Docket No. 50-244

Dr. Robert C. Mecredy
Vice President, Nuclear Production
Rochester Gas & Electric Corporation
89 East Avenue
Rochester, New York 14649

Dear Dr. Mecredy:

SUBJECT: PREVENTION OF BORIC ACID CORROSION AT GINNA NUCLEAR POWER PLANT (TAC NO. 68921)

The purpose of this letter is to advise you that our audit of your boric acid corrosion prevention program is acceptable.

On October 10-12, 1989, the NRC staff and our consultant visited the Ginna Nuclear Power Plant to audit the program to prevent boric acid-related corrosion. The audit team included K. Paczewski (NRC) and C. Czatkowski (consultant, Brookhaven National Laboratory). Boric acid corrosion prevention requirements were described in Generic Letter 88-05 which was issued on March 17, 1988, and requested the implementation of such a program by all licensees of operating PWRs and holders of construction permits for PWRs. In your letter dated May 31, 1988, you provided a description of, and a commitment to, a boric acid leakage monitoring and a corrosion prevention program for Ginna.

A copy of the trip report covering the results of the audit which was prepared by our consultant is enclosed. The staff has reviewed this report and agrees with its findings and the conclusion. On this basis and the observations made during the audit, we conclude that you are adequately implementing a program for monitoring small primary coolant leakage through carbon steel components caused by boric acid corrosion as described in your submittal of May 31, 1988. The trip report is submitted to you for information purposes.

Your requirement in responding to Generic Letter 88-05 was acknowledged and closed out by NRC letter dated January 30, 1990.

Sincerely,

Allen Johnson, Project Manager
Project Directorate I-3
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Enclosure:
Trip Report

cc w/enclosure: See next page

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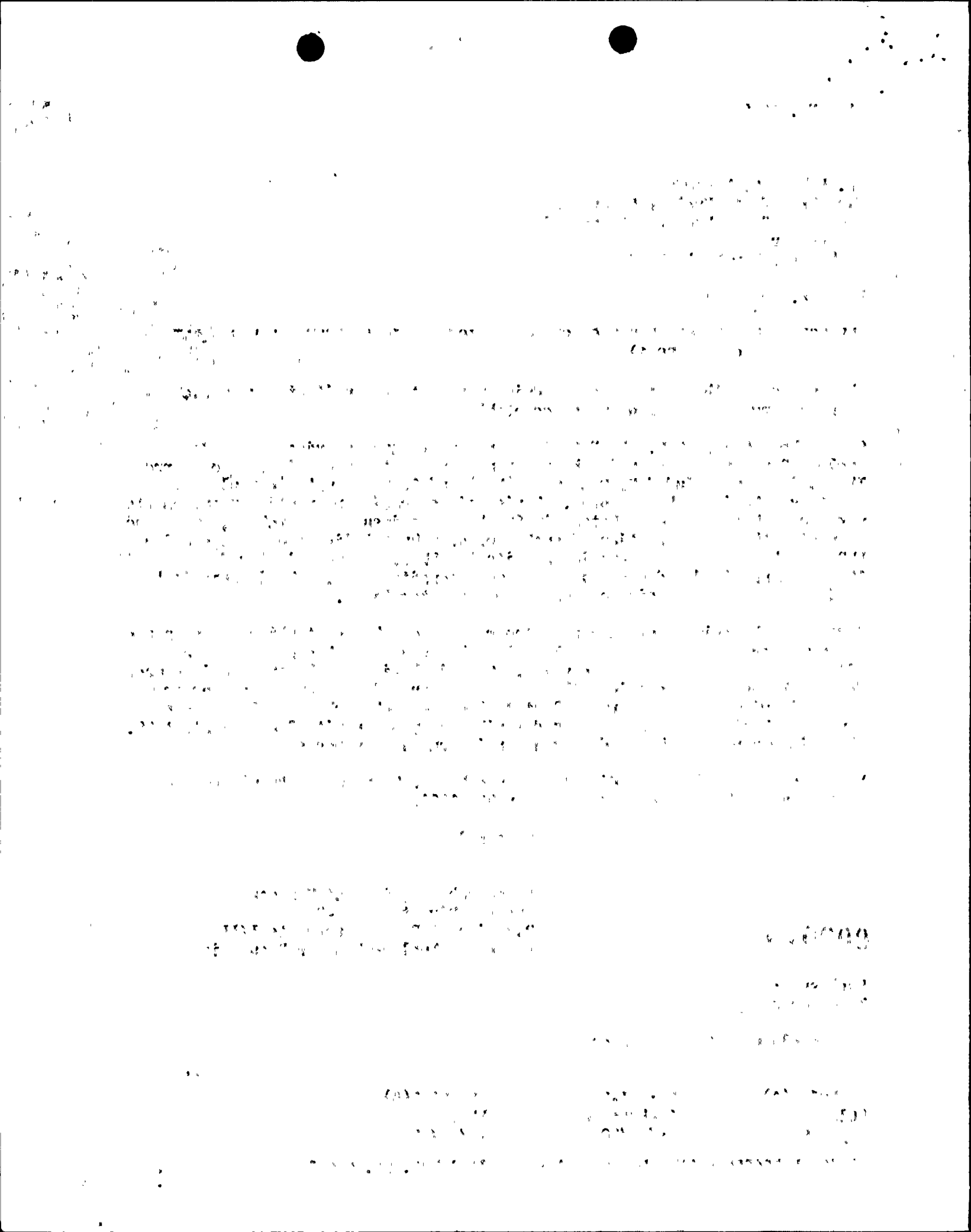

