Consumers Power Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

June 26, 1978

Director, Nuclear Reactor Regulation
Att: Mr Dennis L Ziemann, Chief
Operating Reactors Branch No 2
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-255 - LICENSE DPR-20 -
PALISADES PLANT - STEAM GENERATOR
OPERATING HISTORY QUESTIONNAIRE

Consumers Power was requested by letters dated December 12, 1977 and February 10, 1978 to complete a "Steam Generator Operating History Questionnaire" for the Palisades Plant. Completion of the questionnaire was delayed until results of the most recent steam generator inspection could be compiled and reviewed.

It must be emphasized that the completed questionnaire (attached) does not supersede previously submitted steam generator inspection reports. All of the information provided in the questionnaire has been previously submitted but was reproduced where applicable. The effort required to complete the questionnaire was extensive (approximately 5 man-weeks) and represents an undue burden on Consumers Power in light of current Technical Specification reporting requirements.

David P. Hoffman

David P Hoffman
Assistant Nuclear Licensing Administrator

CC: JGKeppler, USNRC

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ENCLOSURE 1

STEAM GENERATOR OPERATING

HISTORY QUESTIONNAIRE

NOTE: All percentages should be reported to four significant figures.

I. BASIC PLANT INFORMATION

Plant: Palisades Nuclear Plant

Startup Date: December 31, 1971

Utility: Consumers Power Company

Plant Location: Route 1, Box 178, Covert, MI 49043

Thermal Power Level: 2530 MW_t

Nuclear Steam Supply System (NSSS) Supplier: Combustion Engineering, Inc

Number of Loops: 2

Steam Generator Supplier, Model No. and Type: CE, Unit 1 - S/N CE 66501, Vertical
Unit 2 - S/N CE 66502, "U" Tube

Number of Tubes Per Generator: 8519

Tube Size and Material: 3/4" O.D., 0.048" Wall, Inconel 600 Tubing

II. STEAM GENERATOR OPERATING CONDITIONS

Normal Operation

Secondary Temperature: 513.8°F

Secondary Flow Rate: 5.281×10^6 lb/hr (each loop)

Allowable Leakage Rate: 0.3gpm/24 consecutive hours

Primary Pressure: 2100 psia

Secondary Pressure: 770 psia

Accidents

Design Base LOCA Max. Delta-P: 1000 psia

Main Steam Line Break (MSLB) Max. Delta-P: 2500 psia

III. STEAM GENERATOR SUPPORT PLATE INFORMATION

Material: Carbon Steel, SA-36

Design Type: Full and partial plates with drilled tube and flow holes and flow cut-outs.

Design Code: 1965 edition of the ASME Code, Section III for Class A Vessels.

Dimensions: 3/4" Thick Plate, full and partial plates

Flow Rate: 5.281×10^6 lb/hr + for full support plate; some recirculation takes place on secondary side

Tube Hole Dimensions: .765" Diameter

Flow Hole Dimensions: .250" Diameter, 2 per Tube Hole

IV. STEAM GENERATOR BLOWDOWN INFORMATION (Secondary)

Frequency of Blowdown: Continuous during power operation

Normal Blowdown Rate: 10,000 lb/hr per steam generator

Blowdown Rate w/Condenser Leakage: 25,000 lb/hr per steam generator

Chemical Analysis Results

Assumes no condenser tube leakage

Results (Typical during normal operation)		Parameter Control Limits (For normal operation-administrative)	
pH	9	pH	8.5-9.2
Specific Cond.	3.6 μmho/cm	Specific Cond	7.0 μmho/cm
Na^+	< 2 ppb	Na^+	70 ppb
Silica	<1 ppm	Silica	1 ppm
Suspended Solids	<1 ppm	Suspended Solids	1 ppm

V. WATER CHEMISTRY INFORMATION

Secondary Water

Type of Treatment and Effective Full Power (EFP) Months of Operation:
AVT: Hydrazine for O_2, Morpholine for pH, 18 EFP Months (up to January, 1978)

