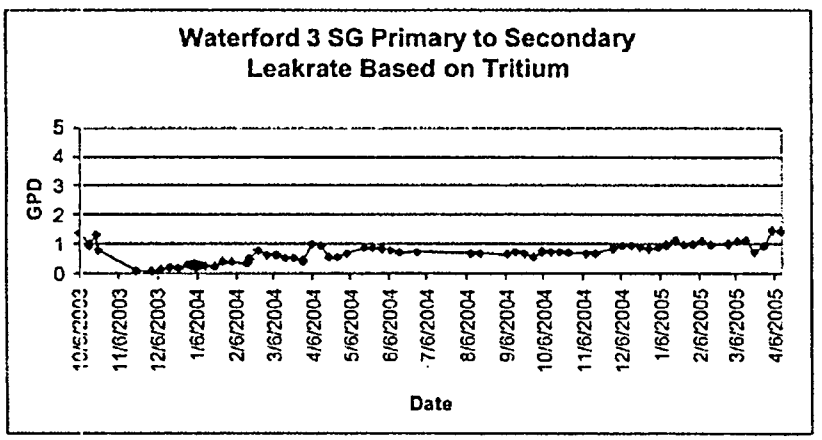
DRAFT

Mid-Inspection Questions with the NRC for Waterford 3 Steam Generators during RF13

1. **Discuss any trends in the amount of primary to secondary leakage observed in the recently completed cycle.**

   Primary to secondary leakage was constant all cycle and remained less than 2 GPD.



2. **Discuss whether any secondary side pressure tests were performed during the outage and the associated results.**

   A secondary side pressure test was not performed.

3. **Discuss any exceptions taken to industry guidelines.**

   There were no exceptions taken to the EPRI guidelines.

4. **For each steam generator, provide a description of inspections performed including the areas examined and which probe was used. The scope of the inspection and the expansion criteria. Also discuss the extent of the inspections performed in the portion of the tube below the expansion transition region in relation to NRC generic letter 2004-01 and industry inspection recommendations.**

DRAFT

Attachment A

DRAFT

SG31 and SG32

Scope	Probe	Sample	Extent	Expansion Required
Full Length Bobbin	Bobbin	100%	Full Length	No
Top of Tubesheet	Plus Point	100%	*Hot Leg +3 to -11	No
Low Row (1&2)	Plus Point	100%	07H to 07C	No
Historical Wear	Plus Point	20%	Random	No
New Wear (bobbin)	Plus Point	100%	+2/-2 Structure	**Yes
Freespan Dings(>5V)	Plus Point	20%	Random	No
Dented Eggcrates(>2V)	Plus Point	100%	+2/-2	No
Dented Dia. Straps	Plus Point	20%	+3/-3	No
Over Expansions	Plus Point	100%	+2/-2	No
Loose Parts	Plus Point	100%	Surrounding	No
Bobbin Coil "I Codes" as required				

* Consistent with C* for Waterford (10.4 inches)
** 100% Plus Point inspection of all wear

Expansion plans in accordance with EPRI – PWR Steam Generator Inspection Guidelines – Rev 6.

5. **For each area examined, provide a summary of the number of indications identified to-date of each degradation mode. For the most significant indications in each area, provide an estimate of the severity or the indication. In particular, address whether tube integrity was maintained during the previous operating cycle. In addition, discuss whether any location exhibited a degradation mode that had not previously been observed at this location at this unit.**

   All cracks were screened for in-situ testing. There were no indications that required testing. Therefore all performance criteria were met in all areas.

   The new area that cracking was identified is as follows:

   1. Cracking in the vertical straps (axial)

      There were 3 axial cracks identified in the vertical straps in the batwings.

DRAFT

May 1 WF3 Steam Generator Inspection Report (Not Final)

Tube Status	SG - 31	SG - 32
Tubes inservice prior to RF	8779	8866
Total Number of tubes previously removed from service	571	484
Repair Candidates from RFO13:		
Hot Leg Top of Tubesheet Axial Indications (Above TTS)	1	2
Hot Leg Top of Tubesheet Circ. Indications (Above TTS)	1	0
Hot Leg Tube Sheet Axial Indications (Within Tubesheet)	5	0
Hot Leg Tube Sheet Circ. Indications (Within Tubesheet)	16	1
Tubesheet with Axial and Circumferential Indications	0	0
Support Plate With Axial Indications	100	21
Support Plate With Circumferential Indications	0	0
Batwings With Axial Indication	0	3
Customer Decision (NSI) or NTE/PTE)	7	20
Hot Leg Volumetric Indications	0	3
Cold Leg Volumetric Indications	5	0
Row 1 - Row 2 U-Bend Indications	0	0
Bobbin Percents => 40%	2	5
Restricted/Obstructed Tubes or Unable to Complete Test	0	0
Total Candidate Tubes to be Repaired	113	50
Potential Stabilizer Candidates During RF13 (-3" TTS or Higher)	4	1
Tubes Plugged During RF13		
Total Tubes Plugged - Post RF13		

6. **Describe repair/plugging plans.**

All plugs are mechanical rolled I-690
All circumferential cracks from TSH -3 and higher are stabilized
All cracks are removed from service via plugging

Current plugging numbers are:

SG31 = 113
SG32 = 50

Attachment A

DRAFT

7. **Describe in-situ and tube pull plans and results.**

   Currently there are no in-situ or tube pull candidates for RF13

8. **Provide the schedule of steam generator related activities during the remainder of the current outage.**

   We are currently in the repair mode of the inspection. There are no additional planned tubes of eddy current inspection left to do. FOSAR results will dictate final decision for additional inspections/ repairs. Completion of Steam Generator work is scheduled to completed by 5/5/2005

9. **Discuss the following regarding loose parts:**

   a. **What inspection are being performed to identify loose parts**

      - 100% bobbin (using turbo mix – for wear)
      - 100% HL TTS with plus point
      - SG31 FOSAR at the top of the tube-sheet annulus and tubelane.

   b. **A description of loose parts identified and their location within the SG.**

      Six periphery potential loose parts were identified in SG 31. Attempts to visually inspect the loose part locations (5 new) in 31 Steam Generator are in progress. The significance of the findings in 31 SG will determine the need to FOSAR SG 32 which identified only 2 potential loose parts on the periphery.

   c. **If the loose parts were removed from the steam generator.**

      FOSAR is in progress in SG31.

   d. **Indications of tube damage associated with the loose parts.**

      Only one identified (PLP) potential loose part has caused wear. The loose part was identified on ECT inspection of tube 128-130 (SG32 approximately 10 inches above the hot leg TTS).

      The loose part associated with indication called on SG 32 HL in tube 128-130 will not be removed in RF13. Baring additional information driving FOSAR inspection of SG32, not attempting to remove the potential part is acceptable based on the following:

