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POWER BUILDING
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WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
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October 25, 1979

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Robert L. Baer, Chief
Light Water Reactors Branch No. 2

Subject: McGuire Nuclear Station
Secondary Water Chemistry Monitoring and Control

Dear Mr. Denton:

Attached is a description of the McGuire Nuclear Station program to monitor and control the secondary water chemistry. This information is provided in response to Mr. Robert L. Baer's letter of August 24, 1979. The control of secondary water chemistry in accordance with this program will provide adequate assurance of steam generator tube integrity.

Due to the continuing evolution of chemistry control technology the procedures and administrative controls described in this program are subject to modification. Any modifications will be designed in accordance with the operating experience of McGuire Nuclear Station as well as new developments in technology. The program's objective of inhibiting steam generator corrosion and tube degradation will not change.

Very truly yours,

William O. Parker, Jr.

William O. Parker, Jr. By THH

THH:scs
Attachment

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McGuire Nuclear Station
Secondary Water Chemistry
Monitoring and Control Program

Critical secondary water chemistry parameters are monitored and controlled to inhibit steam generator corrosion and tube degradation. The schedule for sampling secondary water chemistry during normal operation is presented in Table 1. Table 2 specifies the acceptance criteria for these critical parameters. The sample type and the process sampling points are identified in Table 3. Continuous samples are routed to the Conventional Sampling Laboratory where they are aligned with inline analytical instrumentation. Each sample source is routed to a complement of instruments required to analyze the sample. Both these samples and other periodic local samples are analyzed according to the appropriate procedure listed in Table 4.

Recording and management of secondary water chemistry data is accomplished through the use of the Secondary Chemistry Daily Data Sheet (Table 5) and the Secondary Chemistry Data Legal Log (Table 6). Analysis data from both local and continuous samples are recorded on these two forms. The daily data sheet is routed to the Station Chemist each day for his review and use in preparing a daily chemistry report. This report is evaluated by both the System Chemist and the Unit Co-ordinator. Further details of the procedures governing the recording and management of this data are contained in the McGuire Chemistry Manual.

The appropriate corrective actions for various out-of-specification chemistry parameters are listed in Table 7. The Staion Chemist is responsible for the review of data and the implementation of corrective action. This corrective action is coordinated with either the shift supervisor or the operations duty engineer. Any difficulties in implementing the necessary corrective actions are resolved procedurally through the station management channels described in Chapter 13 of the McGuire Final Safety Analysis Report.

Table 1

SECONDARY CHEMISTRY SAMPLING SCHEDULE
NORMAL OPERATION

SAMPLE	pH	COND μmhos	C COND μmhos	O_2 ppb	Na ppb	N_2H_4 ppb	Cl ppb	F ppb	MILL SUS SOLID	SiO_3 ppb	TOTAL Fe ppb	Cu ppb	NH_3 ppb	GROSS β μc/cc	GROSS γ μc/cc	OTHER
Steam Generator B.D. (A - D)	C		C		C		D	D	D	C	2/W	5/W	W	DT	DT	(a-c)
Main Steam (A - D)	C	C	C		C											
Hotwell Pump Disch	C	C	C*	C	C	C				C	2/W	5/W				(c)
Polish Demin Effluent			C		C				D	D	2/W	5/W		W**	W**	
Feedwater	C	C	C	C	C	C	D	D	D	C	2/W	5/W	3/W	D	D	(d)
C Heater Drains	3/W	3/W	W		W							W				
G Heater Drains	3/W	3/W	W		W							W				
Condensate Storage Tank	W	W								W						
Moisture Separators (1A1 - 1C2)	D				W		W					D				
Condenser Hotwell (1A1 - 1C2)					W		D			W						

KEY: C = Continuous Monitor
D = Daily
3/W = 3 Times Weekly
W = Weekly
T = Technical Specifications
* = Continuously Sampled as Polish Demineralizer Influent
** = Conducted on Resins removed from Spent Cells

