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MECREDY,R.C. Rochester Gas & Electric Corp.
RECIP.NAME RECIPIENT AFFILIATION
JOHNSON,A.R. Project Directorate I-3

SUBJECT: Forwards Westinghouse reassessment of IEB 88-002. Re-evaluation determined that two addl tubes in S/G-A & two addl tubes in S/G-B should be taken out of svc.Tubes to be stabilized & plugged during 1992 refueling oytage.

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March 2, 1992

U.S. Nuclear Regulatory Commission
Document Control Desk
Attn: Allen R. Johnson
Project Directorate I-3
Washington, D.C. 20555

Subject: Transmittal of Westinghouse Reassessment of IEB 88-02 for R.E. Ginna
R.E. Ginna Nuclear Power Plant
Docket No. 50-244

Dear Mr. Johnson:

In your letter dated July 10, 1990, Subject: Westinghouse Reassessment of IEB 88-02 for R.E. Ginna, you requested that RG&E submit the Westinghouse reassessment to the NRC when it was received. The reassessment has been completed and a copy of the non-proprietary version is attached. The re-evaluation process has determined that two additional tubes in S/G-A and two additional tubes in S/G-B should be taken out of service. These tubes will be stabilized and plugged during the 1992 refueling outage.

Very truly yours,

Robert C. Mecredy

Robert C. Mecredy

SCK/207
Attachment

xc: Mr. Allen R. Johnson (Mail Stop 14D1)
Project Directorate I-3
Washington, D.C. 20555

U.S. Nuclear Regulatory Commission
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475 Allendale Road
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Ginna Senior Resident Inspector

Cert No P748978215

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ATTACHMENT

WESTINGHOUSE PROPRIETARY CLASS 3

Subject: '88-02' Reevaluation of R.E. Ginna SG's

Ref: 1) W. J. Johnson ltr. NS-NRC-90-3498, "..Tube Fatigue Evaluations Update", March 27, 1990

2) WCAP-11802, WCAP-11803, "R. E. Ginna Evaluation for Tube Vibration Induced Tube Fatigue", April 1988

3) WCAP-12409, Evaluation of the Effect of Reduced Steam Pressure and End-of-Cycle Coastdowns on Steam Generator Tube Fatigue at R.E. Ginna", October 1989

Please convey the following evaluation to Rochester Gas & Electric Corporation.

Reference 1 lists R. E. Ginna as a 'category 6' plant, requiring reevaluation of the eddy current test data and the flow peaking interpretation of the same. The reevaluation process has been completed, with the conclusion that two additional tubes in SG A and two additional tubes in SG B should be taken out of service.

Published in April of 1988, the Tube Fatigue Evaluation performed for R. E. Ginna (reference 2) preceded the most recent eddy current interpretation of [

] a,c

The AVB data for R. E. Ginna has been reviewed to evaluate the possibility that the more recent methods would lead to different AVB placement (with different flow peaking and tube fatigue results) than were reported in the original WCAP reports. In this review process, detailed AVB signal maps have been made for approximately 650 of the 1850 tubes originally considered, and the eddy current evaluation has been repeated for approximately 300 tubes.

The interpretation of AVB positioning when [

]a,c In the R. E. Ginna SG's, this condition appears to be unrelated to columnar location. The most significant result of this change in AVB insertion distance is an increase in flow peaking for tubes in proximity to the AVB's involved.

The revised AVB placement maps are attached as Figures 1 and 2. Examples of the result of the updated AVB mapping technique in SG A are the relocation of the AVB's in the region between columns 9 and 15. A large scale map of this region is shown in Figure 3. Reevaluation of the EC data for this region resulted in the 'withdrawal' of the AVB's on both sides of column 11 and the AVB shared by columns 13 and 14. The data indicates that support can not be verified for tubes R12C11, or R13C11. The resulting combination of flow peaking and stress ratios for these tubes is high enough (see Tables 1 and 2) that they should be taken out of service. Conversely, 'withdrawal' of the AVB shared by columns 13 and 14 does not modify support conditions or appreciably effect flow peaking for tubes in that region.