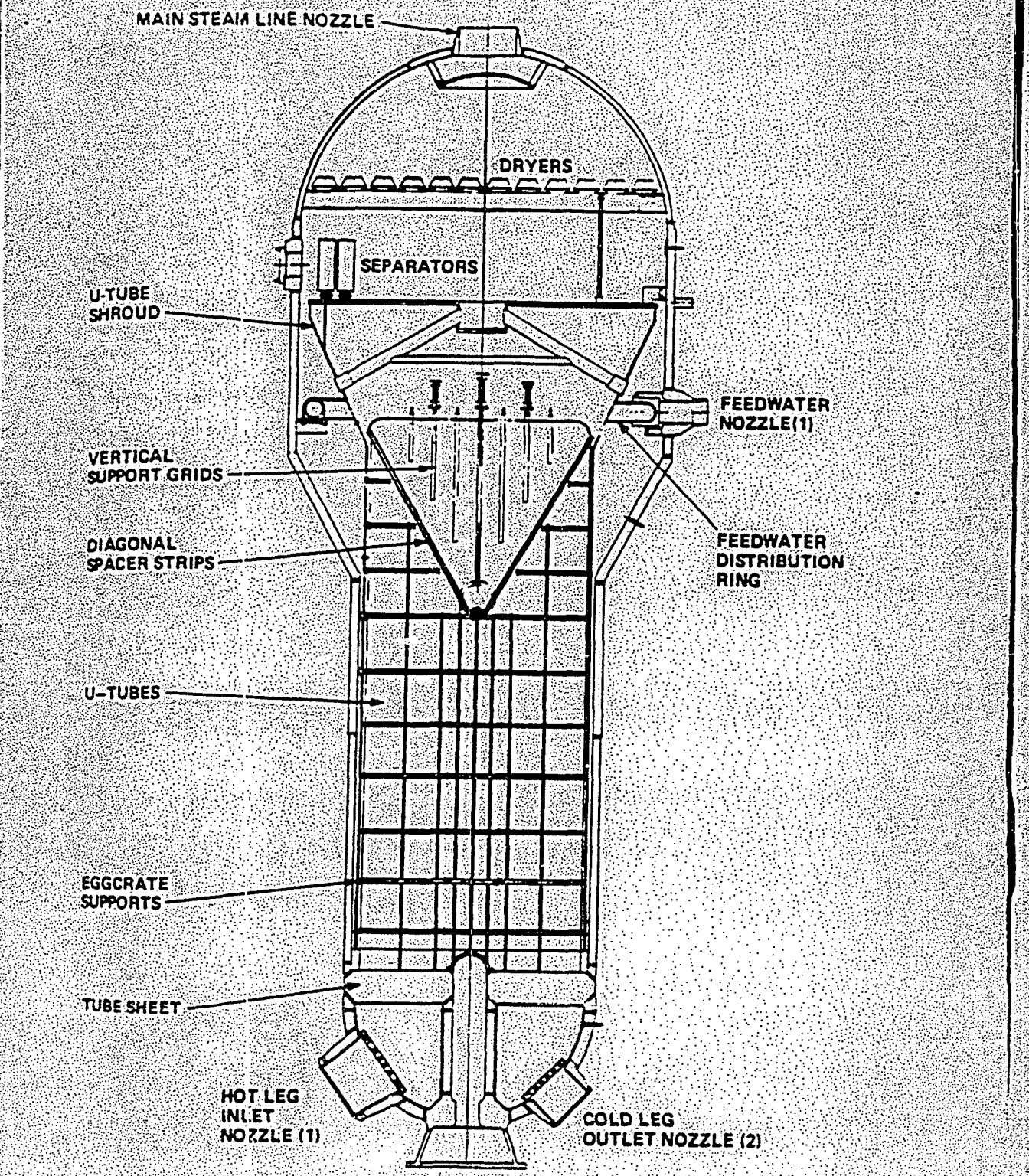


FIGURE 2.1-1 SONGS-2 STEAM GENERATOR ARRANGEMENT

05/04/2005 MSB LIBRARY

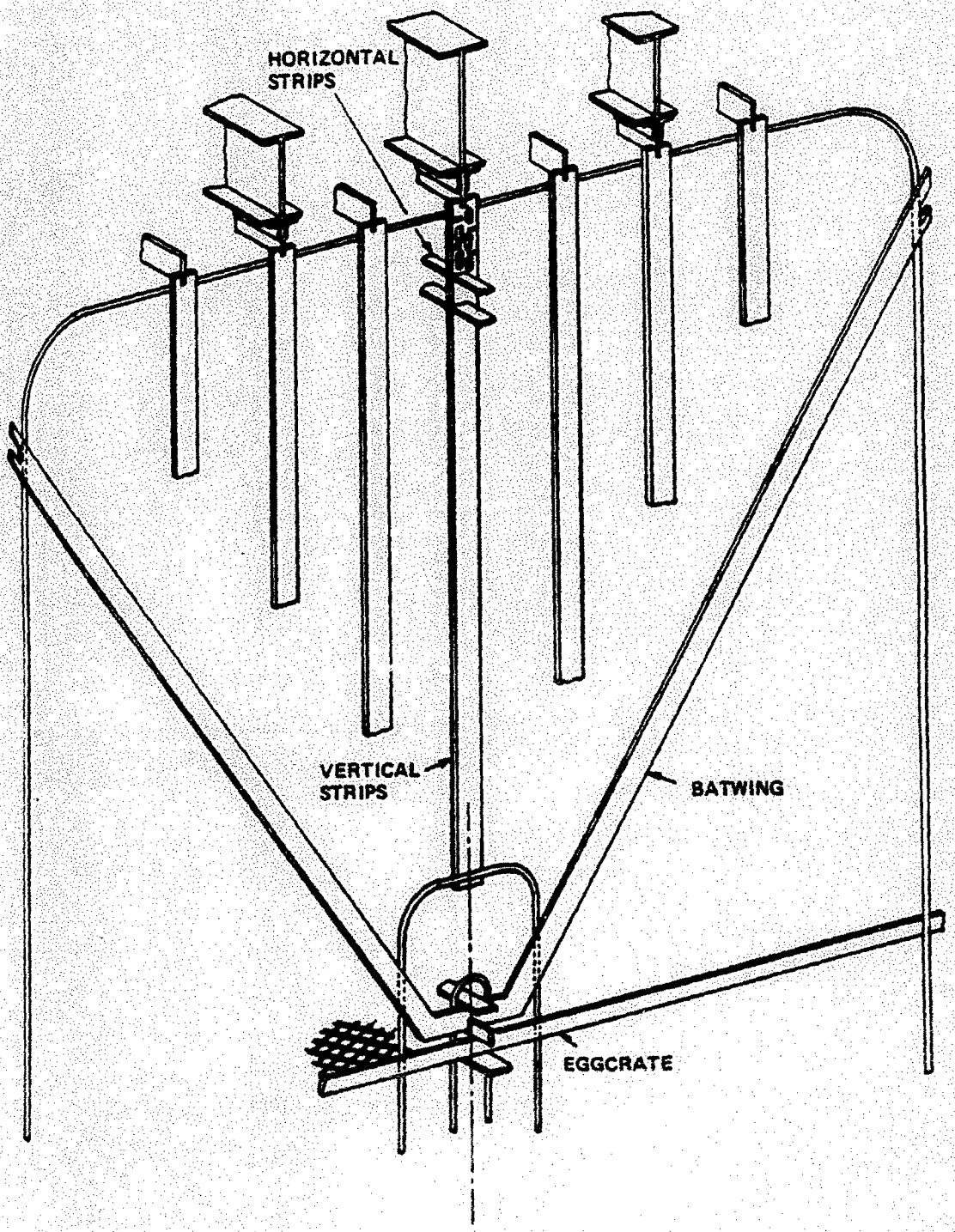


FIGURE 2.2-2
SONGS-2 STEAM GENERATOR BEND REGION TUBE SUPPORTS

05/04/2005 MSB LIBRARY

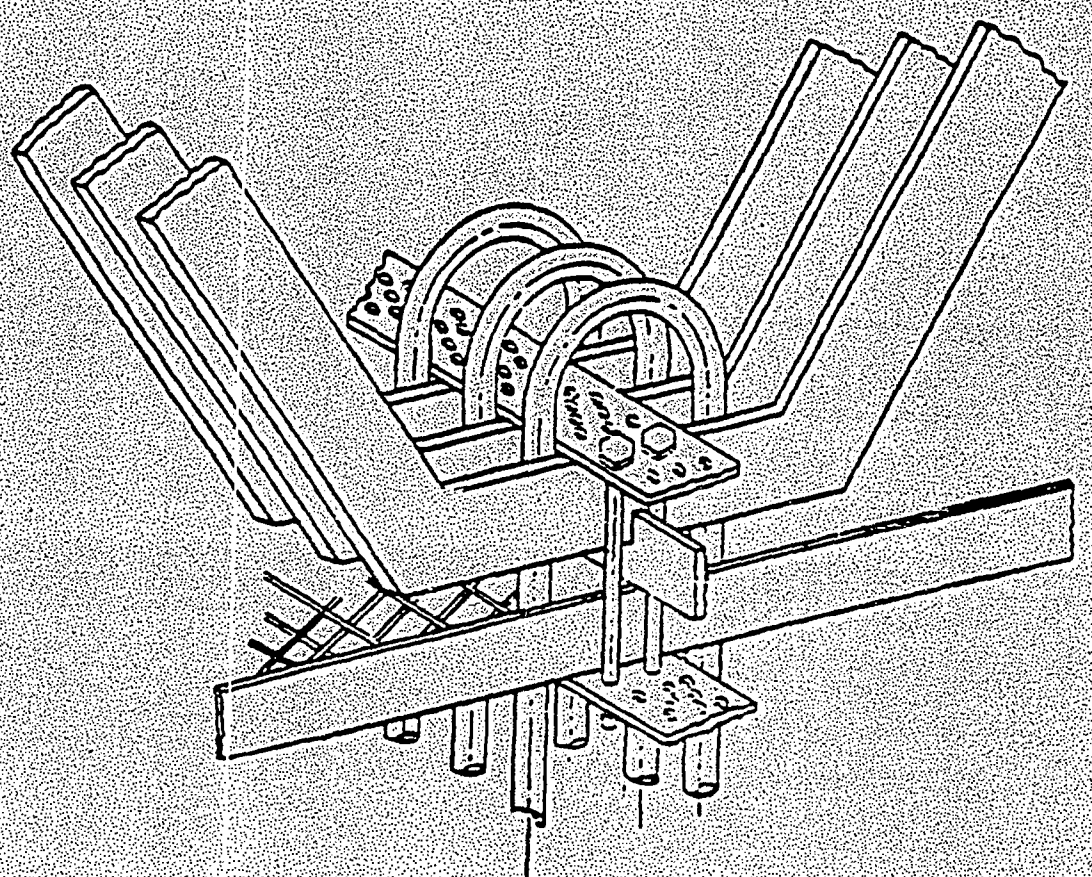


FIGURE 2.4-5
SCNGS-2 STEAM GENERATOR LOWER "BATWING" ASSEMBLY

