		CRI	TEH + 3.0	
		MAI	TEH + 4.1	
22	23	CRI	TEH + 3.0	B&W Sleeve
25	23	MAI	TEH + 3.1 to 4.7	B&W Sleeve
24	26	CRI	TEH + 2.6	B&W Sleeve
		SRI	TEH + 2.7	
		MAI	TEH + 3.1 to 3.9	
		SAI	TEH + 6.3 to 6.7	
2	27	SRI	TEH + 2.7	B&W Sleeve
35	29	SRI	TEH + 2.9	B&W Sleeve
27	30	SRI	TEH + 2.7	B&W Sleeve
25	33	ADI	TEH + 4.4	B&W Sleeve
		SAI	TEH + 3.6 to 4.1	
11	34	ADI	TEH + 3.7 to 6.7	B&W Sleeve
		MAI	TEH + 4.0 to 5.0	
25	34	SAI	TEH + 4.4 to 4.7	B&W Sleeve
26	34	SRI	TEH + 3.4	B&W Sleeve

Table 4-A



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
12	35	MAI SAI SAI	TEH + 3.8 to 10.4 TEH +12.8 TEH +15.6	B&W Sleeve
4	36	SAI	TEH + 6.0	B&W Sleeve
23	36	SAI	TEH + 4.2 to 4.6	B&W Sleeve
38	36	MRI	TEH + 3.1	CE Mech Pl
12	37	MAI	TEH + 3.1 to 4.2	B&W Sleeve
10	38	SAI	TEH + 9.2 to 10.1	B&W Sleeve
22	38	MRI	TEH + 3.1	B&W Sleeve
31	39	SRI	TEH + 3.0	B&W Sleeve
8	40	SRI	TEH + 2.8	B&W Sleeve
35	40	SRI	TEH + 3.0	B&W Sleeve
19	41	MAI SAI	TEH + 3.1 to 5.0 TEH + 3.2 to 5.8	B&W Sleeve
34	41	SAI	TEH + 4.7	B&W Sleeve
16	42	CRI	TEH + 2.6	B&W Sleeve
33	43	SRI	TEH + 3.0	B&W Sleeve
34	43	SRI	TEH + 3.0	B&W Sleeve
42	43	SRI	TEH + 3.0	CE Mech Pl
22	44	SRI SAI	TEH + 2.7 TEH + 4.4	B&W Sleeve
33	44	SRI	TEH + 2.8	B&W Sleeve
38	44	MRI	TEH + 2.8	CE Mech Pl

Table 4-A



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
40	44	SRI	TEH + 3.1	CE Mech Pl
41	44	SRI	TEH + 3.0	CE Mech Pl
4	45	NQI SAI	TEH + 3.9 TEH + 3.6 to 4.1	B&W Sleeve
31	45	NQI SAI PTF	TEH + 4.0 TEH + 4.0 to 4.7 TEH +17.1	B&W Slv Pl
35	45	SRI	TEH + 3.1	B&W Sleeve
25	46	SAI	TEH + 4.3 to 4.8	B&W Sleeve
24	47	SAI	TEH + 3.2 to 3.5	B&W Sleeve
32	47	CRI PTF	TEH + 2.4 TEH +17.0	B&W Slv Pl
2	52	CRI	TEH + 3.4	B&W Sleeve
11	53	CRI	TEH + 3.1	B&W Sleeve
2	55	CRI	TEH + 3.4	B&W Sleeve
15	55	SRI	TEH + 3.3	B&W Sleeve
16	55	CRI	TEH + 3.2	B&W Sleeve
28	55	SRI	TEH + 2.7	B&W Sleeve
35	55	MRI	TEH + 3.3	B&W Sleeve
37	55	SRI	TEH + 3.0	CE Mech Pl
13	56	CRI SAI	TEH + 3.2 TEH + 4.2	B&W Sleeve
16	56	CRI	TEH + 3.3	B&W Sleeve
7	58	MRI	TEH + 3.4	B&W Sleeve