Examples of the result of the updated AVB mapping technique in SG B are the relocation of the AVB's in the region between columns 44 and 51. A large scale map of this region is shown in Figure 4. Reevaluation of the EC data for this region resulted in the 'withdrawal' of the AVB's on both sides of column 46 and the AVB shared by columns 50 and 51. The data indicates that support can not be verified for tube R12C46; and the resulting combination of flow peaking and stress ratios for that tube is high enough (see Tables 1 and 2) that it should be taken out of service. Additionally, support cannot be verified for R13C89, which should also be taken out of service. Conversely, 'withdrawal' of the AVB shared by columns 50 and 51 had no significant effect on support or flow peaking for tubes in that region.

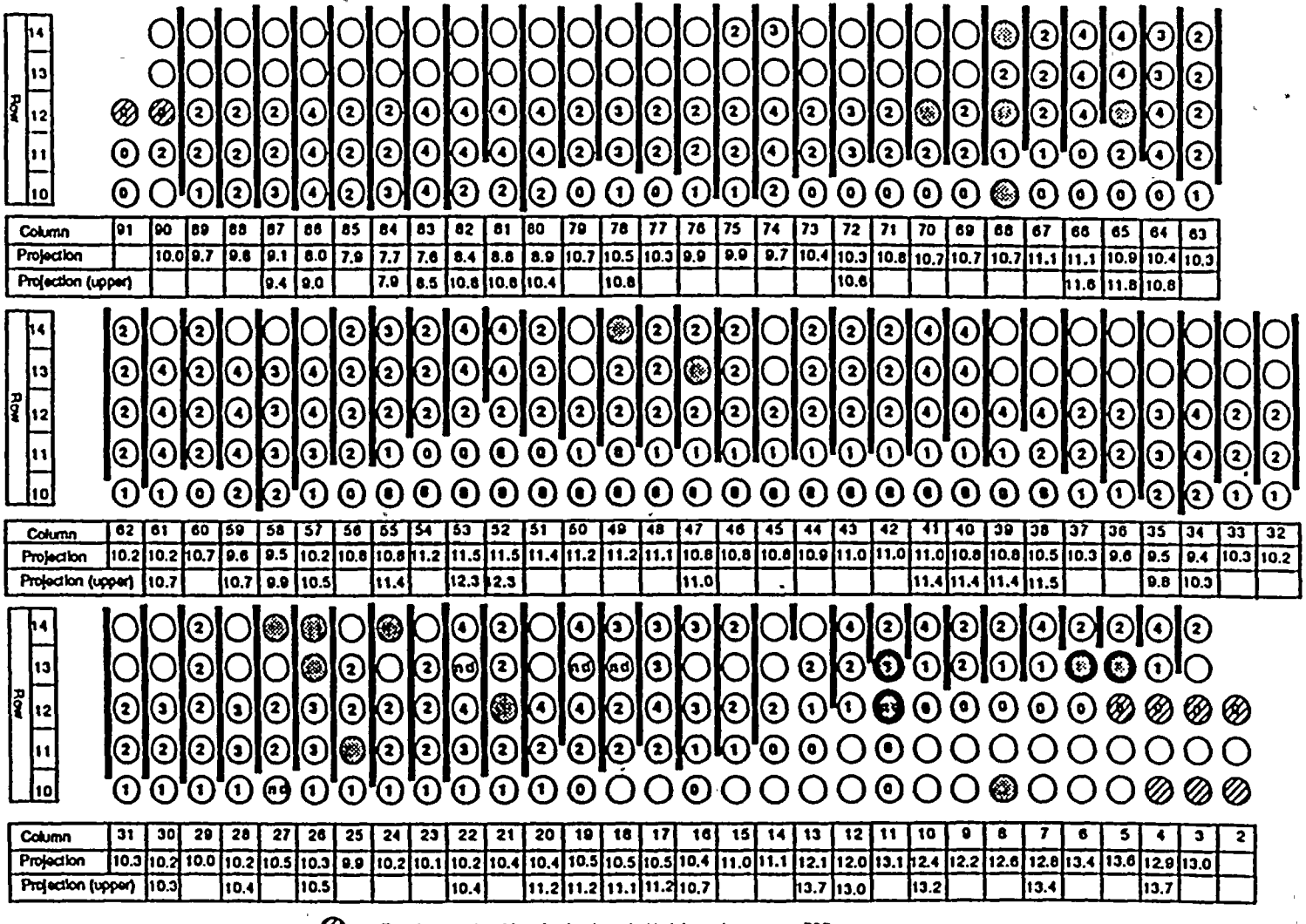
The flow peaking models used are shown pictorially in Figure 5, and flow peaking interpretation in Table 1. The resulting stress ratio values are listed in Table 2 and the stress ratio plots in Figure 6. These figures and tables supersede those originally supplied as a part of the 'WCAP' reports listed in reference 2.