05/04/2005 MSB LIBRARY

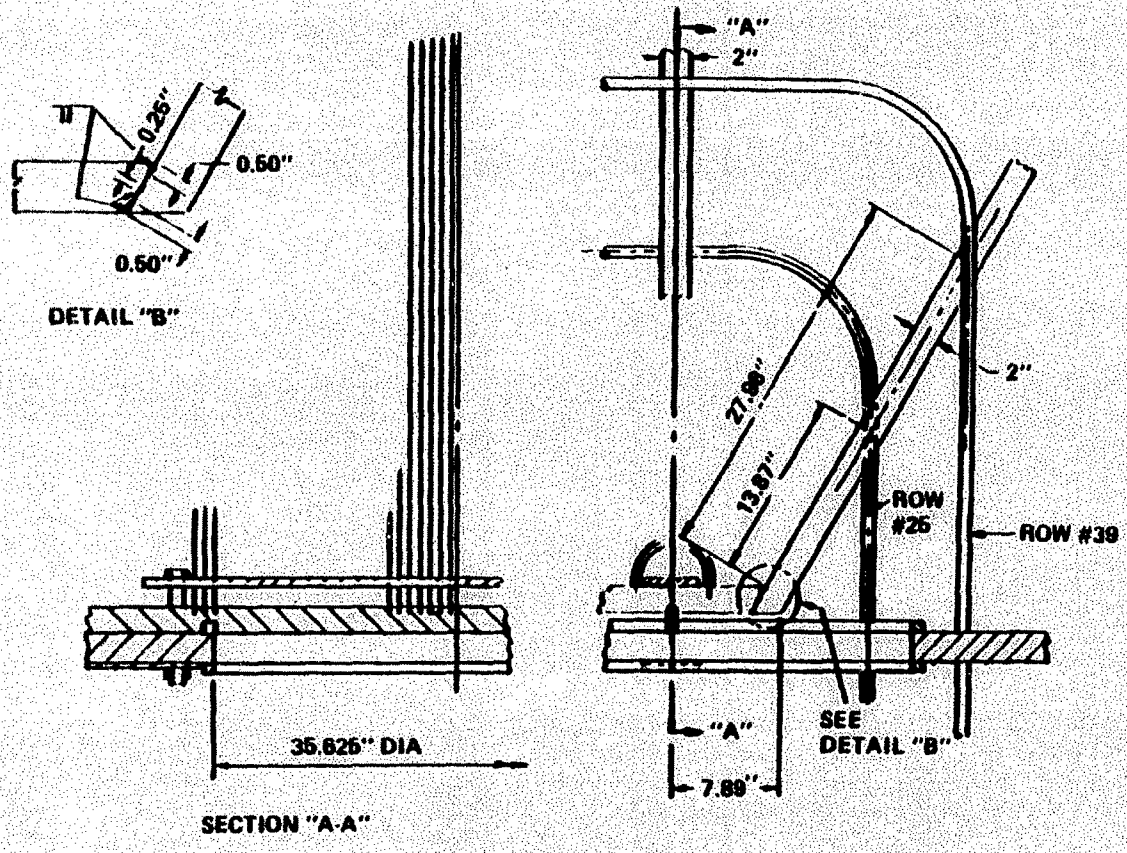


FIGURE 2.4-1
BAT WING ARRANGEMENT IN CENTRAL STAY CYLINDER REGION

05/04/2005 MSB LIBRARY

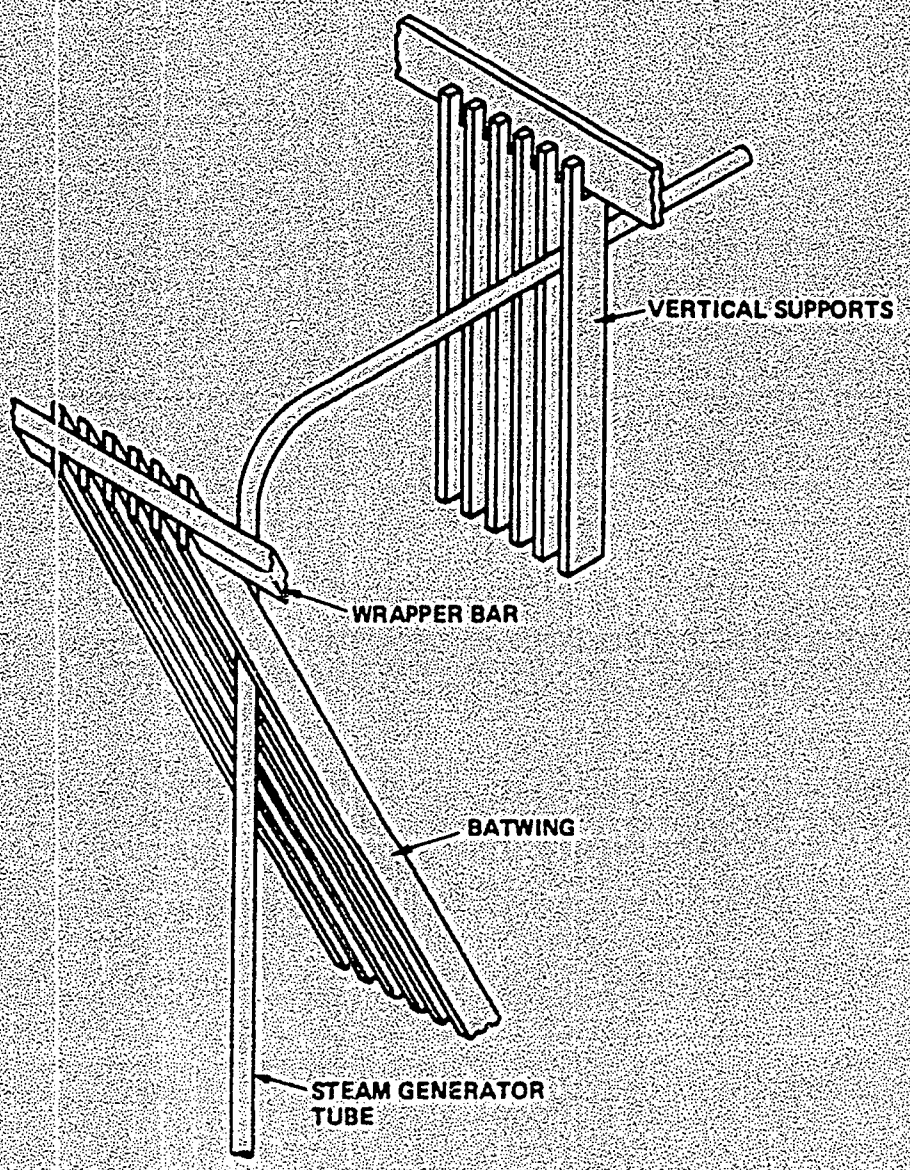


FIGURE 2.4-4
SONGS-2 STEAM GENERATOR UPPER "BATWING" ASSEMBLY

05/04/2005 MSB LIBRARY

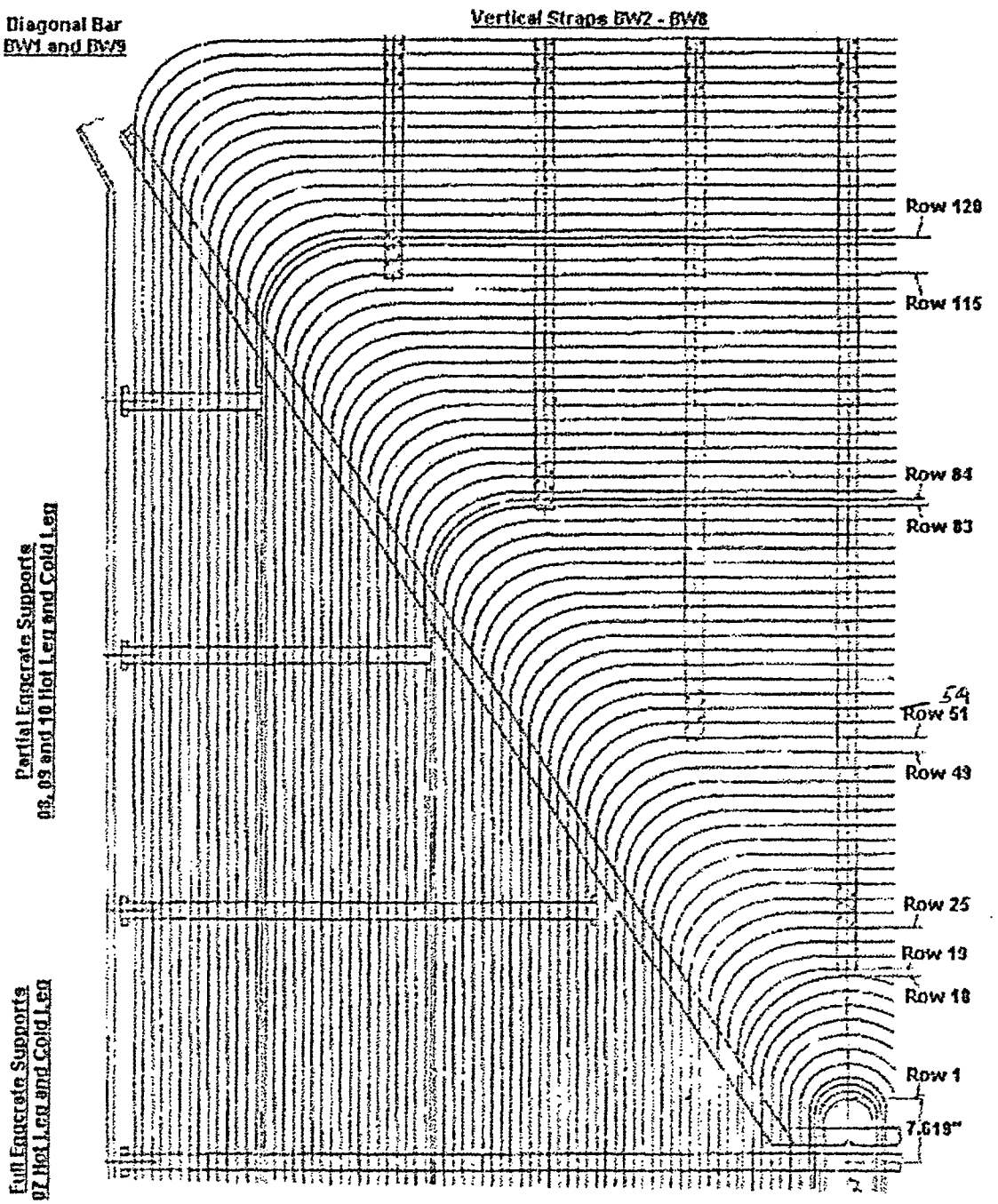
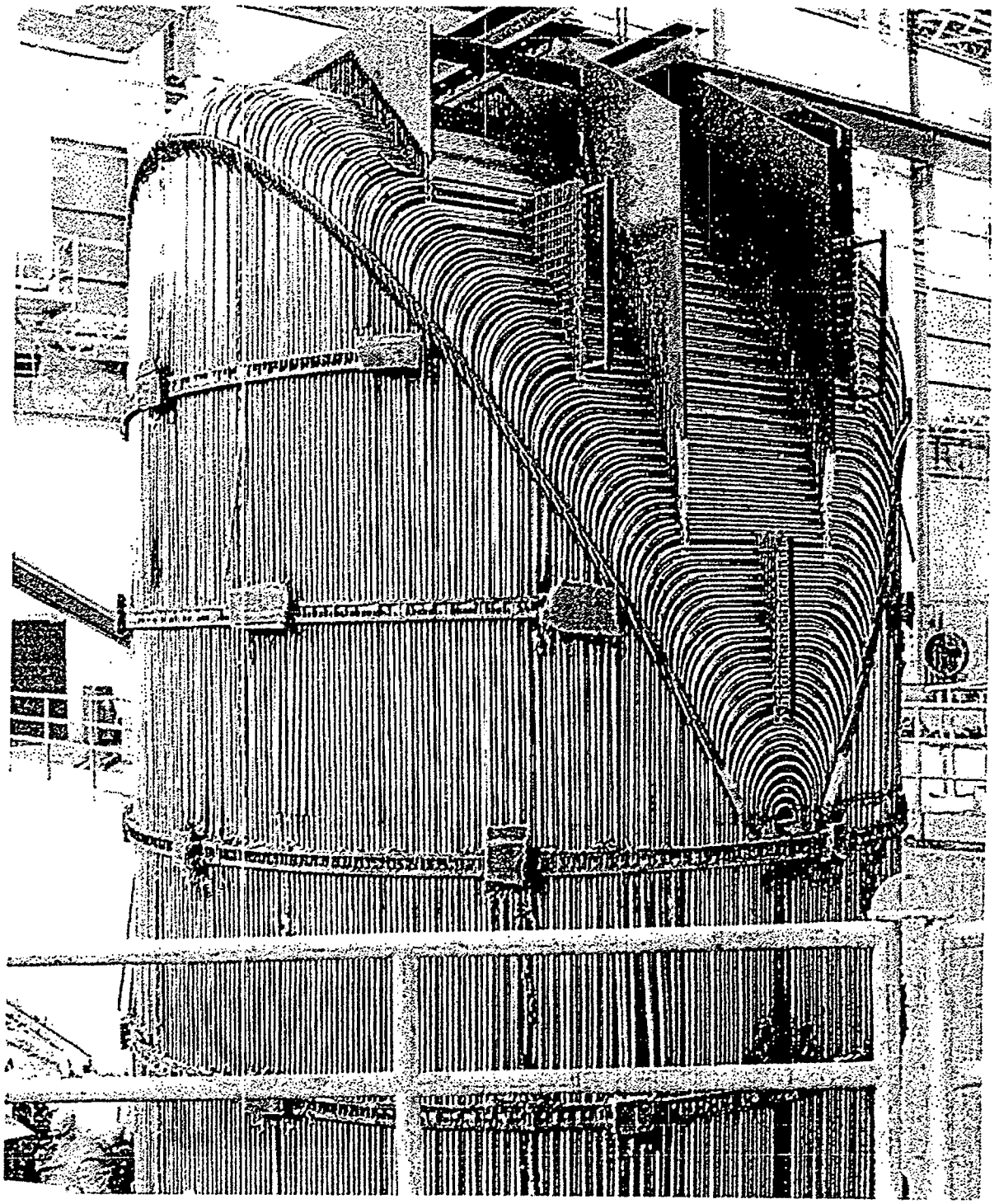