Table 4-A



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
12	58	CRI	TEH + 3.1	B&W Sleeve
31	58	SRI	TEH + 2.9	B&W Sleeve
10	59	CRI	TEH + 3.3	B&W Sleeve
		SAI	TEH + 4.0	
28	59	MAI	TEH + 2.8 to 5.3	B&W Sleeve
3	60	SRI	TEH + 2.9	B&W Sleeve
27	61	MRI	TEH + 2.6	B&W Sleeve
28	62	SRI	TEH + 2.8	B&W Sleeve
		MAI	TEH + 3.8	
6	65	SRI	TEH + 2.7	B&W Sleeve
24	65	SRI	TEH + 2.8	B&W Sleeve
25	65	MAI	TEH + 4.1 to 4.8	B&W Sleeve
7	66	MRI	TEH + 2.9	B&W Sleeve
22	66	SAI	TEH + 4.6 to 5.7	B&W Sleeve
28	66	MAI	TEH + 3.0 to 4.6	B&W Sleeve
22	67	MAI	TEH + 3.6 to 4.6	B&W Slv Pl
		PTF	TEH +18.9	
28	67	SAI	TEH + 3.3 to 3.7	B&W Sleeve
8	68	SAI	TEH + 3.8 to 4.0	B&W Sleeve
		SAI	TEH + 3.1 to 3.8	
		SAI	TEH + 4.8	
19	69	CRI	TEH + 3.0	B&W Sleeve
22	69	CRI	TEH + 2.3	B&W Sleeve
		MAI	TEH + 3.6 to 6.8	

Table 4-A



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
27	70	SRI	TEH + 2.8	B&W Sleeve
4	71	SRI	TEH + 2.3	B&W Sleeve
15	72	SRI	TEH + 2.6	B&W Sleeve
19	72	SAI	TEH + 3.8 to 4.5	B&W Sleeve
25	72	SRI	TEH + 2.6	B&W Sleeve
16	73	CRI	TEH + 2.8	B&W Sleeve
23	73	MRI	TEH + 3.2	B&W Sleeve
28	73	SAI	TEH + 3.3 to 4.5	B&W Sleeve
4	75	SRI	TEH + 2.2	B&W Sleeve
12	75	CRI	TEH + 2.3	B&W Sleeve
18	75	NQI SAI	TEH + 3.8 TEH + 4.0	B&W Sleeve
2	76	SAI	TEH + 2.6 to 3.9	B&W Sleeve
15	76	SRI	TEH + 2.9	B&W Sleeve
23	76	SRI	TEH + 2.8	B&W Sleeve
9	87	SRI	TEH + 2.9	CE Mech Pl

Number of Tubes:

88

Number of Entries: 111

Table 4-A

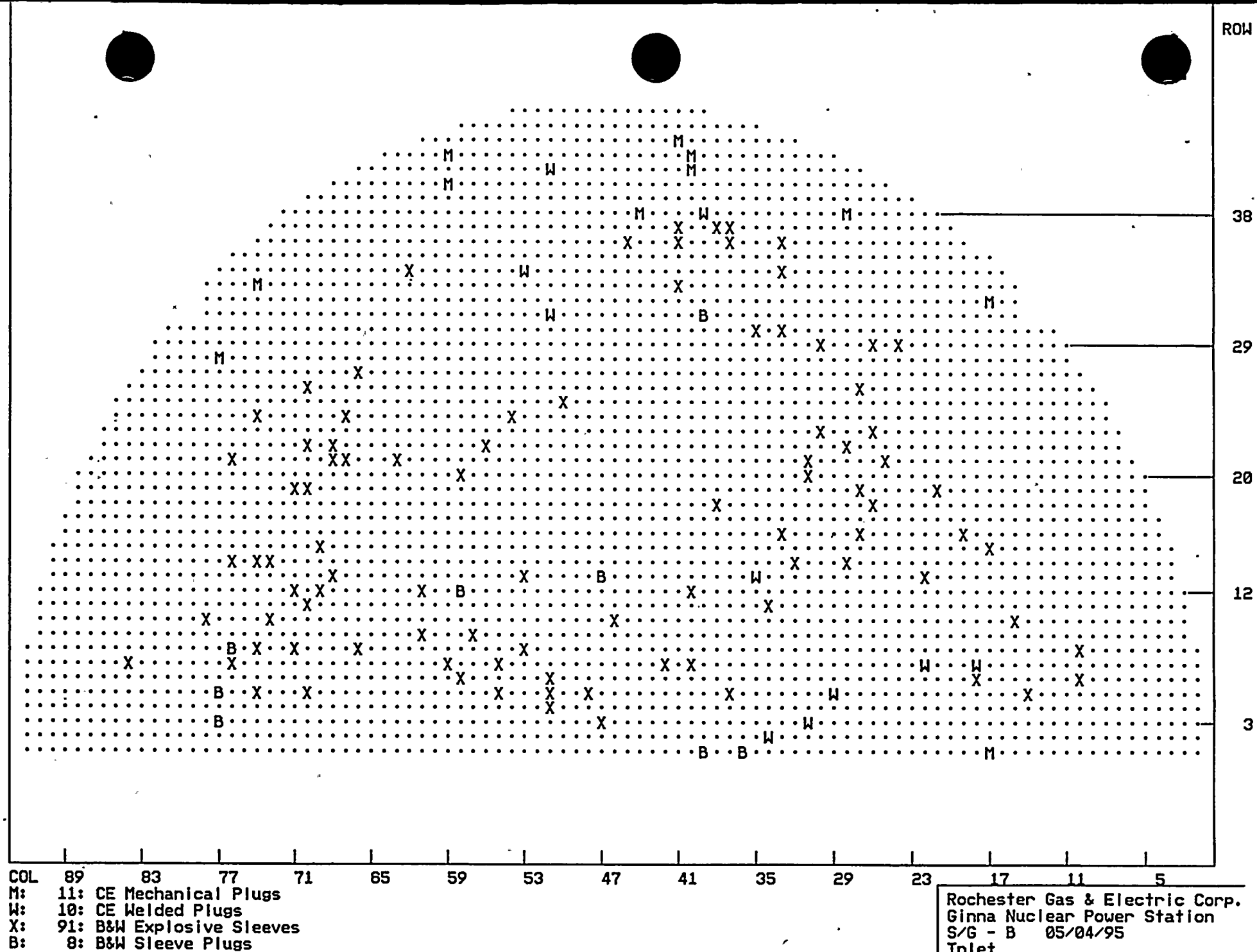


FIGURE 3



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
7	9	MAI	TEH + 4.3	B&W Sleeve
10	15	SAI	TEH + 6.3 to 6.8	B&W Sleeve
3	16	NQI MAI PTF	TEH + 4.3 TEH + 3.8 to 4.9 TEH +18.5	B&W Slv Pl
5	16	SAI PTF	TEH + 3.8 to 4.9 TEH +18.1	B&W Slv Pl
28	16	NQI MAI	TEH + 3.3 TEH + 2.6 to 3.6	CE Mech Pl
7	17	MAI	TEH + 3.2 to 4.6	B&W Sleeve
8	17	NQI SRI SAI MAI PTF	TEH + 4.1 TEH + 2.9 TEH + 3.4 to 3.7 TEH + 4.0 to 4.4 TEH +18.0	B&W Slv Pl
14	17	SAI	TEH + 4.1	B&W Sleeve
21	17	MAI	TEH + 3.3 to 3.9	B&W Sleeve
5	19	NQI	TEH + 3.3 to 8.2	B&W Sleeve
8	19	CRI	TEH + 2.9	B&W Sleeve
14	19	NQI MAI	TEH + 3.1 to 4.3 TEH + 3.0 to 5.2	B&W Sleeve
24	19	SAI	TEH + 3.1 to 5.2	B&W Sleeve
33	19	MAI	TEH + 3.9	CE Mech Pl
10	20	MAI	TEH + 5.0 to 7.2	B&W Sleeve
14	20	MAI	TEH + 3.1 to 4.9	B&W Sleeve
8	22	SAI	TEH + 4.1 to 4.9	B&W Sleeve
12	22	SAI	TEH + 4.8	B&W Sleeve
19	22	MAI	TEH + 3.2 to 7.5	B&W Sleeve

Table 4-B



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
5	23	NQI	TEH + 7.3	B&W Sleeve
11	23	CRI	TEH + 2.3	B&W Sleeve
19	23	MAI	TEH + 2.7 to 4.5	B&W Sleeve
22	23	SRI	TEH + 2.5	B&W Sleeve
26	23	CRI	TEH + 2.6	B&W Sleeve
12	24	MAI	TEH + 3.2 to 4.8	B&W Sleeve
15	24	MAI	TEH + 3.7 to 4.8	B&W Sleeve
13	25	SAI	TEH + 3.8 to 5.0	B&W Sleeve
21	25	NQI CRI	TEH + 4.8 TEH + 2.6	B&W Sleeve
22	25	CRI	TEH + 2.5	B&W Sleeve
21	26	MRI	TEH + 3.7	B&W Sleeve
24	26	SRI	TEH + 2.6	B&W Sleeve
8	27	NQI	TEH + 6.2	B&W Sleeve
27	27	NQI CRI SAI	TEH + 4.4 TEH + 2.4 TEH + 3.9	B&W Sleeve
21	30	SRI	TEH + 3.2	B&W Sleeve
34	31	NQI MAI	TEH + 5.4 TEH + 4.4 to 4.9	B&W Sleeve
9	32	SRI	TEH + 2.3	B&W Sleeve
12	32	MAI	TEH + 4.1 to 4.9	B&W Sleeve
7	34	MAI	TEH + 3.1 to 4.4	B&W Sleeve
40	34	MAI	TEH + 2.8 to 3.9	CE Mech Pl
42	34	SAI	TEH + 3.2	CE Mech Pl
6	35	SRI	TEH + 2.3	B&W Sleeve