Typical Chemistry or Impurity Limits: Normal-Administrative - pH: 8.5-9.2, specific conductivity: 7.0 μmho/cm, Na^+: 70 ppb, Silica: 1 ppm, Suspended Solids: 1 ppm

Feedwater

Typical Chemistry or Impurity Limits: Normal-Administrative: pH: 8.8-9.2, Cation conductivity: 0.5 μmho/cm, O_2: 10 ppb, Iron: 10 ppb, Copper: 10 ppb

Condenser Cooling Water

Typical Chemistry or Impurity Limits: Langelier's Limits - +1.0 to +1.5
pH - 7.8 to 8.5

Demineralizers - Type: Powdered resin condensate polishers

Cooling Tower (open cycle, closed cycle or none): closed cycle

VI. TURBINE STOP VALVE TESTING (applicable to Babcock & Wilcox (B&W) S.G. only)

NA - Palisades has CE steam generators

Frequency of Testing

Actual:

Manufacturer Recommendation:

Power Level At Which Testing Is Conducted

Actual:

Manufacturer Recommendation:

Testing Procedures (Stroke length, stroke rate, etc.)

Actual:

Manufacturer Recommendation:

VII. STEAM GENERATOR TUBE DEGRADATION HISTORY

The NRC has received previous submittals on all Palisades Steam Generator Inspections to-date; therefore, Part VII will only be completed for the 1978 Steam Generator Inspection results. The inspection dates and corresponding CPCo submittals are as follows:

Inspection Date	Primary Submittal Date	Reference Submittal Date
09/73	21/21/73	1/29/74
06/74	7/9/74	8/20/74
12/74	1/3/75	1/31/75, 2/6/75
02/75	3/10/75	3/25/75, 6/24/75
01/76	3/9/76	3/22/76
01/78	3/1/78	2/27/78, 3/3/78, 4/5/78

Inservice Inspection (ISI) Date: January, 1978

Number of EFP Days of Operation Since Last Inspection: 508 EFP days

Steam Generator Number: A

Percentage of Tubes Inspected At This ISI: hot leg 21.7%, cold leg 1.3%

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: 20.9%

Percentage of Tubes Plugged Prior to This ISI: 22.6%

Percentage of Tubes Plugged At This ISI: .11%

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: .03%

Percentage of Tubes Plugged As A Result of Exceedance of Degradation Limits: .08%

Sludge Layer Material Chemical Analysis Results: None (Flushing constituents showed sulfide ions)

Sludge Lancing (date): None

Ave. Height of Sludge Before Lancing: NA

Ave. Height of Sludge After Lancing: NA

Replacement. Retubing or Other Remedial Action Considered: (Briefly Specify Details) Sleeving performed in 1978 (13 sleeves).
Replacement steam generators are on order.

Support Plate Hourglassing: None known.

Support Plate Islanding: None known.

Tube Metalurgical Exam Results: Tube metalurgical exam results have shown intergranular attack but stress corrosion cracking has not been found. (Prior to 1978 Inspection)

Steam Generator Number: B

Percentage of Tubes Inspected At This ISI: hot leg 16.9%, cold leg 1.0%.

Percentage of Tubes Inspected At This ISI That Had Been Inspected At The Previous Scheduled ISI: 15.2%

Percentage of Tubes Plugged Prior To This ISI: 20.5%

Percentage of Tubes Plugged At This ISI: .08%

Percentage of Tubes Plugged That Did Not Exceed Degradation Limits: .03%

Percentage of Tubes Plugged As A Result of Exceedance ofDegradation Limits: .05%

Sludge Layer Material Chemical Analysis Results: None (Flushing constituents showed sulfide ions)

Sludge Lancing (date): None

Ave. Height of Sludge Before Lancing: NA

Ave. Height of Sludge After Lansing: NA

Replacement, Retubing or Other Remedial Action Considered: (Briefly specify Details) Sleeving performed in 1976 (14 sleeves) and 1978 (10 sleeves).
Replacement steam generators are on order.