FIGURE 6
UPPER BUNDLE TUBE SUPPORT CONTACT POINTS



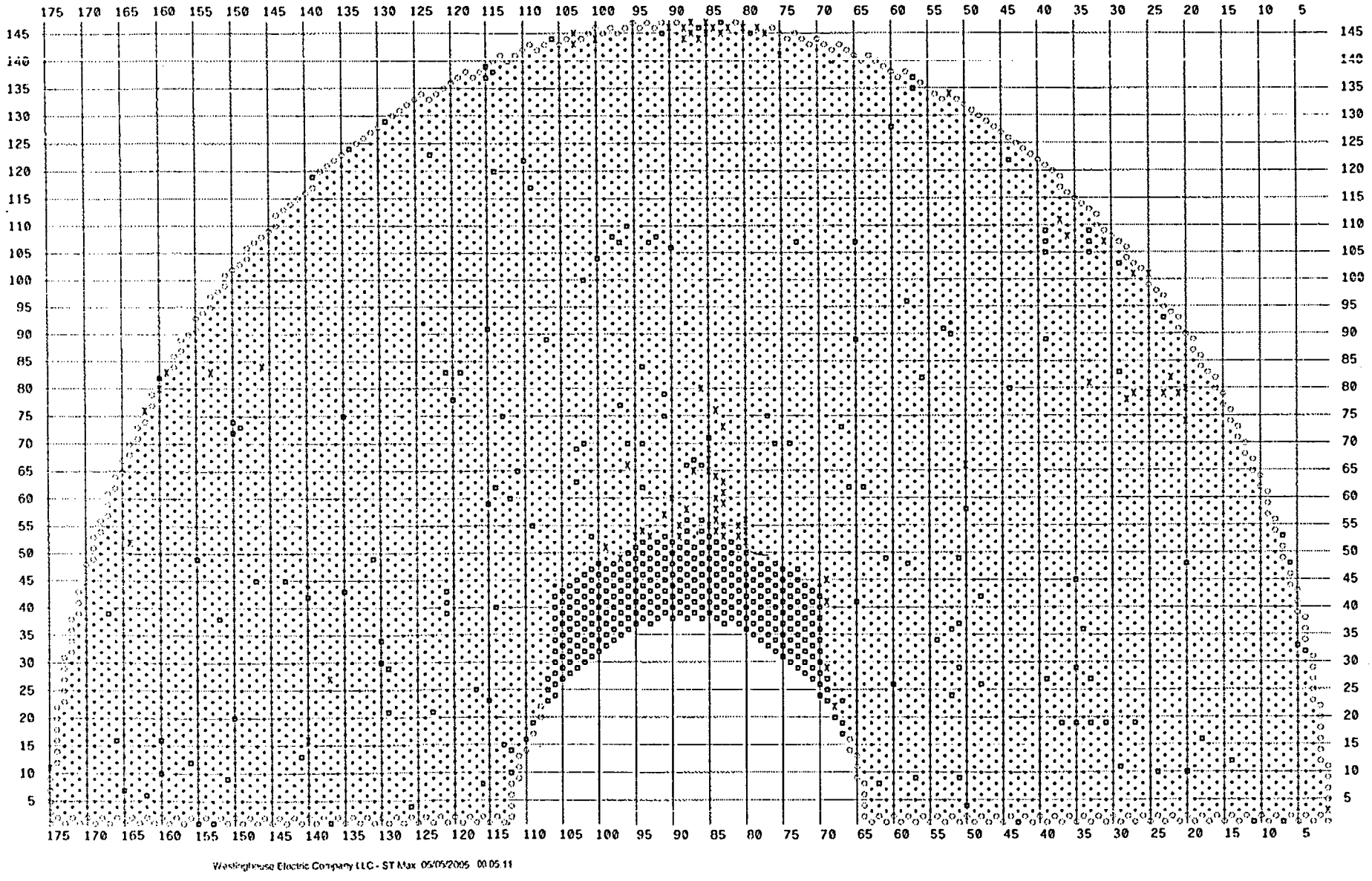
SG - 32

Waterford RFO13 WTR3 3410

X 82

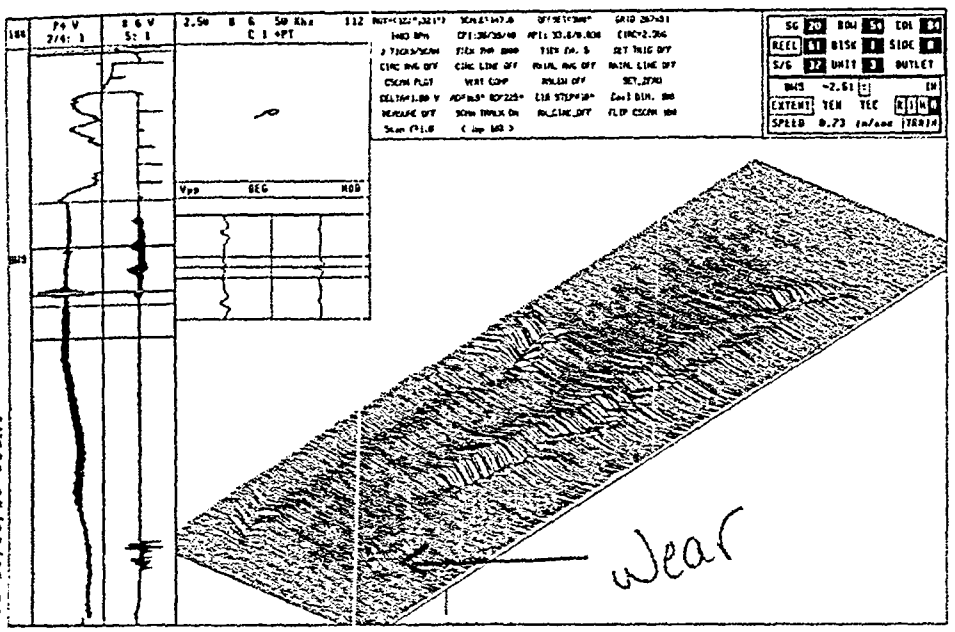
▫ 484 Plugged Tube

• 7 Stay Rod



Appears to be strap between Column 82 + 84

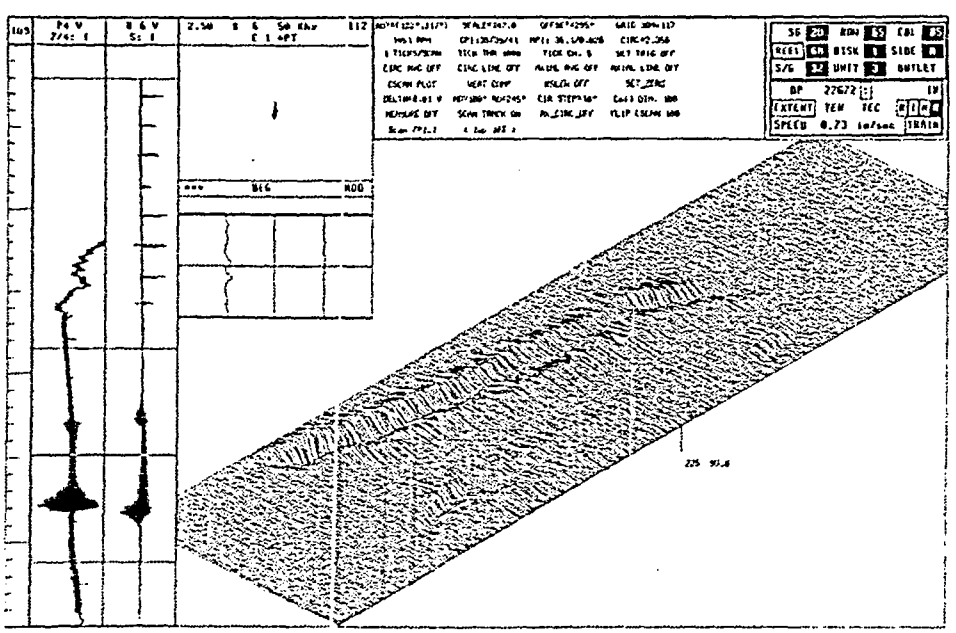
BW offset @ Wear



WTR 4/29/2005 OUTLET UNIT: 3 SG: 32 CAL: 61 RI

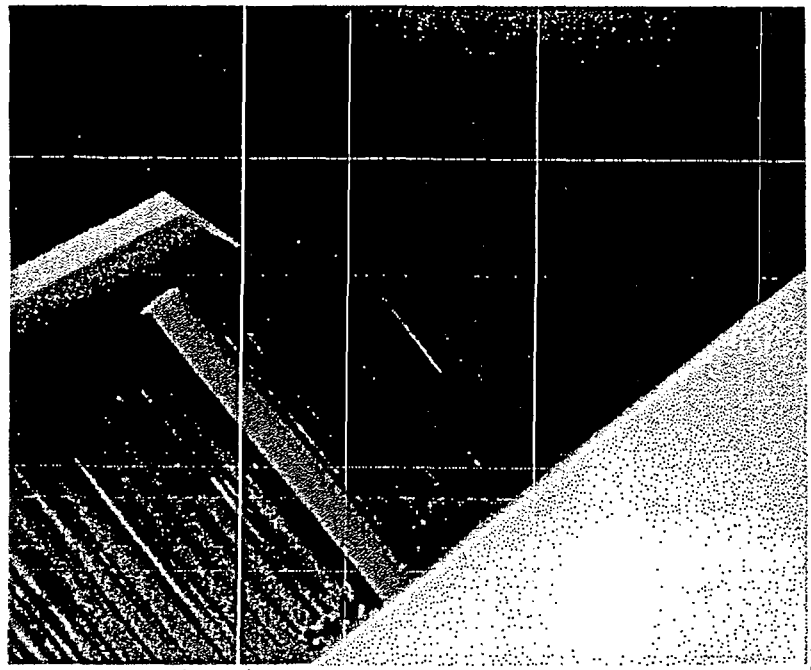
AN008 05/02/05 22:50

Non-offset BW

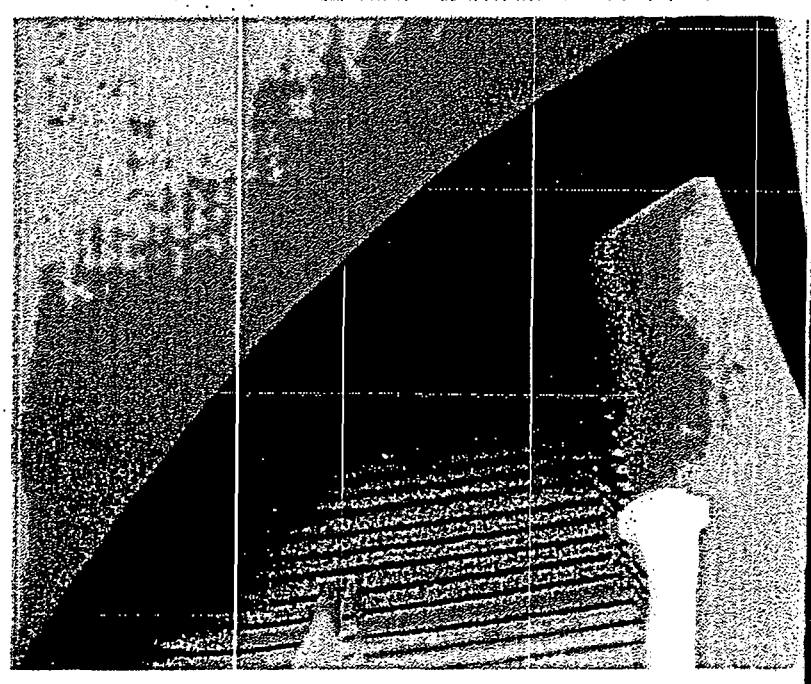


WTR 4/30/2005 OUTLET UNIT: 3 SG: 32 CAL: 68 RES

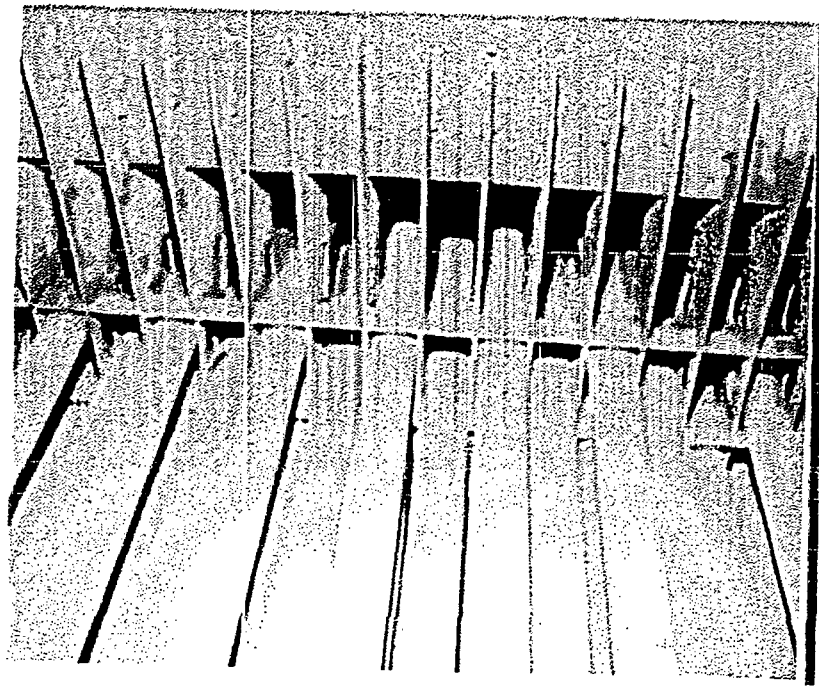
AN008 05/02/05 23:00:17



1-28 View of tube bundle and vertical supports.



1-29 View of tube bundle and vertical supports.



1-30 Closeup of vertical supports.

Questions for NRC on SG Inspection at Waterford 3

1. Why did you not inspect the cold leg tubesheet if you were C-3 in the previous inspection per section 3.4.1?

Based on section 3.4.1 in the EPRI examination guidelines, it is stated that "For temperature-sensitive degradation mechanisms (for example, primary water stress corrosion cracking [PWSCC], intergranular stress corrosion cracking), examinations may be limited to hot leg locations) that is expansion transitions, dings, dents, sleeves, until a C-3 result is encountered. The determination of the need to examine the cold leg fro temperature sensitive degradation mechanisms shall be based on the results of the degradation assessment and operational assessment. But as a minimum, after identifying a C-3 condition, a cold leg examination shall be performed at the next outage.

The classification of the generator in RF12 was based on the bobbin examination. The total number of defective tubes (by bobbin and RPC) was conservatively added together with the bulk being ODSCC at eggcrate supports. The bobbin program is conducted full length on 100% of the tubes thus providing detection technique for the cold leg.

Section 3.5 also addresses that the classification of the periodic sample shall be classified into one of the following categories by detection technique and location/region per SG examined. This implies that the C-3 category should be addressed by region such as the tubesheet.

During the RF12 examination, the following indications were identified:

	SG31	SG32
Axial ODSCC	7	2
Axial PWSCC	22	4
Circ ODSCC	10	0
Circ PWSCC	28	2
Total	67	8

To go C-3 in the tubesheet alone would require a total of 89 indications. A large portion of the tubesheet indications was an inspection transient due to inspecting further down into the tubesheet from -5 to -8 inches. Therefore, an inspection in the cold leg tubesheet is not currently required by the guidelines.

2. What were the number and locations of the cold leg eggcrate indications:

	SG31	SG32
RF12	**0**	**2**
RF13	**7**	**5**

Gen	Outage	Row	Col	Ind	Loc	Inch
32	RF12	16	18	SAI	03C	-0.87
32	RF12	9	51	SAI	05C	0.69
31	RF13	2	26	SAI	07C	-0.36
31	RF13	2	26	SAI	07C	-0.32
31	RF13	112	32	SAI	01C	-0.79
31	RF13	112	32	SAI	01C	0.35
31	RF13	112	32	SAI	01C	-0.52
31	RF13	112	32	SAI	01C	-0.30
31	RF13	112	32	SAI	01C	0.54
32	RF13	85	55	SAI	09C	-0.65
32	RF13	2	148	SAI	07C	-0.47
32	RF13	2	148	SAI	07C	-0.50
32	RF13	2	150	SAI	07C	0.35
32	RF13	2	150	SAI	07C	0.21

Waterford 3 RF013 WTR3 20050401 05/04/2005 02:57:48

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	I	CRLEN	CRWID	CEG	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM
85	55	.24	109	SAI		4	09C	-.65			.21	.33	50	09C	09C	.600	ZPS3C	58	C	
2	148	.09	108	SAI		2	07C	-.47			.49	.37	56	07C	07H	.560	ZPUN8	55	C	
2	148	.18	136	SAI		3	07C	-.50			.36	.19	29	07C	07C	.590	ZRSRG	72	C	
2	150	.21	93	SAI		2	07C	.35	.55		.20	.37	56	07C	07H	.560	ZPUN8	55	C	
2	150	.39	137	SAI		3	07C	.21			.39	.21	32	07C	07C	.590	ZRSRG	72	C	

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	I	CRLEN	CRWID	CEG	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM

Tubes: 3 Records: 5

Waterford 3 RFO13 WTR3 20050401 05/04/2005 02:57:48

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	I	CRLEN	CRWID	CEG	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM
2	26	.14	111	SAI		2	07C	-.36			.36	.41	63	07C	07H	.560	ZPUN8	60	C	
2	26	.28	126	SAI		3	07C	-.32			.30	.27	42	07C	07C	.590	ZRSRG	80	C	
112	32	.22	69	SAI		4	01C	-.79			.29	.55	84	01C	01C	.600	ZPS3C	68	C	LAR
112	32	.37	90	SAI		4	01C	.35			.21	.26	40	01C	01C	.600	ZPS3C	68	C	LAR
112	32	.47	132	SAI		3	01C	-.52			.16	.26	40	01C	01C	.590	ZRSRG	80	C	
112	32	.37	102	SAI		3	01C	-.30			.16	.24	37	01C	01C	.590	ZRSRG	80	C	
112	32	.48	95	SAI		3	01C	.54			.16	.25	39	01C	01C	.590	ZRSRG	80	C	

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	I	CRLEN	CRWID	CEG	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM

Tubes: 2 Records: 7

Waterford 3 RFO12 WTR3 20050401 05/04/2005 02:49:23

INSPDATE	ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	I	CRLEN	CRWID	CEG	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM
2003/10/01	16	18	.17	112	SAI		3	03C	-.87	-.69	0	.24		59	03C	03C	.600	ZRS3C	85	C	
2003/10/01	9	51	.19	112	SAI		3	05C	.69	.97	0	.45		64	05C	05C	.600	ZRS3C	85	C	

| INSPDATE | ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | I | CRLEN | CRWID | CEG | BEGT | ENDT | PDIA | PTYPE | CAL | L | COM |

Tubes: 2 Records: 2

INSPDATE	ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	I	CRLEN	CRWID	CEG	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM
INSPDATE	ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	I	CRLEN	CRWID	CEG	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM

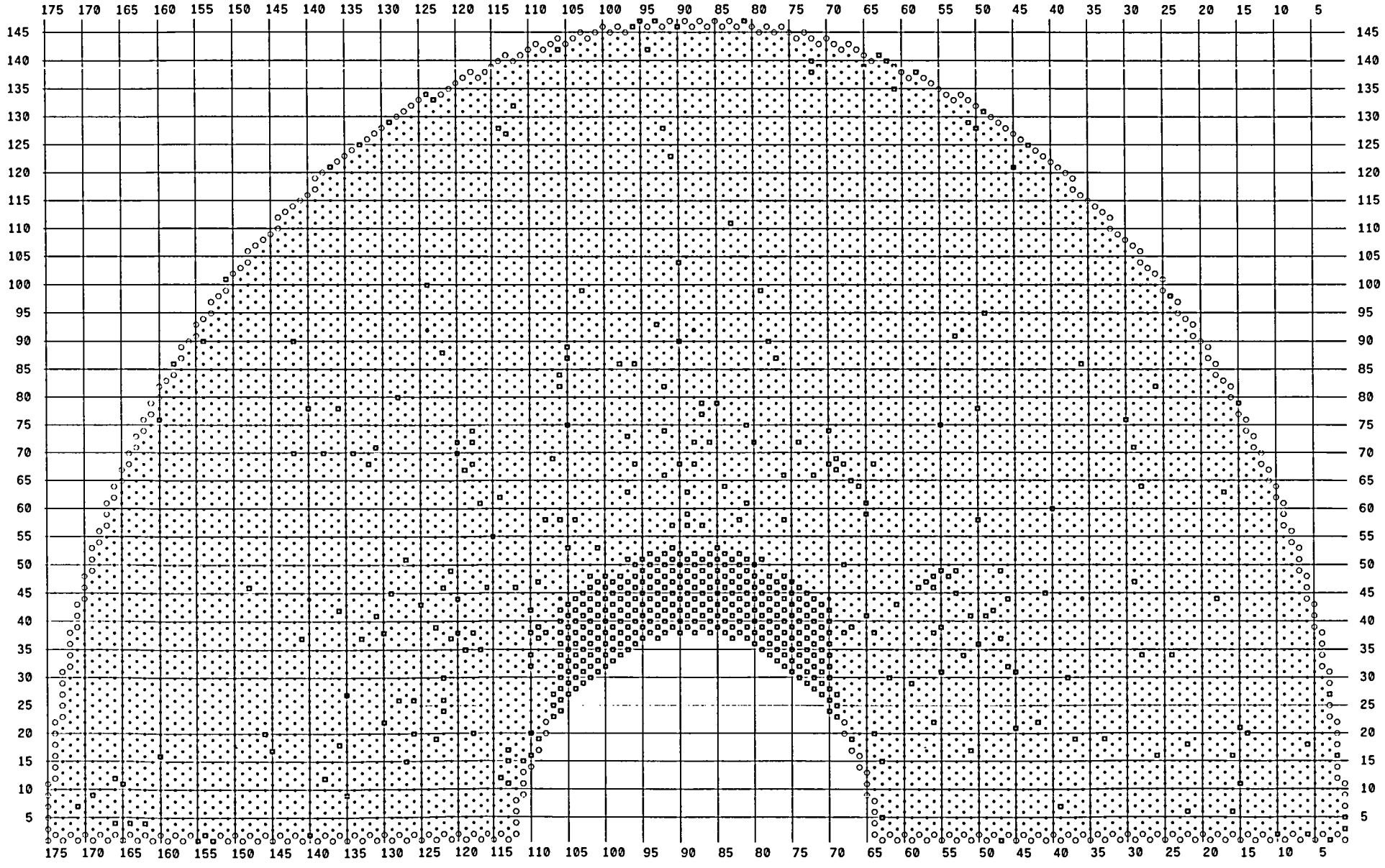
SG - 31 PLUGGED TUBE STATUS

PRIOR TO RFO 13

Waterford RFO13 WTR3 3410

* 7 STAY POSITION

▫ 571 PLUGGED TUBE



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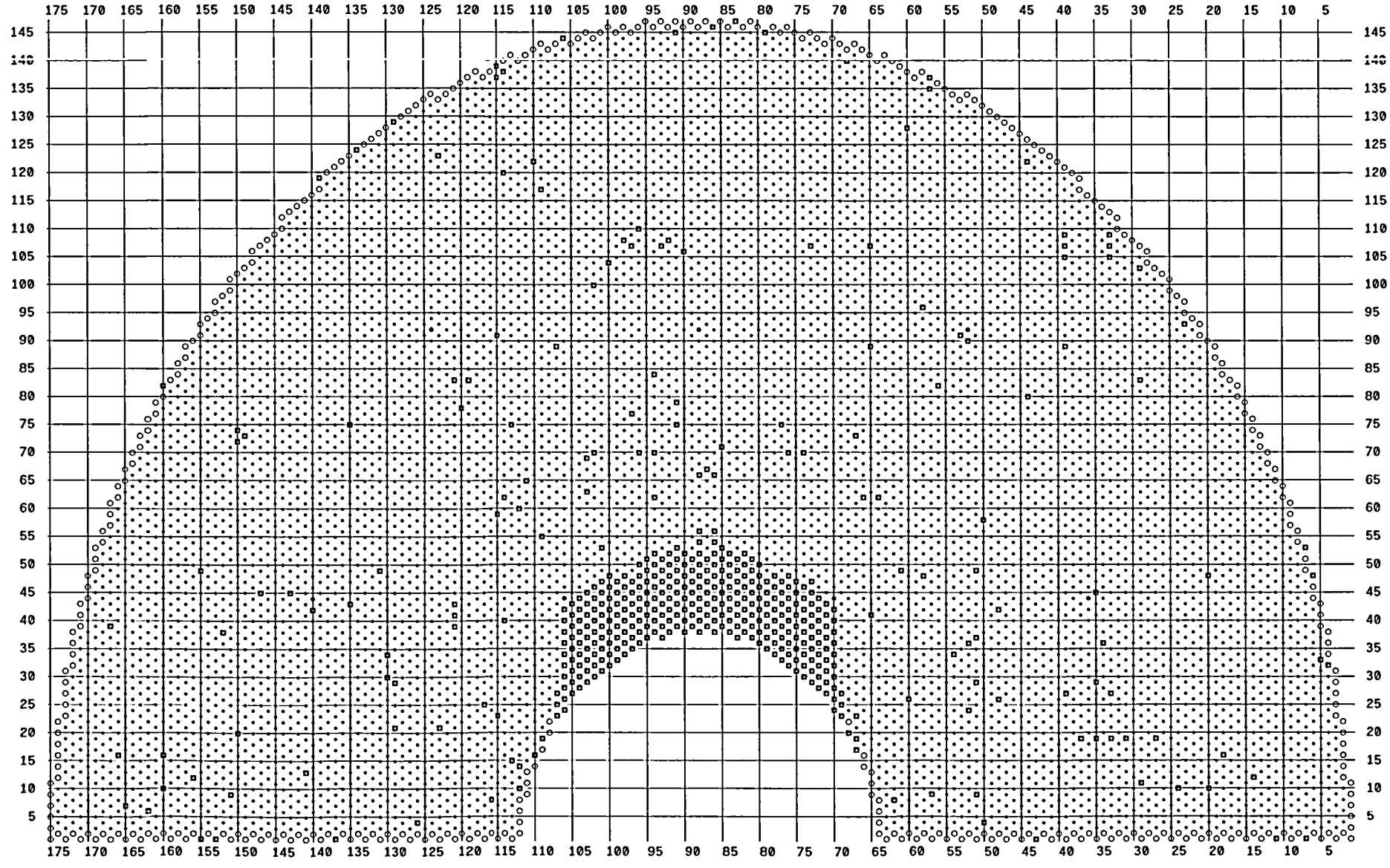
SG - 32 PLUGGED TUBE STATUS

PRIOR TO RFO 13

Waterford RFO13 WTR3 3410

* 7 STAY POSITION

▫ 484 PLUGGED TUBE



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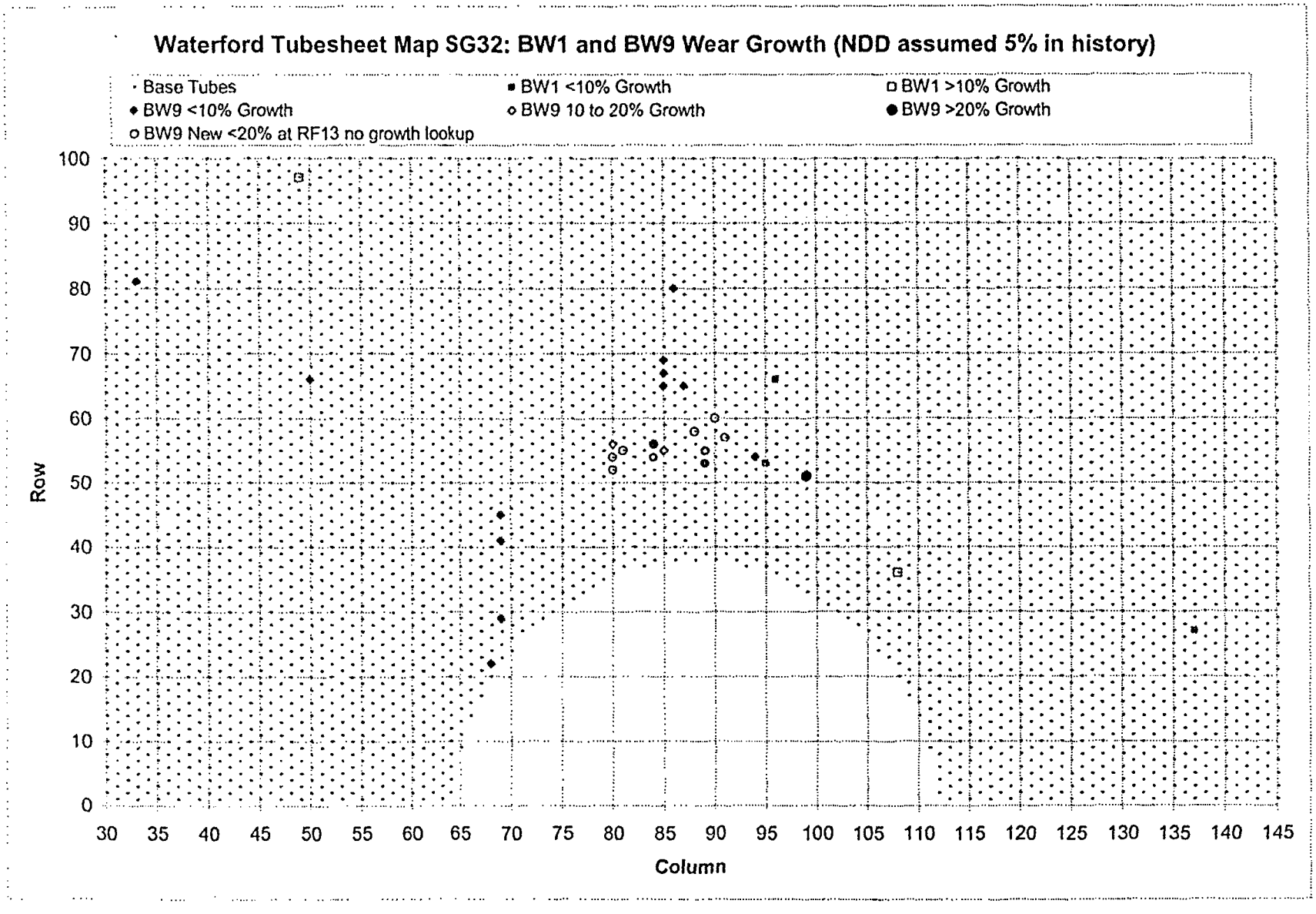
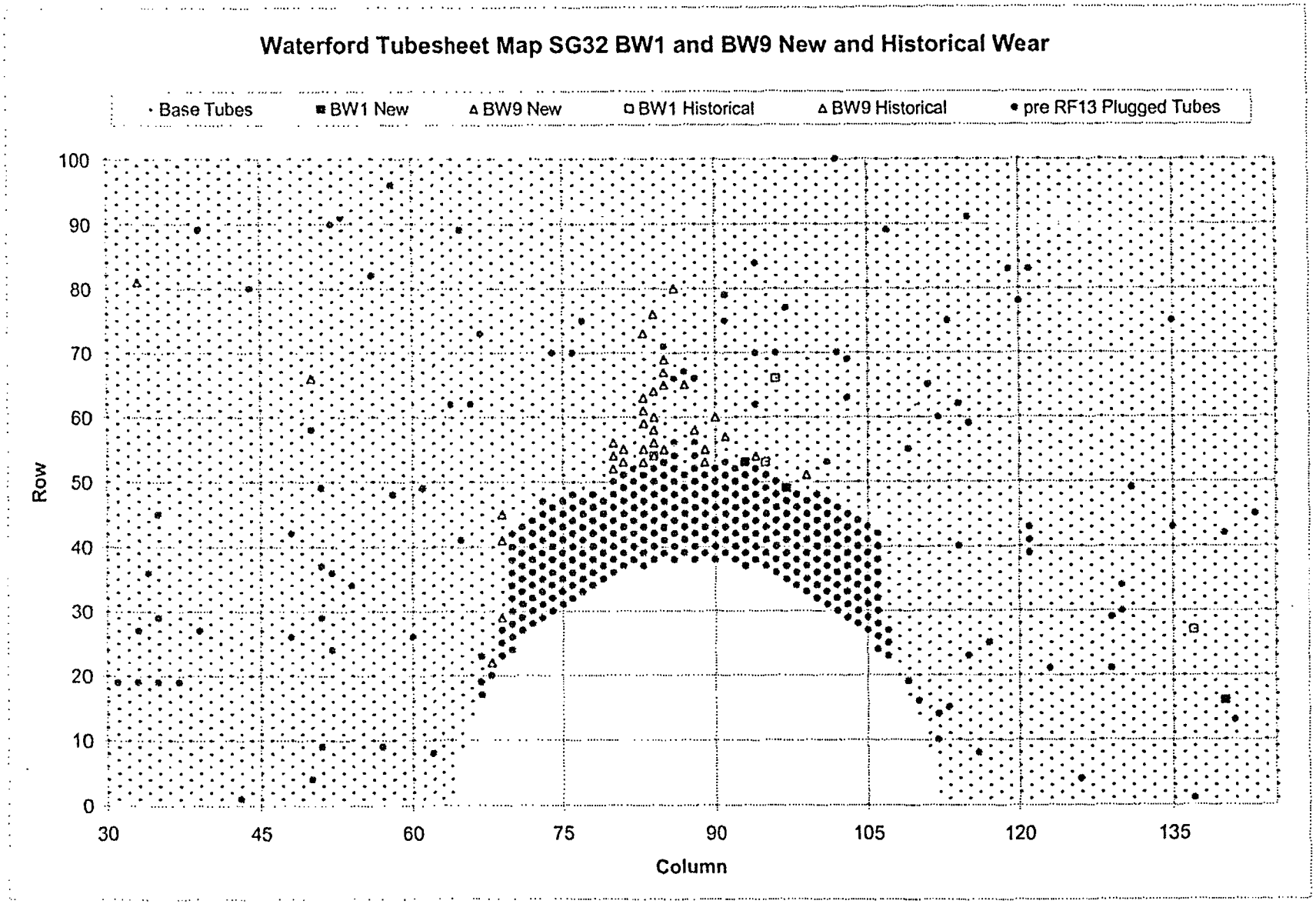