Table 4-B



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
12	35	89 %	TEH + 2.5	B&W Slv Pl
20	35	MAI	TEH +11.5 to 14.1	B&W Sleeve
9	36	CRI	TEH + 2.6	B&W Sleeve
22	37	SRI	TEH + 2.6	B&W Sleeve
5	38	SRI	TEH + 2.3	B&W Sleeve
7	38	SAI	TEH + 3.8 to 5.3	B&W Sleeve
24	39	NQI	TEH + 3.5	B&W Sleeve
8	40	MAI	TEH + 3.9 to 11.1	B&W Sleeve
13	40	SRI	TEH + 2.5	B&W Sleeve
34	40	SVI	TEH +24.4	CE Weld Pl
4	42	ADI	TEH + 3.2 to 6.5	B&W Sleeve
		MAI	TEH + 3.0 to 4.8	
5	42	SAI	TEH + 4.2	B&W Sleeve
6	42	ADI	TEH + 3.5 to 6.9	B&W Sleeve
31	42	Inc. Fusion	Upper Weld	CE Weld Pl
41	42	Inc. Weld	Upper Weld	CE Weld Pl
25	43	SAI	TEH + 3.8	B&W Sleeve
5	45	MAI	TEH + 2.8 to 9.6	B&W Sleeve
3	46	MRI	TEH + 2.5	B&W Sleeve
13	46	NBI	TEH +34.5	B&W Slv Pl
10	47	SAI	TEH + 4.4	B&W Sleeve
36	48	MAI	TEH + 3.1 to 8.2	B&W Sleeve
38	49	SAI	TEH + 3.3 to 4.2	CE Mech Pl
7	51	SRI	TEH + 2.7	B&W Sleeve

Table 4-B





## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
33	52	MAI	TEH + 3.0 to 10.0	B&W Sleeve
36	52	NQI MAI	TEH + 3.3 to 4.9 TEH + 3.7	B&W Sleeve
37	52	NQI CRI	TEH + 5.6 TEH + 2.7	B&W Sleeve
43	52	SAI	TEH + 3.3	CE Mech Pl
7	53	SAI	TEH + 4.8	B&W Sleeve
12	53	SRI SAI	TEH + 2.9 TEH + 5.1 to 5.3	B&W Sleeve
41	53	SRI	TEH + 2.9	CE Mech Pl
42	53	SRI	TEH + 2.9	CE Mech Pl
1	54	OBS		B&W Slv Pl
31	54	94 %	TEH + 2.7	B&W Slv Pl
38	54	OBS		CE Weld Pl
18	55	MAI	TEH + 4.6 to 7.4	B&W Sleeve
37	55	NQI	TEH + 3.3 to 12.1	B&W Sleeve
5	56	MRI	TEH + 2.5	B&W Sleeve
36	56	NQI	TEH + 3.3 to 7.1	B&W Sleeve
37	56	NQI	TEH + 3.6 to 8.9	B&W Sleeve
1	57	OBS		B&W Slv Pl
13	58	Inc. Fusion	Upper Weld	CE Weld Pl
30	58	CRI	TEH + 2.8	B&W Sleeve
2	59	SVI	TEH +22.6	CE Weld Pl
11	59	NQI NQI	TEH + 4.7 TEH + 6.8	B&W Sleeve