Support Plate Hourglassing: None known.

Support Plate Islanding: None known.

Tube Metalurgical Exam Results: Tube metalurgical exam results have shown intergranular attack but stress corrosion cracking has not been found. (Prior to 1978 Inspection)

A HOT LEG

NA - Palisades has not observed any fretting or vibration.

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures

Wastage/Cavitation Erosion AS OF (4) January, 1978

A Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Table based solely on 1978 Data .....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion	12%				25%
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)	0%				.06%
% of Tubes Plugged That Did Not Exceed Degradation Limit	0%				.03%
Location Above Tube Sheet (3)	.1%				4.8%
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave)(Mills/Month)	.29				.29
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)	21				33

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

B HOT LEG

NA - Palisades has not observed any fretting or vibration.

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures

Wastage/Cavitation Erosion AS OF (4) January, 1978

B Hot Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Table based solely on 1978 Data .....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion	14%				17%
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)	0%				.05%
% of Tubes Plugged That Did not Exceed Degradation Limit	0%				.05%
Location Above Tube Sheet (3)	0%				.2%
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave)(Mills/Month)	.29				.29
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave)(Mills)	22				29

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

A COLD LEG

NA - Palisades has not observed any fretting or vibration.

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventive Measures

Wastage/Cavitation Erosion AS OF (4) January, 1978

A Cold Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Table based solely on 1978 Data ....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion	0%				1%
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)	0%				0%
% of Tubes Plugged That Did not Exceed Degradation Limit	0%				.09%
Location Above Tube Sheet (3)	0%				.1%
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave)(Mills/Month)	0				.29
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave)(Mills)	0				23

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

B COLD LEG

NA - Palisades has not observed any fretting or vibration

Fretting or Vibration in U-Bend Area (not applicable to B&W S.G.) AS OF (4)

Percentage of Tubes Plugged	Other Preventative Measures

Wastage/Cavitation Erosion AS OF (4) January, 1978

B Cold Leg: (Repeat this information for the cold leg on Combustion Engineering (C.E.) and Westinghouse (W) S.G.)

Table based solely on 1978 Data .....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Wastage/Cavitation Erosion	0%				0%
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)	0%				0%
% of Tubes Plugged That Did not Exceed Degradation Limit	0%				.09%
Location Above Tube Sheet (3)	0%				0%
Max. Wastage/Cavitation Erosion Rate for Any Single Tube (Tube Circum. Ave)(Mills/Month)	0				0
Max. Wastage/Cavitation Erosion in Any Single Unplugged Tube (Tube Circum. Ave)(Mills)	0				<9.6

Cracking AS OF (4)

Caustic Stress Corrosion Induced in C.E. and W S.G.

Flow Induced Vibration Caused in B&W S.G.

Cracking (Continued) NA - Cracking has not occurred at Palisades.

A&B Hot Legs: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Cracking					
% of Tubes Plugged Due to Cracking					
% of Tubes Plugged That Did Not Exceed Degradation Limit					
Location Above Tube Sheet (3)					
Rate of Leakage From Leaking Cracks (gpm)					

Denting (Not applicable to B&W S.G.) AS OF (4) January, 1978

A Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Table based solely on 1978 Data .....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Denting	12.4%				24.5%
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)	0%				.04%
% of Tubes Plugged That Did Not Exceed Degradation Limit	0%				0%
Rate of Leakage From Leaking Dents (gpm)	0				0
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)	.26				.29
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)	5.8				5.8

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be $\leq$5.8 mills. The operating period was 20 months.