Waterford Tubesheet Map SG32: BW1 and BW9 Wear Growth (NDD assumed 5% in history)
Base Tubes
BW1 <10% Growth
BW1 >10% Growth
BW9 <10% Growth
BW9 10 to 20% Growth
BW9 >20% Growth
BW9 New <20% at RF13 no growth lookup
Row
Column
0
10
20
30
40
50
60
70
80
90
100
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145


Waterford Tubesheet Map SG32 BW1 and BW9 New and Historical Wear
Base Tubes
BW1 New
BW9 New
BW1 Historical
BW9 Historical
pre RF13 Plugged Tubes
Row
100
90
80
70
60
50
40
30
20
10
0
30
45
60
75
90
105
120
135
Column

SG - 31 COLD LEG TUBE REPAIR

RFO 13

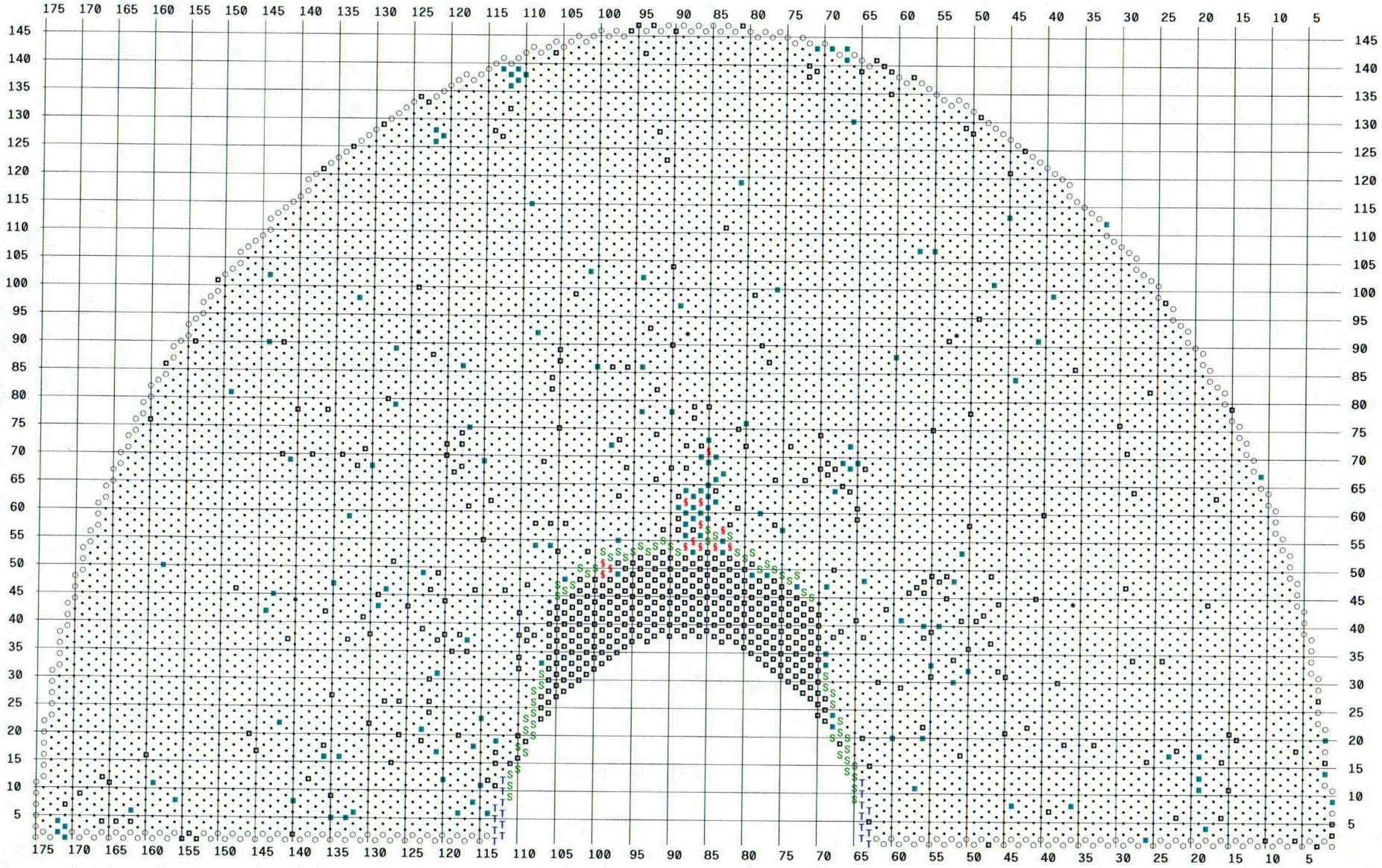
Waterford RFO13 WTR3 3410

■ 151 STD MECHANICAL PLUG ▫ 571 PLUGGED TUBE

§ 13 LONG STABILIZER STD MECHANICAL PLUG * 7 STAY POSITION

S 64 SENTINEL MECH PLUG

T 19 STABILIZER MIN 54" STD MECHANICAL PLUG



Westinghouse Electric Company LLC - ST Max 05/10/2005 12:54:43

C01

SG - 31 HOT LEG TUBE REPAIR

RFO 13