Other: (a) W - Tritium
(b) W - Iodine 131-T
(c) W - Lead
(d) W - Lead

Table 2

SECONDARY CHEMISTRY SPECIFICATIONS
NORMAL OPERATION

SAMPLE	pH	COND μmhos	C COND μmhos	O_2 ppb	Na ppb	N_2H_4 ppb	Cl ppb	F ppb	MILL SUS SOLID	SiO_2 ppb	Fe ppb	Cu ppb	NH_3 ppb	GROSS β μc/cc	GROSS γ μc/cc	OTHER
Steam Generator B.D. (A - D)	8.5-9.0		< 2.0		< 100		< 150	< 150	< 1000	< 1000	< 1000	< 100	< 250	< MDA	< MDA	a & b
Main Steam (A - D)	8.8-9.2		< 0.5		< 3											
Hotwell Pump Disch	8.8-9.2	1 - 12	< 2.0	< 5	< 5					< 20	< 10	< 5				b & c
Polish Demin Effluent			< 0.5		< 5				< 10	< 20	< 10	< 5		< MDA	< MDA*	
Feedwater	8.8-9.2		< 0.5	< 5	< 3	5 - 25	< 150	< 150	< 10	< 20	< 10	< 5	100-1000	< MDA	<	& c
C Heater Drains	8.0-9.2		< 0.5	< 5	< 3							< 5				
G Heater Drains	8.8-9.2		< 0.5	< 5	< 3							< 5				
Condensate Storage Tank	6.0-9.2	5 - 12								< 20						
Moisture Separators (1A1 - 1C2)	8.8-9.2			< 5	< 30							< 5				
Condenser Hotwell (1A1 - 1C2)																
Polish Demin. Cell Effluent			< 0.5							< 20						
Main Steam Crossover	8.8-9.2	- 12	< 0.5		< 3											

* - Conducted on Resins removed from Spent Cells

(a) Tritium
(b) Iodine 131 - Technical Specification ≤ 0.10 μCi/cc Dose Equivalent I-131
(c) Lead

Table 3

SECONDARY CHEMISTRY
SAMPLE, TYPE AND LOCATION

SYSTEM	SAMPLE	TYPE	LOCATION
BB	S/G B.D. - A	Continuous	CT Lab S/G Sample A Tap (760', Room 321-C)
BB	S/G B.D. - B	Continuous	CT Lab S/G Sample B Tap (760', Room 321-C)
BB	S/G B.D. - C	Continuous	CT Lab S/G Sample C Tap (760', Room 321-C)
BB	S/G B.D. - D	Continuous	CT Lab S/G Sample D Tap (760', Room 321-C)
SM	Main Steam A	Routine	CT Lab MS Sample A Tap (760', Room 321-C)
SM	Main Steam B	Routine	CT Lab MS Sample B Tap (760', Room 321-C)
SM	Main Steam C	Routine	CT Lab MS Sample B Tap (760', Room 321-C)
SM	Main Steam D	Routine	CT Lab MS Sample B Tap (760', Room 321-C)
CM	Pol. Demin. Eff.	Continuous	CT Lab Pol Demin Eff Sample Tap (760', Rm 321-C)
CF	Final Feedwater	Continuous	CT Lab Final FW Sample Tap (760', Room 321-C)
CM	HPHD	Continuous	CT Lab HPHD Sample Tap (760', Room 321-C)
CM	LPHD	Continuous	CT Lab LPHD Sample Tap (760', Room 321-C)
CS	Condensate Stg. Tank	Routine	Local Sample taken at CST (739'+1")
CM	Hotwell Pump Discharge	Continuous	CT Lab Hotwell Sample Tap (760', Room 321-C)
MS	Moisture Separators	Routine	Sample Taps from MS Drain Tanks
YM	YM Storage Tank	Routine	CT Lab YM Sample Tap (760', Room 321-C)
CM	Polisher Influent	Continuous	CT Lab Polisher Panel (760', Room 321-C)
CM	Polisher "A" Effluent	Continuous	CT Lab Polisher Panel (760', Room 321-C)
CM	Polisher "B" Effluent	Continuous	CT Lab Polisher Panel (760', Room 321-C)
CM	Polisher "C" Effluent	Continuous	CT Lab Polisher Panel (760', Room 321-C)
CM	Polisher "D" Effluent	Continuous	CT Lab Polisher Panel (760', Room 321-C)
MS	Moisture Separator Drain Tanks	Routine	Turbine Bldg. (760'+4")
CB	Auxiliary Electric Boilers	Routine	Auxiliary Boiler Room (760')