In conclusion: In SG A, in addition to tubes R13C5 and R13C6 previously identified; tubes R12C11 and R13C11 also require action. In SG B, in addition to tube R11C73 previously identified; tubes R11C46, and R13C89 require action. All other tubes identified as being unsupported are judged to have acceptable flow peaking values. The evaluation documented herein is based on the full power operating conditions of 3,240,000 #/hr steam flow at 736 psia, used as analytical input to the referenced 'WCAP' reports. Operation at a lower pressure or a higher power level may make these tube fatigue assessments non-conservative and is contingent on meeting the criteria identified below.

As described in reference 3, future full power operation at reduced steady state pressures, together with end-of-cycle coastdowns will produce SG U-bend conditions of higher velocity and lower damping than the values used in the analyses of reference 2. Analyses of these lower pressure conditions can lead to the identification of additional tubes which do not meet the stress ratio and fatigue usage criteria for acceptance. The R. E. Ginna steam generators may be operated at full power steady-state pressures as low as 675 psia, together with end-of-cycle coastdowns as defined, with no additional tubes requiring actions other than the seven tubes previously identified.

However, if the steady-state pressure is reduced to 650 psia, two additional tubes in SG B; R10C41 and R10C67 must be taken out of service. If the steady-state pressure is further reduced to 625 psia, tube R10C79 must be taken out of service in SG A, and tube R10C73 must be taken out of service in SG B. Operation at steady-state pressures lower than 625 psia has not been evaluated. A summary of effected tubes, and 'limiting' tubes is provided in Table 3.

The reduced pressure analyses are based on tube-specific fatigue usage calculations composed of three components: 1) usage accumulated during past operation, with an accounting for cycle to cycle variations in operating conditions; 2) usage associated with future operation at reduced steady-state steam pressures and; 3) the incremental usage associated with 19 future end-of-cycle coastdowns, assuming there is an "enveloping coastdown" cycle at the end of each. See reference 3 for details of the calculational methodology.



Column	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
Projection		10.0	9.7	9.6	9.1	8.0	7.9	7.7	7.6	8.4	8.8	8.9	10.7	10.5	10.3	9.9	9.9	9.7	10.4	10.3	10.8	10.7	10.7	10.7	11.1	11.1	10.9	10.4	10.3
Projection (upper)					9.4	9.0		7.9	8.5	10.8	10.8	10.4		10.8						10.6						11.6	11.8	10.8	

Column	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
Projection	10.2	10.2	10.7	9.6	9.5	10.2	10.8	10.8	11.2	11.5	11.5	11.4	11.2	11.2	11.1	10.8	10.8	10.8	10.9	11.0	11.0	11.0	10.8	10.8	10.5	10.3	9.6	9.5	9.4	10.3	10.2
Projection (upper)		10.7		10.7	9.9	10.5		11.4		12.3	12.3					11.0						11.4	11.4	11.4	11.5			9.8	10.3		

Column	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
Projection	10.3	10.2	10.0	10.2	10.5	10.3	9.9	10.2	10.1	10.2	10.4	10.4	10.5	10.5	10.5	10.4	11.0	11.1	12.1	12.0	13.1	12.4	12.2	12.6	12.8	13.4	13.6	12.9	13.0	
Projection (upper)		10.3		10.4		10.5				10.4		11.2	11.2	11.1	11.2	10.7			13.7	13.0		13.2			13.4			13.7		

NOTES:

Numbers indicate 'Visible' AVB's

If no number is given, no data exists

Projections are based on centerline of AVB relative to centerline of tube

Tube Inspected and found to be dented with deformation at upper TSP

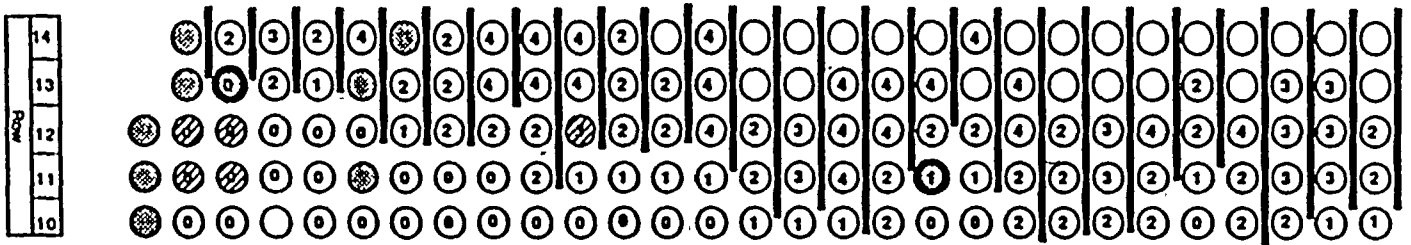
Tube Plugged for reasons other than susceptibility to 'North Anna' type tube fatigue

Recommend tube be plugged for susceptibility to 'North Anna' type tube fatigue

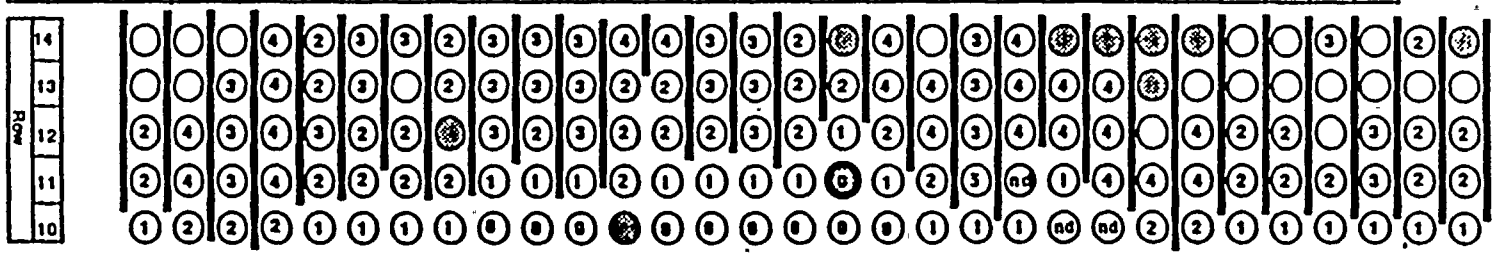
Noisy data; inconclusive data

Figure 1

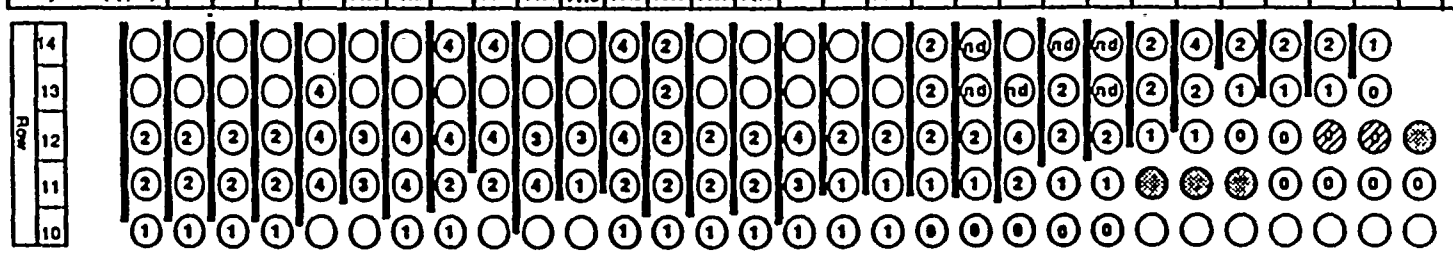
R. E. Ginna SG A - AVB Positions



Column	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
Projection			13.1	12.9	12.8	11.7	11.6	11.7	11.7	10.7	10.8	11.6	11.4	11.1	10	10.1	9.8	9.8	11.2	10.7	9.4	9.5	9.8	9.7	10.7	9.2	9.3	10.1	10.3
Projection (upper)						12.9			12.4	12.5	11.5			11.8	11.1	10.3	10.3	11.2	12.1	12.1	10.7		9.9	11.0		11.3	9.9	10.3	