Denting (Continued)

B Hot Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Table based solely on 1978 Data .....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Denting	11.9%				19.8%
% of Tubes Plugged Due to Exceedance of Allowable Limits (2)	0%				0%
% of Tubes Plugged That Did Not Exceed Degradation Limit	0%				0%
Rate of Leakage From Leaking Dents (gpm)	0				0
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)	.29				.29
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)	5.8				5.8

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be ≤5.8 mills. The operating period was 20 months.

Cracking NA - Cracking has not occurred at Palisades.

A&B Cold Legs: (Repeat this information for the cold leg on C.E. and W S.G.)

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Cracking					
% of Tubes Plugged Due to Cracking					
% of Tubes Plugged That Did Not Exceed Degradation Limit					
Location Above Tube Sheet (3)					
Rate of Leakage From Leaking Cracks (gpm)					

Denting (Not applicable to B&W S.G.) AS OF (4) January, 1978

A Cold Leg: (Repeat this information for the cold leg on C.E. and W S.T.)

Table based solely on 1978 Data ....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Denting	.1%				1.3%
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)	0%				0%
% of Tubes Plugged That Did Not Exceed Degradation Limit	0%				.04%
Rate of Leakage From Leaking Dents (gpm)	0				0
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)	.29				.29
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)	5.8				5.8

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be ≤ 5.8 mills. Th operating period was 20 months.

Denting (Continued)

B Cold Leg: (Repeat this information for the cold leg on C.E. and W S.G.)

Table based solely on 1978 Data ....

Area of Tube Bundle (1)	a	b	c	d	e
% of Tubes Affected by Denting	0%				.9%
% of Tubes Plugged Due to Exceedance of Allowable Limit (2)	0%				0%
% of Tubes Plugged That Did Not Exceed Degradation Limit	0%				0%
Rate of Leakage From Leaking Dents (gpm)	0				0
Max. Denting Rate for Any Single Tube (Tube Circum. Ave) (Mills/Month)	No common data points				.29
Max. Denting in Any Single Unplugged Tube (Tube Circum. Ave) (Mills)	5.8				5.8

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be $\leq$5.8 mills. The operating period was 20 months.

Denting (Continued)

A Hot Leg: Table based solely on 1978 Data ....

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1	.7				1.5	.3				.1
2	1.7				5.8	6.7				12.4
3	5.8				5.8	7.9				11.4
4	5.8				5.8	5.1				11.4
5	5.8				2.5	4.6				7.0
6	2.5				1.5	1.7				4.9
7	5.8				5.8	3.5				4.7
8	.5				0	.1				0
9	5.8				1.5	.2				.4
10	5.8				5.8	5.5				9.0
11	3.0				5.8	2.9				7.9
12	5.8				5.8	3.1				6.2
13	5.8				1.1	1.6				0
14	5.8				NA	.9				0

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be $\leq$5.8 mills.

Denting (Continued)

B Hot Leg: Table based solely on 1978 Data ....

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1	1.9				1.3	.8				.5
2	5.8				1.7	10.0				15.1
3	5.8				5.8	7.1				11.1
4	5.8				5.8	4.3				9.9
5	5.8				3.0	7.2				8.4
6	1.2				3.0	2.3				7.2
7	5.8				5.8	6.0				9.4
8	.8				.2	.3				.1
9	.9				1.2	.2				.3
10	5.8				1.3	4.9				8.0
11	5.8				5.8	3.9				6.1
12	1.5				5.8	4.7				4.9
13	5.8				.9	1.7				.1
14	2.2				NA	.3				0

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be $\leq$5.8 mills.

Denting (Continued)

A Cold Leg: Table based solely on 1978 Data ....

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1	0				0	0				0
2	5.8				5.8	.3				1.2
3	1.3				5.8	.1				.6
4	5.8				5.8	.1				.8
5	0				5.8	0				.2
6	0				1.7	0				.4
7	0				1.1	0				.1
8	0				0	0				0
9	0				1.3	0				.1
10	0				1.0	0				.2
11	.4				5.8	.1				.5
12	0				.9	0				0
13	0				0	0				0
14	0				NA	0				0

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be $\leq$5.8 mills.