Table 4

Secondary Chemistry Control Procedure Titles

1. Determination of Specific Conductance and Cation Conductivity of Secondary Systems Using Continuous Flow Analyzers
2. Determination of Hydrazine in Feedwater
3. Determination of Oxygen in High Purity Water
4. Determination of pH of Condensate Using Continuous Flow Analyzers
5. Determination of Silica in Condensate
6. Determination of Sodium in Condensate and S/G Blowdown Continuous Flow
7. Determination of pH of Condensate, Alternate Method
8. Determination of pH of Aqueous Solutions as Performed in the Conventional Sampling Lab
9. Determination of Conductivity of Aqueous Solutions as Performed in the Conventional Sampling Lab, Manual Method
10. Determination of Suspended Solids in High Purity Water as Performed in the Conventional Sampling Lab
11. Determination of Dissolved Oxygen in High Purity Water as Performed in the Conventional Sampling Lab
12. Determination of Hydrazine as Performed in the Conventional Sampling Lab
13. Determination of Ammonia in High Purity Wax
14. Determination of Free Caustic in Steam Generator Blowdown Samples

Table 5

SECONDARY CHEMISTRY DAILY DATA SHEET

Page ___ of ___

UNIT # _____

DATE _____

UNIT STATUS _____

BY _____

SAMPLE	TECH	TIME	pH	SPEC. COND. µmhos	CAT. COND. µmhos	O_2 ppb	Na ppb	N_2H_4 ppb	Cl ppb	F ppb	SUS. SOLIDS ppb/Fe	SiO_2 ppb	TOTAL Fe ppb	Cu ppb	NH_3 ppb	GROSS β µc/cc	GROSS γ µc/cc	Al ppb	Pb ppb	TURB FTU	FREE CAUSTIC ppb	OTHER
STEAM GENERATOR B.D. A																						
STEAM GENERATOR B.D. B																						
STEAM GENERATOR B.D. C																						
STEAM GENERATOR B.D. D																						
MAIN STEAM A																						
MAIN STEAM B																						
MAIN STEAM C																						
MAIN STEAM D																						
HOTWELL DISCHARGE																						
POLISH DEMIN EFFLUENT																						
FEEDWATER																						
H.P.H.D.																						
L.P.H.D.																						
COND STORAGE TANK																						
P.D. CELL EFF A																						
P.D. CELL EFF B																						
P.D. CELL EFF C																						
P.D. CELL EFF D																						

Table 5 (Continued)

SECONDARY CHEMISTRY DAILY DATA SHEET

UNIT # ______

UNIT STATUS ______

Page ___ of ___

DATE ______

BY ______

SAMPLE	TECH	TIME	pH	SPEC. COND. µmhos	CAT. COND. µmhos	O_2 ppb	Na ppb	N_2H_4 ppb	Cl ppb	F ppb	SUS. SOLIDS ppb/Fe	SiO_2 ppb	TOTAL Fe ppb	Cu ppb	NH_3 ppb	GROSS β µc/cc	GROSS γ µc/cc	Al ppb	Pb ppb	TURB FTU	FREE CAUSTIC ppb	OTHER
MOISTURE DRAIN TANK 1A1																						
MOISTURE DRAIN TANK 1A2																						
MOISTURE DRAIN TANK 1B1																						
MOISTURE DRAIN TANK 1C1																						
MOISTURE DRAIN TANK 1C2																						
MAIN STEAM CROSSOVER																						

Table 6

SECONDARY CHEMISTRY DATA- LEGAL LOG

SAMPLE NO	SAMPLE	LINE NO	TECH	DATE	TIME	pH	SPEC. COND. μmhos	CAL. COND. μmhos	O_2 ppb	Na ppb	NH_3 ppb	Cl ppb	
		1											
		2											
		3											
		4											
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	LINE NO.	F ppb	Sol. SiO_2 μg/kg	BiO_3 ppb	TOTAL Fe ppb	Cu ppb	MO_3 ppb	CARBON A mg/kg	CARBON B mg/kg	Al ppb	Pb ppb	TURB. FTU	TOT. CAUSTIC ppm	
	1													
	2													
	3													
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Table 7