Column	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
Projection	10.2	9.6	9.2	9.2	10.6	10.7	10.7	10.7	10.8	10.7	10.7	10.9	11.5	11.4	11.3	11.3	12.3	11.2	10.4	10.2	10.1	11.0	10.3	9.3	9.3	10.3	10.3	10.2	9.9	10.1	10.1
Projection (upper)	10.4	9.6	10.5	10.7	11.1	11.2			11.0	11.4	11.0	13.3	13.3	11.7	11.6			12.4	11.3	10.5	11.7	11.8	11.0	10.3	10.3				10.2		



Column	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
Projection	10.2	10.2	10.2	10.1	10.0	10.3	10.1	10.4	10.0	10.0	10.7	10.3	10.4	10.4	10.1	10.2	10.9	10.9	10.8	10.1	10.6	11.4	11.5	11.8	12.1	12.2	12.9	12.9	13.3	
Projection (upper)					10.7	10.6	10.6	11.4	11.3	10.7	10.8	10.9				10.8					11.4				13.3	13.8				

Tube inspected and found to be dented with deformation at upper TSP

Tube plugged for reasons other than susceptibility to "North Anna" tube tube fatigue

Noisy data; inconclusive data

Recommend tube be plugged for susceptibility to "North Anna" type tube fatigue

NOTES:

Numbers indicate 'visible' AVB's

If no number is given, no data exists

Projections are based on centerline of AVB relative to centerline of tube

Figure 2

R. E. Ginna SG B - AVB Positions

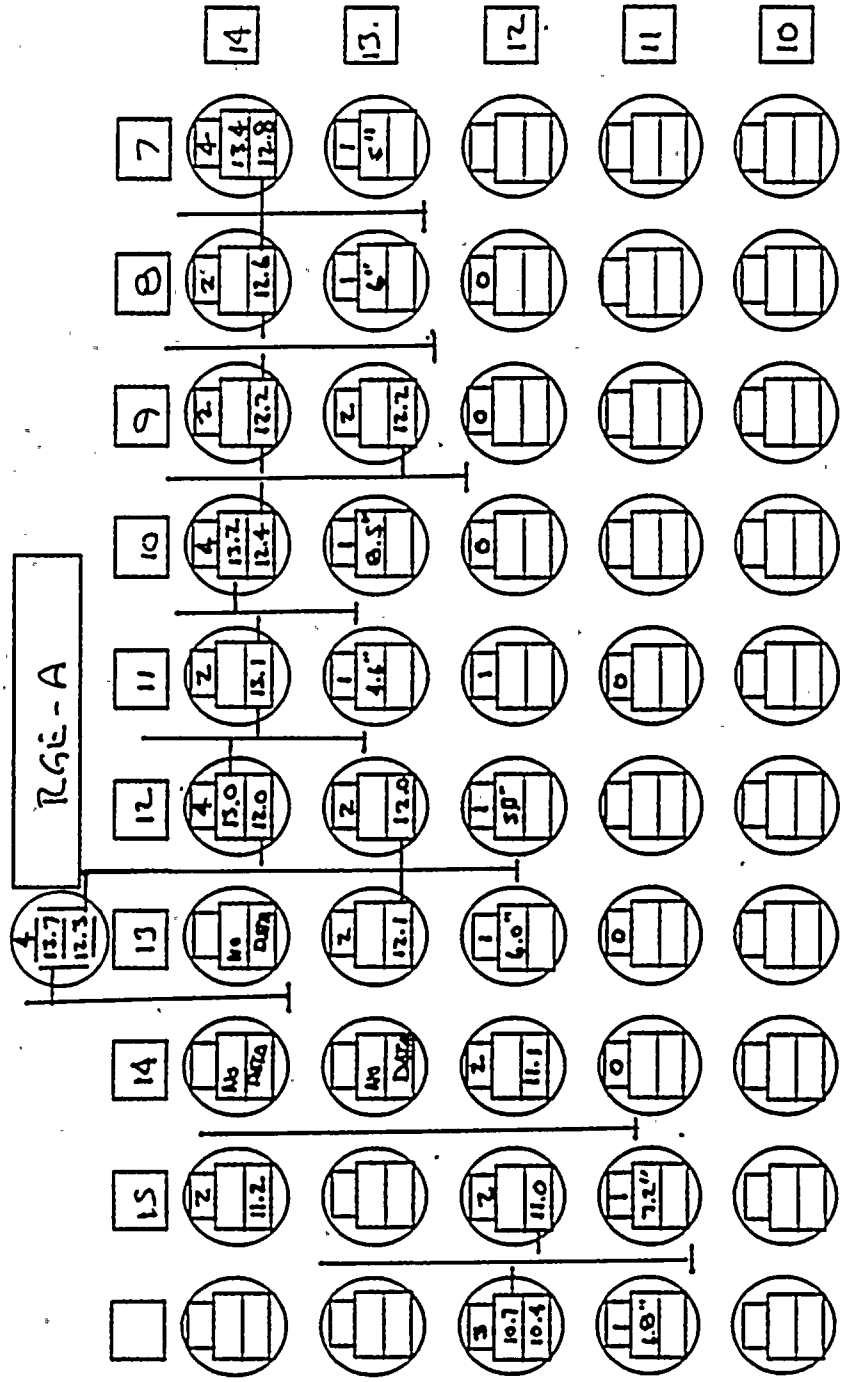


Figure 3

R. E. Ginna SG A AVB Insertion: Columns 9 through 15

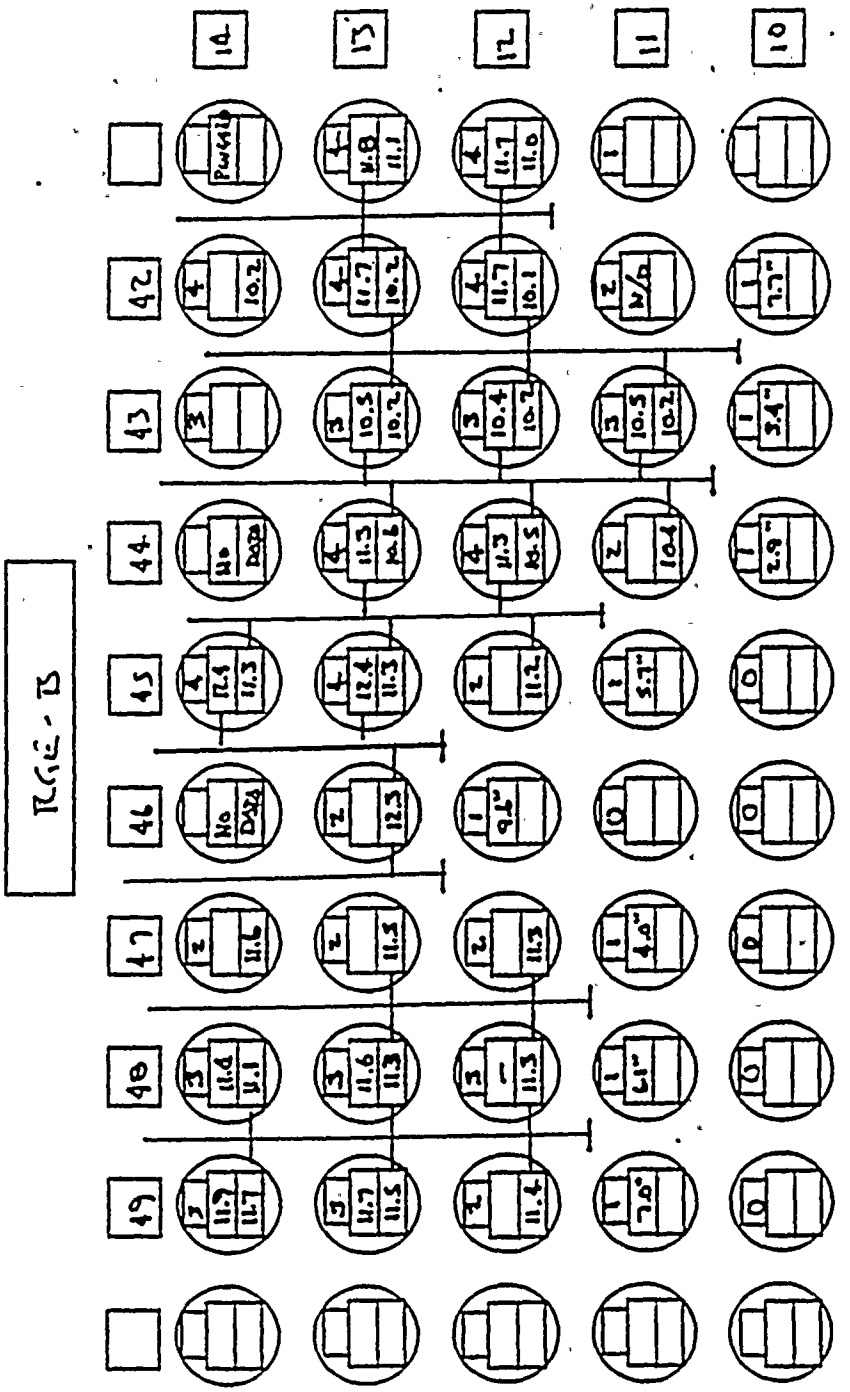


Figure 4

R. E. Ginna SG B AVB Insertion: Columns 42 through 49

TYPE OF AVB INSERTION	PEAKING FACTOR	TYPE OF AVB INSERTION	PEAKING FACTOR	TYPE OF AVB INSERTION	PEAKING FACTOR

Figure 5

Flow Peaking Models Used in Analysis

[redacted]

a,c

R. E. Ginna - Plots of Stress Ratio

Steam Generator	Row No	Column No	Type of AVB Configuration	Peaking Factor	Peaking Ratio
A	10	79	~4d, ~4r	[redacted]	[redacted]
		60	~4a		
		27	4b		
	11	53	~1w		
	12	11	~4w		
	13	6	~5j		
		5	~4e		
	All of the remaining				
B	10	73	< 4d		
		72	< 8a		
		67	~1a, ~4f		
		41	~1a, ~8k		
		24	~1w		
		21	~4a, ~4w		
	11	79	~1n, <1y		
		73	<1s		
		46	~1a		
	All of the remaining				

B, C

Table 1

Velocity Peaking Factors and Peaking Ratios
R. E. Ginna U-bend Flow

S.G	ROW	COL *	F.P	ALLOW F.P	RSR*FP	STRESS RATIOS W/DENTING	STRESS RATIOS W/O DENTING
					a,c		
A	10	79			0.846	0.71	0.66
		60			0.675	0.21	0.19
		27			0.581	0.09	0.08
	11	53			0.717	0.24	0.22