Denting (Continued)

B Cold Leg: Table based solely on 1978 Data ....

Support Plate Levels	Max. Denting in Any Single Tube in Bundle Area (Tube Ave) (Mills) (1)					% of Tubes Affected By Denting in Bundle Area				
	a	b	c	d	e	a	b	c	d	e
1	0				.7	0				.1
2	.5				5.8	.1				.9
3	5.8				5.8	0				.5
4	5.8				5.8	0				.7
5	0				1.5	0				.2
6	0				1.5	0				.3
7	0				5.8	0				.1
8	0				0	0				0
9	0				.6	0				.1
10	0				1.4	0				.2
11	0				1.1	0				.2
12	0				5.8	0				.2
13	0				.5	0				0
14	0				NA	0				0

NOTE: The maximum dent sizes are based on saturated ECT readings which have been shown to be $\leq$5.8 mills.

TABLE KEY

NOTE: All percentages refer to the percent of the tubes within a given area of the tube bundle.

(1)

Area of the Tube Bundle	No. of Tubes Within the Area
a. Periphery of Bundle (wi/20 rows for B&W; wi/10 rows for CE and W)	2036
b. Patch Plate (wi/4 rows)	NA
c. Missing Tube Lane (B&W only) (wi/5 rows)	NA
c. Flow Slot Areas (CE and W only) (wi/10 rows)	The flow slot areas of the various support plates cover the entire tube bundle area; therefore, this area is the same as for a. and e. No significant effects have been seen associated with the flow slots. See attached diagram of the flow slot areas.
d. Wedge Regions (CE and W only) (wi/8 rows)	The wedge attachments for the 14 support plates cover the entire perifery of the steam generator; therefore, this area is the same as in a. Perifery of Bundle, above. See CPCo March 3, 1978 submittal to the NRC.
e. Interior of Bundle (remainder of tubes)	6483

(2)

Allowable Limit for Wastage/Cavitation Erosion: (based on % reduction of wall thickness) 64%, except multiples: 30%. NOTE: *Operating allowances applied to this limit.

Allowable Limit for Denting: Blockage of .540" ECT probe.

*See Table 4.14 of Tech Spec for Operating Allowance.

(3)

1. Specifies area between the tube sheet and the first support plate

   NOTE: All short radius U-bend tubes were plugged out to Row 11.

2. Specifies in the following locations: (list the additional locations)

   Wastage/Cavitation Erosion: Throughout steam generator

   Cracking: None

(4)

Specify the date of the inspection for which results have been tabulated:

January, 1978

VIII. SIGNIFICANT STEAM GENERATOR ABNORMAL OPERATIONAL EVENTS

DATE	SUMMARY
	(Include event description; unscheduled ISI results, if performed; and subsequent remedial actions) No abnormal events occurred in the last cycle. For previous abnormal events, see Annual Operating Reports.