Table 4-B



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
16	60	CRI SAI	TEH + 2.3 TEH + 5.0	B&W Sleeve
30	60	CRI	TEH + 2.9	B&W Sleeve
34	60	NQI	TEH + 3.4 to 4.4	B&W Sleeve
36	60	NQI	TEH + 3.5 to 4.9	B&W Sleeve
14	61	SAI	TEH + 7.1	B&W Sleeve
3	62	Inc. Fusion	Upper Weld	CE Weld Pl
20	62	MAI	TEH + 7.3 to 14.7	B&W Sleeve
21	62	MAI	TEH + 7.1 to 9.6	B&W Sleeve
23	63	MRI	TEH + 2.7	B&W Sleeve
29	63	MAI	TEH + 4.9 to 9.7	B&W Sleeve
5	64	Inc. Fusion	Upper Weld	CE Weld Pl
14	65	SAI	TEH + 4.4 to 5.0	B&W Sleeve
22	65	MRI	TEH + 2.8	B&W Sleeve
38	65	NQI MAI	TEH + 3.5 TEH + 3.4 to 4.2	CE Mech Pl
16	66	ADI MAI	TEH + 3.8 to 15.7 TEH + 3.2 to 4.9	B&W Sleeve
19	66	NQI MAI	TEH + 3.9 to 7.3 TEH + 4.3 to 4.6	B&W Sleeve
26	66	SAI	TEH + 3.5 to 4.1	B&W Sleeve
18	67	SAI	TEH + 3.7 to 4.3	B&W Sleeve
23	67	NQI	TEH +11.0 to 17.6	B&W Sleeve
29	67	SRI	TEH + 2.5	B&W Sleeve
21	68	NQI	TEH + 4.5	B&W Sleeve
29	69	MRI	TEH + 3.1	B&W Sleeve

Table 4-B



## REPAIRABLE INDICATIONS

Row	Col	Indication	Location	Repair
7	71	Inc. Fusion	Upper Weld	CE Weld Pl
13	71	NQI	TEH + 4.9	B&W Sleeve
19	72	MAI	TEH + 3.7 to 9.9	B&W Sleeve
16	74	CRI SAI	TEH + 2.9 TEH + 3.9 to 5.1	B&W Sleeve
6	75	ADI	TEH + 4.9 to 7.4	B&W Sleeve
7	75	Inc. Fusion	Upper Weld	CE Weld Pl
1	76	SAI	TEH + 3.5 to 4.3	CE Mech Pl
15	76	SAI	TEH + 4.9 to 6.0	B&W Sleeve
32	76	SAI	TEH + 3.4	CE Mech Pl
10	78	MAI	TEH + 3.4 to 9.4	B&W Sleeve
5	79	SAI	TEH + 3.0 to 7.9	B&W Sleeve
6	83	SAI	TEH + 2.8	B&W Sleeve
8	83	SAI	TEH + 9.9 to 10.7	B&W Sleeve