	12	11			1.091	>2.0	>2.0
	13	6			1.019	1.82	1.68
		5			1.406	>2.0	>2.0
		11			0.993	1.40	1.29
B	10	73			0.840	0.69	0.63
		72			0.668	0.19	0.18
		67			0.855	0.76	0.70
		41			0.857	0.77	0.71
		24			0.616	0.12	0.11
		21			0.711	0.27	0.25
	11	79			0.703	0.22	0.20
		73			0.967	1.46	1.34
		46			0.997	1.98	1.82
	13	89			1.008	1.64	1.51

( )* - An axisymetric model (with symetry about C47/C48) is used. The 'mirror immage' tube has been analyzed.

Table 2

Stress Ratios for R. E. Ginna

Evaluated Tube	Nominal Stress Ratio	Enveloped Tubes	Accumulated Fatigue Usage	Pressure	Future Steady State	Future Coastdown	Future Total
SGB: R10C41	0.77	SGB: R10C67	0.084	700	0.296	0.024	0.404
				675	0.503	0.045	0.632
				650	0.938	0.143	*1.165*
				625	2.221	0.546	*2.831*
SGA: R10C79	0.71		0.059	700	0.204	0.016	0.279
				675	0.344	0.03	0.433
				650	0.637	0.073	0.769
				625	1.206	0.27	*1.535*
SGB: R10C73	0.69		0.052	700	0.179	0.014	0.245
				675	0.301	0.027	0.38
				650	0.556	0.054	0.662
				625	1.05	0.2	*1.302*
SGB: R10C21	0.27	SGA: R11C53	0.001	700	0.004	<0.001	0.005
		R10C60		675	0.005	<0.001	0.006
		R10C27		650	0.009	0.001	0.011
		SGB: R11C79		625	0.015	0.001	0.017
		R10C72					
		R10C24					

Table 3

Tubes Effected by Operation at Low Pressure and 'Coastdown' Operation