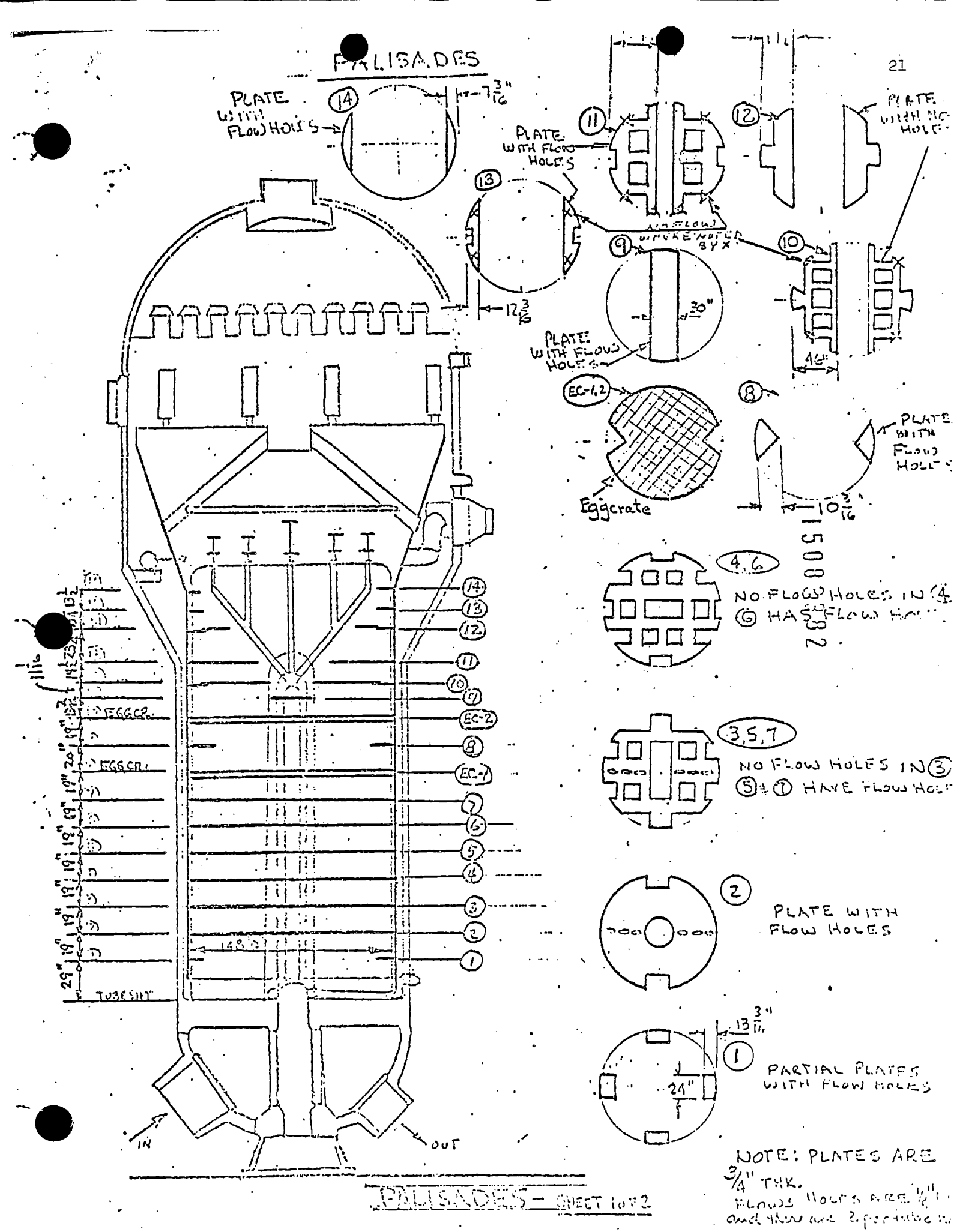
IX. CONDENSER INFORMATION

Condenser Material	Tube Leakage Date	Tube Leakage Rate (gpm)	Detectable Limit	Detection Method
For perifery and air removal: SS type 304 (18-8)	See Annual Operating Reports			Atomic Absorption Spectrophotometer with Graphite Furnace Accessory (After April, 1976)
For all other areas: 90 cu-10Ni (Previously Admiralty)	Latest Event 12-27-77	.15 gpm	.05 gpm	

X. RADIATION EXPOSURE HISTORY WITH RESPECT TO STEAM GENERATORS

Date	Exam Dosage (Man-Rem)	Repair Dosage (Man-Rem)	Comments
1976	35.8 Man-Rem	227.1 Man-Rem	Repair dosage includes all misc. dosage.
1978	44.3 Man-Rem	180.0 Man-Rem	Repair dosage includes all misc. dosage.

PALISADES



NOTE: PLATES ARE 3/4" THK.
FLOWS HOLES ARE 1/2" ... and flow are 2 per hole ...