Corre.. Actions for Out of Specification Conditions in Secondary Systems:

Sample Point	Parameter Out of Specification	Corrective Action
Steam Generator S/G Blowdown (A-D)	All Parameters (except pH low)	Increase S/G blowdown, determine that all Feedwater parameters are in specification.
	pH (low)	Determine Feedwater pH and add ammonia (Conventional Chemical Addition (YA)-Steam Generator) as necessary. Verify correct hydrazine feed.
Feedwater	pH (low)	Add ammonia (YA-Condensate). Verify correct hydrazine feed.
	pH (high)	Terminate ammonia feed to Condensate System. Alter Condensate Polisher (C/P) precoat with hydrogen form overlay. Verify correct hydrazine feed.
	Cation Conductivity (Acid Conductivity) Cl^-, F^-, Silica (SiO_2)	Determine C/P conductivity differential. Adjust resin ratio for anion removal as requested. Identify source using other sample points as necessary.
	O_2	Determine adequate hydrazine residual. Contact Control Room and check vacuum. Identify source if possible using other sample points and analytical techniques.
	Copper (Cu^{++})	Sample stator coolers and hydrogen coolers locally at isolated drains, etc. Monitor pH and O_2 in Hotwell Pump Discharge.
	Sodium (Na^+)	Determine C/P differential. Adjust precoat as necessary. Identify source using other sample points and analytical techniques.
	Hydrazine	Chemical addition or termination (YA-Condensate).
	Suspended Solids	Determine ability of C/P to remove solids. Adjust precoats with resin overlays as necessary. See Oxygen above.

Sample Point	Parameter Out of Specification	Corrective Action
Feedwater (cont'd)	Iron (Fe^{++})	Assure pH is maintained at high end of specification. Adjust C/P resin ratios as necessary.
	Gross β & γ, Iodine-131	Determine leakrate, optimize use of C/P, evaluate radwaste capacity, and determine source.
G & C Heater Drains	pH, Cation Conductivity, O_2, SiO_2, Na^+, Cu^{++}	Maintain feedwater specifications, determine source using additional sample points and various analytical techniques, request that drains be routed to condenser.
C/P Effluent	Cation Conductivity, Suspended Solids, Na^+, Cl^-	Determine cell differential, remove cell from service and precoat or overlay as necessary. Operating Procedure for C/P defines properties of various precoat resin ratios and criteria for use.
Hotwell Pump Discharge	pH	Initiate or terminate chemical addition as necessary.
	O_2	Check with Control Room to determine vacuum. Request that Hotwell pumps be cycled. Check for condenser inleakage. Adjust hydrazine feed as necessary. Sample condenser water boxes and request isolation as necessary.
	Na^+, Cl^-, SiO_2	Sample water boxes for condenser inleakage and request isolation as necessary. Note C/P differentials and precoat or overlay resins as necessary.
	Fe^{++}	Determine that Hotwell oxygen and pH are in specification. Analyze makup water and Upper Surge Tank for iron.
	Gross β & γ, Iodine-131	Determine leakrate, optimize use of C/P, evaluate Radwaste capacity, and determine source.
Condensate Storage Tank	pH, SiO_2, Specific Conductance	Request increase in flow rate through tank. Drain Tank.

Sample Point	Parameter Out of Specification	Corrective Action
Moisture Separator	pH	Determine Main Steam and Feedwater pH. Adjust Chemistry as necessary by initiation or termination of chemical feed. Request that drains be routed to the condenser.
	Na^{+}	Increase blowdown on S/G's, determine C/P differential.
	Cu^{++}	Determine pH, sample the various drain tanks for localization of high Cu^{++} concentration and high pH.
Main Steam	pH	Initiate or terminate chemical addition as required.
	Na^{+}	Determine Feedwater and blowdown sodium. Increase blowdown. Determine C/P differential for sodium and adjust precoats or resin overlays as necessary.