Number of Tubes: 120

Number of Entries: 133



GINNA STATION  
STEAM GENERATOR TUBE INSPECTION  
AND CORRECTIVE ACTION HISTORY

DATE	NO. TUBES INSPECTED				TOTAL TUBES REQUIRING CORRECTIVE ACTION		TYPE OF DEGRADATION	>40% REQUIRED REPAIRS		NO. TUBES PLUGGED		NO. TUBES SLEEVED		NO. PLUGGED RETURNED TO SERVICE		NO. SLEEVES PLUGGED		NO. PULLED TUBES		TOTAL (NET) PLUGGED		TOTAL (NET) SLEEVED		COMMENTS	
	A		B		A	B		A	B	A	B	A	B	A	B	A	B	A	B	A	B				
	HOT	COLD	HOT	COLD		A																B	A		B
IN FACTORY																									
APR 1972	1050				1	0		1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
MAR 1974	3259	516	1098	516	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
NOV 1974	1701	430	672	39	19	0	WASTAGE	19	0	19	0	0	0	0	0	0	0	0	2	0	19	0	0	0	
MAR 1975	2174	442	1931	442	2	0	WASTAGE	2	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0		
JAN 1976	0	0	53	0	46	11	CRACKING/WASTAGE	46	11	46	11	0	0	0	0	0	0	0	0	0	2	0	0	0	
FEB 1976	3192	3192	3247	3247	0	2	WASTAGE	0	2	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	
APR 1976	100	0	1025	75	39	2	WASTAGE	39	2	39	2	0	0	0	0	0	0	0	0	0	0	2	0	0	
APR 1977	2003	268	1525	268	0	15	CRACKING	0	15	0	15	0	0	0	0	0	0	0	0	0	0	15	0	0	
JUL 1977			300		13	2	WASTAGE	13	1	13	1	0	0	0	0	0	0	0	0	0	13	1	0	0	
JAN 1978					0	6	ID CRACKING	0	5	0	5	0	0	0	0	0	0	0	0	0	0	5	0	0	
APR 1978	2049	325	1714	375	0	8	CRACKING/WASTAGE	0	8	0	8	0	0	0	0	0	0	0	0	0	0	8	0	0	
FEB 1979	2049	325	1714	375	1	15	ID CRACKING	1	15	1	15	0	0	0	0	0	0	0	0	1	1	15	0	0	
DEC 1979					0	6	CRACKING/WAS/IGA	0	6	0	6	0	0	0	0	0	0	0	0	0	0	6	0	0	
APR 1980	3139	325	3182	375	0	13	IGA/WASTAGE	0	13	0	13	0	0	0	0	0	0	0	0	0	0	13	0	0	
NOV 1980	3138	325	3151	375	1	31	"A" PITTING/"B" IGA	1	13	1	34	0	0	0	0	0	0	0	3	1	34	0	0	1	
MAY 1981	3138	325	3141	400	0	0	IGA	0	2	0	0	0	5	0	0	0	0	0	0	0	0	0	5	2	
FEB 1982	3137	526	3140	526	0	4	IGA/WASTAGE	0	6	0	4	0	16	0	0	0	0	0	0	0	0	4	0	16	3
SEP 1982	3138	382	3129	893	0	18	IGA/MECH/DAM	0	16	0	18	0	0	0	0	0	0	0	1	0	18	0	0	4	
APR 1983	3137	633	3096	832	1	33	IGA	1	28	1	33	0	0	0	0	0	0	0	0	1	33	0	0		
MAR 1984	3137	717	3093	963	4	4	IGA/SCC	0	23	0	3	4	74	0	0	0	0	0	1	0	4	4	73	5	
MAR 1985	3135	3135	3087	3087	1	1	IGA/SCC	0	5	1	1	0	9	0	0	0	1	0	0	1	2	0	8		
FEB 1986	3134	623	3083	770	3	4	IGA/SCC/WASTAGE	3	70	2	4	2	67	0	0	0	0	0	0	0	2	4	2	67	6
FEB 1987	3128	0	2884	0	6	27	IGA/SCC/WASTAGE	2	49	0	27	6	30	0	3	0	0	0	0	0	2	4	2	67	7
FEB 1988	3122	1517	2723	1301	7	73	IGA/SCC	17	78	10	72	24	80	0	0	0	0	0	0	0	24	6	33	8	
MAR 1988	0	0	208	0	7	41	IGA/SCC	4	18	14	58	0	0	0	0	1	1	0	0	10	75	24	77	9	
MAR 1989	3128	1668	2805	1486	0	9	IGA/SCC	0	6	0	8	0	0	0	0	0	0	0	0	15	59	-1	-1	10	
MAR 1990	2949	663	2437	653	0	9	IGA/SCC	0	6	0	8	0	0	0	0	0	0	0	0	0	9	0	-1		
APR 1991	2945	1093	2359	1092	177	445	IGA/SCC/PWS/CC/WAS	21	142	36	73	132	306	17	82	4	5	0	0	22	-4	137	365	11	
APR 1992	2748	757	1998	706	75	211	IGA/SCC/PWS/CC/WAS	18	70	22	20	56	163	0	28	5	1	2	0	24	-8	51	190	12	
MAR 1993	2520	894	1813	723	116	117	IGA/SCC/PWS/CC/WAS	27	52	12	7	81	93	22	15	1	2	1	0	-10	-9	102	107	13	
MAR 1994	2398	646	1690	627	244	218	IGA/SCC/PWS/CC/WAS	5	16	14	20	214	173	16	29	0	8	0	0	-2	-9	230	194	14	
MAR 1995	2235	772	1558	984	122	123	IGA/SCC/PWS/CC	7	14	8	17	114	108	0	46	1	1	0	0	9	-30	113	153	15	
					164	134	IGA/SCC/PWS/CC	3	1	20	29	143	103	0	0	1	1	0	0	21	30	142	102	16	
					88	120	IGA/SCC/PWS/CC	0	0	13	14	75	91	0	0	0	15	0	0	13	29	75	76	17	
					1164	1693				275	520	851	1318	55	203	13	40	7	9	228	343	885	1464		