PALISADES — SHEET 1 OF 2

XI. DEGRADATION HISTORY FOR EACH TYPE OF DEGRADATION EXPERIENCED FOR TEN REPRESENTATIVE, UNPLUGGED TUBES FOR WHICH TWO OR MORE ISI'S ARE AVAILABLE:

Steam Generator A - Wastage

Tube Identification				Indication (in % Wall Thickness Reduction)					
Quad	Line	Row	Level	09/73	06/74	12/74	02/75	01/76	01/78
1	26	61	4	<20	22		22		D < 20
			4+					< 20	
2	17	90	3	38	38	36	37	31	38
			2E	35	35	43	35	38	32
			10				<20	<20	<20
2	37	84	3	45	45		40		38
			3-					35	
2	75	48	4	<20	<20		36		D
			4-					35	
3	2	101	4	<20	<20		<20	23	
3	4	117	3	<20	<20			<20	<20
			12	42	42		36	37	41
			HL					20	< 20
3	11	110	3	<20	< 20		< 20		< 20
			3-					< 20	
			12	<20	<20		<20	D	D
			HL	34	34		30	41	43
3	15	80	3	37	37		33		30
			3-					35	
3	21	94	3	<20	35		<20	34	<20
4	48	31	TS		< 20			< 20	20
			4		34		30		33
			4-					27	

NOTE: D designates a dent for which readings are considered unreliable.

XI. (Continued)

Steam Generator A - Denting

Tube Identification			Inspection	Dent Magnitude (Mils - radial 360° Denting)
Quad	Line	Row	Date	Steam Generator Level/Mils
1	16	75	01/76	2/.0, 3/.0, 10/.9, 11/.9
			01/78	2/.8, 3/.8, 10/.6, 11/.9
2	2	113	01/76	4/.7, 5/1.3, 6/.4, 7/.7, 10/.0, 11/.4, 12/.4
			01/78	4/1.7, 5/.7, 6/.0, 7/.0, 10/.9, 11/.9, 12/3.0
2	11	128	01/76	3/.8
			01/78	3/1.2
2	19	98	01/76	2/.7, 3/.0, 5/.4, 12/1.5
			01/78	2/.0, 3/.4, 5/.0, 12/1.2
2	65	26	01/76	2/1.3, 4/.0, 6/.7, 10/.8
			01/78	2/1.2, 4/.8, 6/.4, 10/.0
3	15	62	01/76	2/.4, 4/.8, 6/.5
			01/78	2/.7, 4/1.9, 6/.7
3	20	51	01/76	2/.4, 3/2.2, 5/.4, 7/.7, 10/1.2, 11/.7
			01/78	2/xxx, 3/2.5, 5/.0, 7/.8, 10/1.1, 11/.7
3	44	85	01/76	2/.5, 5/.9, 7/.4, 11/1.2
			01/78	2/.4, 5/.4, 7/.0, 11/.5
3	63	50	01/76	2/1.1, 4/.9, 6/1.2, 11/1.9
			01/78	2/.4, 4/1.2, 6/.7, 11/2.2
4	47	50	01/76	2/1.1, 4/.0, 11/1.3
			01/78	2/.7, 4/.4, 11/.5

NOTE: xxx signifies a saturated dent magnitude reading. Saturated dent readings have been shown to be ≤5.8 mils.

XI. (Continued)

Steam Generator B - Wastage

Tube Identification				Indications (in % Wall Thickness Reduction)				
Quad	Line	Row	Level	08/73	06/74	02/75	01/76	01/78
2	2	115	3	25	26	32		<20
			3-				30	
			10		30	36	44	40
			11	30		<20	28	
2	5	82	3	<20	<20	<20		29
			3-				30	
2	6	109	3			<20	D	<20
			10	40	38	38	45	43
			12			<20	<20	<20
2	10	75	3	35	35	38		D52
			3					R37
			3-				D30	
2	47	32	4	<20	<20	29		31
			4-				32	
3	9	74	3	<20	<20	38	D	R33
3	13	106	3	<20	<20	31		22
			3-				25	
			12	25	25	25	31	32
			HL			<20	28	30
3	40	57	4					D
			11	40	40	33	48	53
3	54	87	3	<20	<20	32		29
			3-				31	
3	74	61	11+2			29	40	38

NOTE: D designates a dent for which readings are considered unreliable.
R designates a rotational ECT reading.