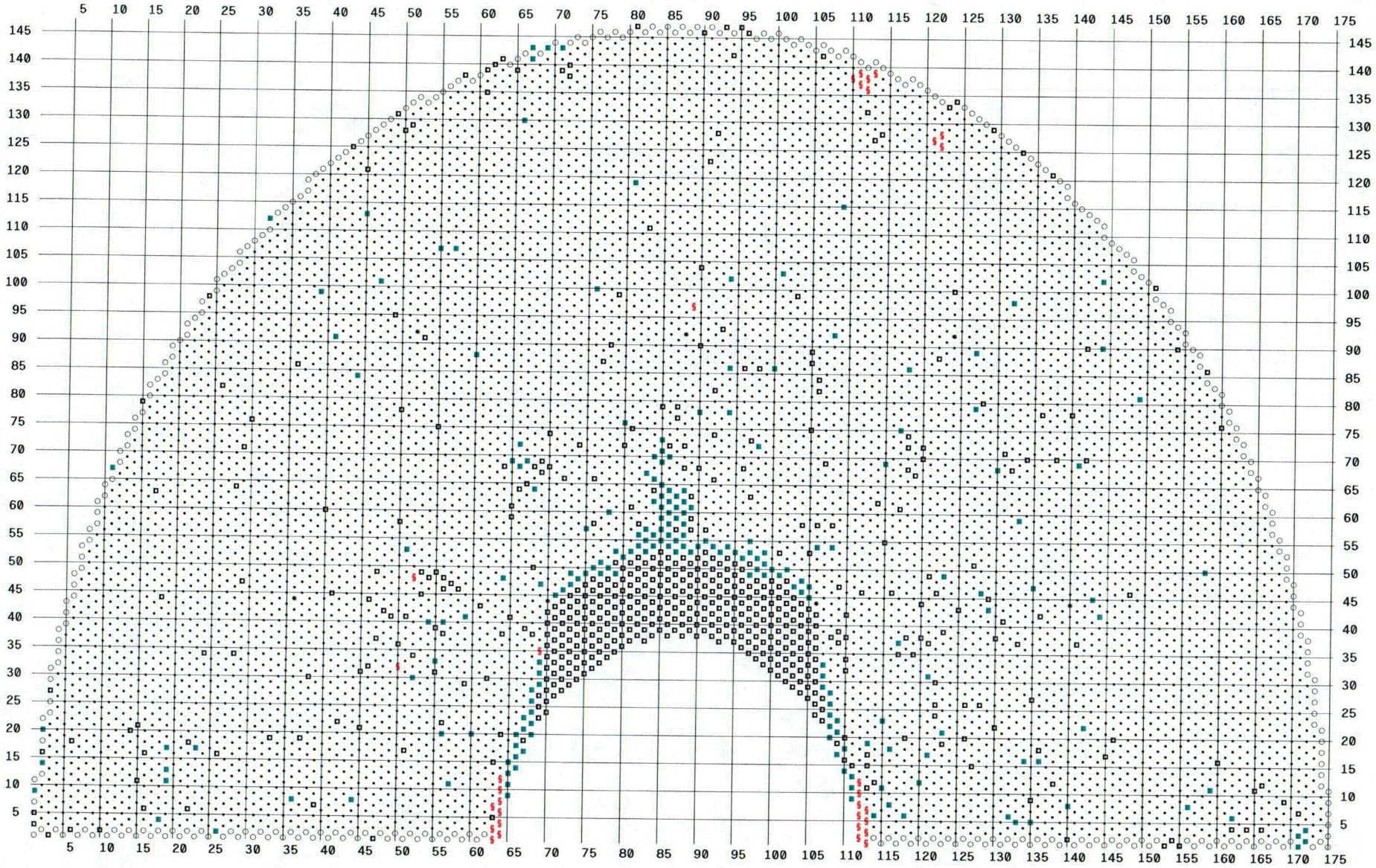
Waterford RFO13 WTR3 3410

■ 215 STD MECHANICAL PLUG

§ 32 STABILIZER MIN 54"
STD MECHANICAL PLUG

* 7 STAY POSITION

▫ 571 PLUGGED TUBE



Westinghouse Electric Company LLC - ST Max 05/10/2005 12:53:49

C02

SG - 32 COLD LEG TUBE REPAIR

RFO 13

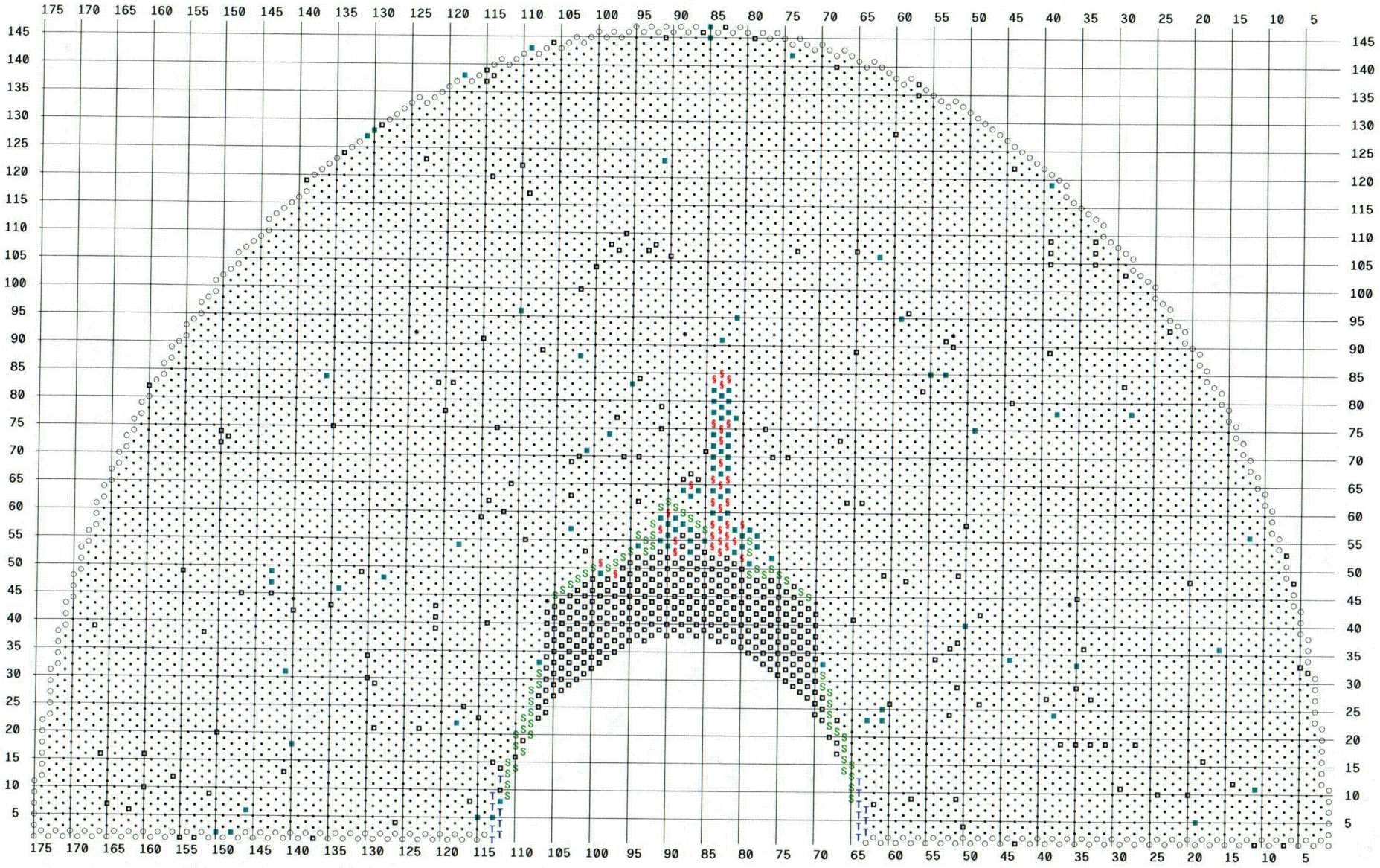
Waterford RFO13 WTR3 3410

■ 104 STD MECHANICAL PLUG ▫ 484 PLUGGED TUBE

T 17 STABILIZER MIN 54" * 7 STAY POSITION
STD MECHANICAL PLUG

§ 34 LONG STABILIZER
STD MECHANICAL PLUG

S 65 SENTINEL MECH PLUG



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C03

SG - 32 HOT LEG TUBE REPAIR

RFO 13

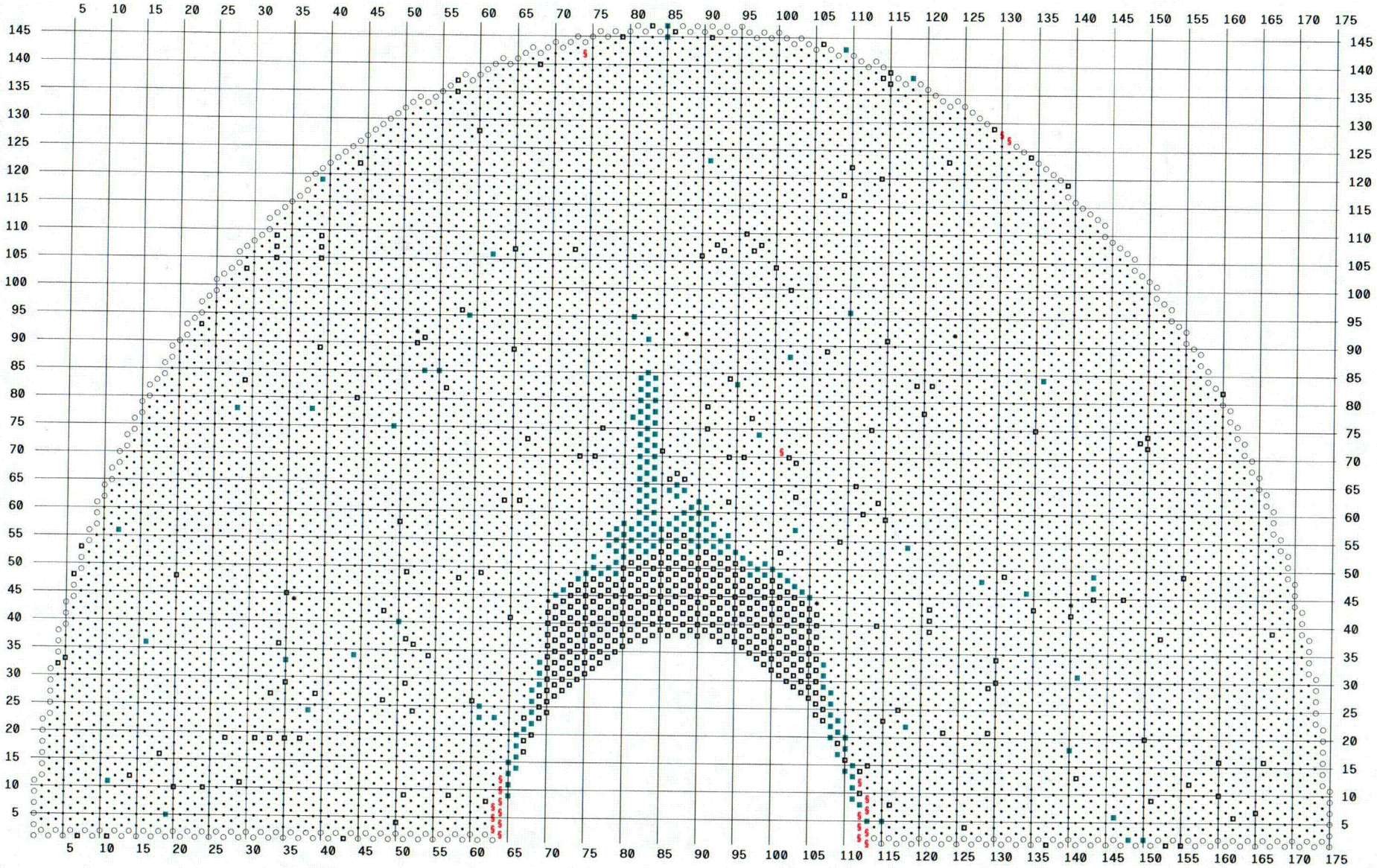
Waterford RFO13 WTR3 3410

■ 199 STD MECHANICAL PLUG

§ 21 STABILIZER MIN 54"
STD MECHANICAL PLUG

▫ 484 PLUGGED TUBE

* 7 STAY POSITION



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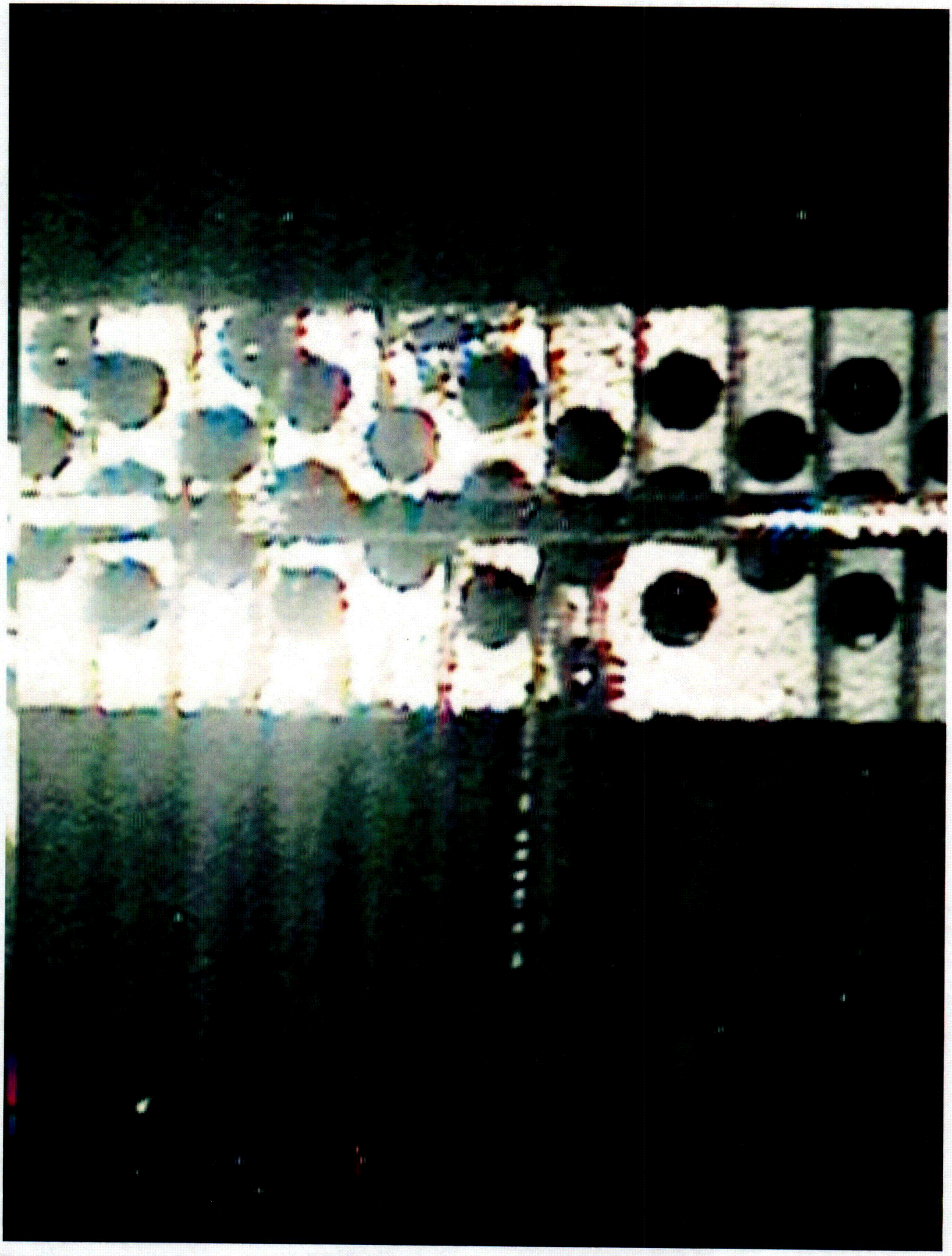
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