\* Returned to Service  
without Sleeve

A=8 B=18

TABLE 5

M. J. Davison  
1-May-95

Rev. 0





**STEAM GENERATOR  
TUBE INSPECTION AND CORRECTIVE ACTION HISTORY  
COMMENTS  
(from TABLE 5)**

- (1) Pulled R15 C55 and R17 C41 from the hot leg and R17 C40 from the cold leg to determine IGA conditions in the "B" steam generator. R17 C41 and ECT indications at all frequencies, R15 C44 had only 100 kHz Absolute ECT indication and R17 C40 had no ECT indication. Both hot leg tubes had approximately 50% IGA, R17 C41 had a 60% SCC indication associated with the IGA.
- (2) Manually sleeved 5 tubes with nickel plated Inconel 600 thermally treated sleeves. Three tubes had IGA indications, two others were preventatively sleeved.
- (3) Sleeved 16 tubes with co-extruded sleeves, 13 with defects and 3 preventatively. Pulled Hot Leg tubes R21 C46 with a 100 kHz ECT indication, R7 C45 and R28 C45 which were clean tubes.
- (4) Recovery from the January 25, 1982 Tube Rupture Event including removing 26 tube sections by EDM and ID cutters along with the one tube pulled from the secondary side.
- (5) The four tubes identified with IGA in the "A" steam generator were sleeved with 22" tubesheet sleeves. The 78 tubes identified in the "B" steam generator with IGA and/or SCC in the crevice were repaired as follows:

41	tubes were sleeved with 36" brazed sleeves
9	tubes were sleeved with 28" brazed sleeves
24	tubes were sleeved with 22" tubesheet sleeves
1	tube and 2 sleeves were plugged
1	tube R34 C54 was pulled for metallurgical analysis
- (6) The two tubes identified with IGA in the crevice in the "A" steam generator inlet were sleeved with 20" tubesheet sleeves. One indication >40% TWD in the U-bend was permanently plugged. The 70 tubes identified in the "B" steam generator were repaired as follows:

56	tubes were sleeved with 20" tubesheet sleeves
10	tubes were sleeved with 36" brazed sleeves
3	tubes were mechanically plugged (CE removable)
1	tube was explosively plugged

1 tube was sleeved with a 36" brazed sleeve due to the domino effect.

- (7) The five tubes identified with crevice indications in the "A" steam generator inlet were sleeved with 27" Combustion Engineering (CE) Sleeves. One tube identified with an O.D. general indication above the secondary side tubesheet was also sleeved with a 27" CE sleeve. The 57 tubes identified in the "B" steam generator were repaired as follows:

- 27 tubes were sleeved with 27" CE sleeves
- 27 tubes were mechanically plugged (CE removable)
- 3 CE Mechanical Plugs installed in 1985 were removed and sleeved with 27" sleeves

The present sleeve installation status is 83 brazed sleeves, 88 tube sheet sleeves, 30 welded CE sleeves in the "B" steam generator with 6 tubesheet sleeves and 6 welded CE sleeves in the "A" steam generator.

- (8) The 34 tubes identified with crevice indications in the "A" steam generator inlet were repaired as follows:

- 10 tubes were mechanically plugged (CE removable)
- 24 tubes were sleeved with 27" CE welded sleeve

The 153 tubes identified with crevice indications in the "B" steam generator inlet were repaired as follows:

- 72 tubes were mechanically plugged (CE removable)
- 80 tubes were sleeved with 27" CE welded sleeves
- 1 CE welded sleeve (installed in 1987) was plugged with a CE welded sleeve plug due to rejection of upper weld.

Other repairs required in the "B" steam generator are as follows:

- 2 B&W test brazed sleeves (installed in 1980) were plugged due to the loss of the primary to secondary pressure boundary as detected by the Hydro Test.
- 5 Westinghouse explosive plugs installed prior to 1987 were removed due to leakage and replaced with CE welded plugs.
- 1 CE Mechanical Plug on the cold leg was removed and replaced with a CE Mechanical Plug.
- 4 CE welded sleeves (installed in 1987), are considered as "leak limiting" due to the marginal acceptance of the upper welds.

- (9) In the "A" steam generator, 15 tubes were plugged as follows:

- 7 tubes had tubesheet crevice indications
- 7 tubes for no confirmed AVB support
- 1 CE sleeve for unverified upper expansion

In "B" steam generator, 61 tubes were plugged as follows:

- 39 tubes had tubesheet crevice indications
- 2 tubes were misplugged in the hot leg during 1987 outage
- 8 tubes to box existing plugs were AVB support could not be verified.
- 10 tubes for no confirmed AVB support
- 1 tube for flow peaking consideration due to AVB placement
- 8 Westinghouse Explosive Plugs were removed and replaced with welded "Top Hat" Plugs

(10) The "B" steam generator had 9 tubes plugged for the following reasons:

- 6 tubes had tubesheet crevice indications identified by a review of the February data. These were removed from service with CE mechanical plugs.
- 2 tubes had signal changes from February to March. The tubes were removed from service with CE mechanical plugs.
- 1 B&W tubesheet sleeve identified by the hydrostatic pressure test was removed from service with a B&W explosive plug in the hot leg and a CE mechanical in the cold leg.