XI. (Continued)

Steam Generator B - Denting

Tube Identification			Inspection	Dent Magnitude (Mils - radial 360° Denting)
Quad	Line	Row	Date	Steam Generator Level/Mils
1	12	113	01/76	2/.0, 3/.0, 10/.0
			01/78	2/.5, 3/1.5, 10/.6
2	7	122	01/76	1/.5, 5/.7, 7/.9, 12/1.2, 13/.4
			01/78	1/1.3, 5/.0, 7/.0, 12/.8, 13/.0
2	16	53	01/76	2/.5, 3/1.2, 4/.0, 5/.0, 6/1.7, 7/.0, 11/.5
			01/78	2/.4, 3/1.3, 4/.3, 5/.9, 6/1.1, 7/.7, 11/.4
2	24	89	01/76	2/1.1, 3/2.7, 5/.0, 7/1.3, 10/.5, 12/.5
			01/78	2/1.8, 3/1.5, 5/.4, 7/.7, 10/.5, 12/.4
2	69	42	01/76	2/.2, 4/1.2, 6/.8, 10/.7
			01/78	2/.4, 4/1.9, 6/.5, 10/.2
3	1	74	01/76	2/.4, 3/.4, 4/1.2, 5/.0, 6/.0, 11/.0
			01/78	2/.2, 3/.5, 4/1.9, 5/.2, 6/.4, 11/.2
3	25	86	01/76	2/.0, 3/1.1, 5/.8, 7/.9, 12/.9
			01/78	2/.2, 3/1.1, 5/.5, 7/.5, 12/.0
3	51	14	01/76	2/.5, 3/.5, 5/.4, 7/.5, 9/.8
			01/78	2/.5, 3/xxx, 5/.2, 7/.4, 9/.8
3	72	31	01/76	2/.5, 4/.5, 6/.0, 10/.0
			01/78	2/.5, 4/1.7, 6/.4, 10/.4
4	20	105	01/76	2/.0, 3/.0
			01/78	2/.2, 3/xxx

NOTE: xxx signifies a saturated dent magnitude reading. Saturated dent readings have been shown to be ≤5.8 mils.

XI. (Continued)

Inspection Dates Versus EFP Months Table

Inspection Date	EFP Months Between Inspection Dates
09/73	
	0 EFP - mon.
06/74	
	.2 EFP - mon.
12/74	
	0 EFP - mon.
02/75	
	5.4 EFP - mon.
01/76	
	16.7 EFP - mon.
01/78	

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Docket 50-255

June 21, 1978

All Power Reactor Licensees

Gentlemen:

SUBJECT: REVISIONS TO INTRUSION DETECTION SYSTEMS AND ENTRY CONTROL HANDBOOKS AND NUCLEAR SAFEGUARDS TECHNOLOGY HANDBOOK

Enclosed is a copy of the Nuclear Safeguards Technology Handbook which was prepared under contract for the Department of Energy (DOE). The purpose of this handbook is to convey an understanding of the current SS safeguards technology development program and its prospective relevance and use to U.S. industrial and utility organizations, as well as to other U.S. government agencies and international organizations.

Also enclosed are updates to the "Entry-Control Systems Handbook" and the "Intrusion Detection Systems Handbook" that were sent to you earlier.

Sincerely,

James R. Miller, Assistant Director
for Reactor Safeguards
Division of Operating Reactors

Enclosures:
As stated

cc w/o enclosures:
Service List