(11) A total of 177 tubes in "A" steam generator were repaired in 1989 as follows:

- 137 CE 27" welded sleeves (straight and periphery)
- 40 Tube and/or sleeve plugs
- 2 Previously plugged tubes stabilized (not counted as repaired)

A total of 445 tubes were repaired in "B" steam generator were repaired as follows:

- 367 CE 27" welded sleeves (straight and periphery)
- 78 Tubes and/or sleeve plugs
- 1 Previously plugged tube stabilized (not counted as repaired)

(12) A total of 75 tubes in "A" steam generator were repaired in 1990 as follows:

- 51 CE 27" welded sleeves (straight and periphery)
- 24 Tube and/or sleeve plugs (includes pulled tubes R25-C63 and R31-C66)

A total of 211 tubes in "B" steam generator were repaired as follows:

- 191 CE 27" welded sleeves (straight and periphery) including 28 deplugged tubes
- 20 Tubes and/or sleeve plugs (includes B&W tubesheet sleeve noted during hydro)

(13) A total of 116 tubes, including 24 deplugged tubes, in "A" steam generator were repaired in 1991 as follows:



- 61 CE 27" welded sleeves (straight and periphery)
- 41 CE 30" welded sleeves (straight)
- 14 Tube and/or sleeve plugs (includes pulled tube R45-C52 and deplugged tubes R17-C52 and R16-C48)

A total of 117 tubes, including 16 deplugged tubes, in "B" steam generator were repaired as follows:

- 80 CE 27" welded sleeves (straight and periphery)
- 28 CE 30" welded sleeves (straight)
- 9 Tube and/or sleeve plugs (includes sleeved tube R5-C37, deplugged tube R26-C56 and 2 B&W Explosive plug repairs)

(14) A total of 244 tubes, including 16 deplugged tubes, in "A" steam generator were repaired in 1992 as follows:

- 36 CE 27" welded sleeves (straight)
- 194 B&W explosively welded tubesheet sleeves
- 14 Tube and/or sleeve plugs (including two tubes stabilized R12-C11 and R13-C11)

A total of 218 tubes, including 30 deplugged tubes, in "B" steam generator were repaired as follows:

- 186 CE 27" welded sleeves (straight and periphery)
- 8 CE 30" welded sleeves (straight)
- 24 Tube and/or sleeve plugs (includes two tubes stabilized R11-C46 and R13-C89, deplugged tube R33-C75 and 3 B&W Explosive plug repairs)

(15) A total of 122 tubes in "A" steam generator were repaired in 1993 as follows:

- 51 CE 27" welded sleeves (straight)
- 62 B&W explosively welded tubesheet sleeves
- 6 CE mechanical tube plugs
- 1 B&W explosively welded sleeve plug
- 2 CE welded tube plugs

A total of 171 tubes, including 48 deplugged tubes, in "B" steam generator were repaired as follows:

- 153 B&W explosively welded tubesheet sleeves (includes 46 de-plugged tubes)
- 1 CE welded sleeve plug
- 17 CE welded tube plug (includes 2 de-plugged tubes)

(16) A total of 164 tubes in "A" steam generator were repaired in 1994 as follows:

- 143 B&W explosively welded tubesheet sleeves



15	C-E mechanical tube plugs
4	C-E welded tube plugs
1	C-E welded sleeve plug
1	B&W explosive sleeve plug

A total of 134 tubes in "B" steam generator were repaired in 1994 as follows:

103	B&W explosively welded tubesheet sleeves
29	C-E mechanical tube plugs
1	C-E welded tube plug
1	C-E welded sleeve plug

(17) A total of 88 tubes in "A" steam generator were repaired

75	B&W explosively welded tubesheet sleeves
3	B&W explosive sleeve plugs
10	C-E mechanical tube plugs

A total of 120 tubes in "B" steam generator were repaired

91	B&W explosively welded tubesheet sleeves
8	B&W explosive sleeve plugs
11	C-E mechanical tube plugs
10	C-E welded sleeve plugs





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