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BORIC ACID PREVENTION

TRIP REPORT

FIN A-3871 TASK ASSIGNMENT NO. 4

A. Introduction

On October 10-12, 1989, a USNRC audit team visited the R.E. Ginna Nuclear Plant. The team was comprised of Messrs. K. Parczewski of the USNRC and Mr. C. Czajkowski of Brookhaven National Laboratory (BNL).

The purpose of the plant visit was to audit the licensee's implemented program for prevention of carbon steel corrosion by boric acid in the reactor pressure boundary of the plant.

The verification of the program implementation took the form of a audit of the Unit's written procedures, interviews with plant staff personnel and verifying that the techniques used by the utility were proper and performed by adequately trained/certified personnel.

The guidelines for the audit fell into four broad areas of concern which should encompass the utility's elicited responses to NRC Generic Letter 88-05.

B. Determination of the principal locations where leaks of primary coolant below the specification limits could cause degradation of the reactor pressure boundary components.

The utility wrote procedure A-1407, "Program to Prevent Degradation of Reactor Coolant Pressure Boundary," Rev. 1, 5/31/89 to comply with the requirements of Generic Letter 88-05. Part of the intended purpose of the procedure was:

> "1.2 To establish a program of systematic measures to ensure that boric acid corrosion does not lead to degradation of the reactor coolant pressure boundary; to provide assurances that the boundary will have an extremely low probability of abnormal leakage, rapidly propagating failure, or gross rupture."

This procedure has incorporated a list of principal locations where borated water leakage can cause degradation. Attachment 1 is a list of these locations.

This appears to comply to Generic Letter 88-05.

C. Procedures for locating small coolant leaks:

Procedure A-1407, Rev. 1, requires in part:

"3.5.2 Any leak from the reactor coolant system (RCS) shall be investigated...

...In addition, any leaks from other systems containing boric acid shall have their leak-path determined. If any position of the leak-path contacted carbon steel components of the RCS pressure boundary; the leak shall be investigated..."

The utility also uses procedure S-12.2, "Operator Action in the Event of Indication of Significant Increase in Leakage," Rev. 24, 9/27/89, which describes the appropriate steps for the operator to take in the event of significant leakage detection.

This procedure requires the submission of a Ginna Station Maintenance Work Request Trouble Report which identifies leakage and requires a thorough evaluation to identify leakage sources.

The utility also utilizes Procedures S-12.4, "RCS Leakage Surveillance Record Instructions," Rev. 23, 6/13/89, which provides instructions for use of the utility's Reactor Coolant System Leakage Surveillance Record. This provides a step by step procedure for maintaining the record whenever the RCS temperature is at or above 350°F.

A VT-2 visual examination for leakage is also required to be performed by qualified personnel during hydrostatic testing prior to heat up of the RCS above 350°F by paragraph 2.3 of Procedure PT-7, "Hydrotest of Reactor Coolant System," Rev. 38, 6/5/89.

VT-2 (all level 2) qualifications were verified for the following personnel; G. Blais, W. Gallowany, K. Kemp, P. Lewis, T. Snell. No discrepancies were noted.

These procedures meet the intent of the Generic Letter.

D. Procedures for evaluating boric acid induced corrosion of carbon steel components in the reactor pressure boundary.

The utility makes use of its Materials/NDE personnel in evaluating boric acid corrosion. This is accomplished through the use of Procedure NDE-100-12, "Visual Examination for Leakage," which has specific requirements for evaluation of boric acid leakage/corrosion:

"8.3.1 General Examination for leakage, corrosion and boric acid residue in noninsulated components.

8.3.1.1 The visual examination VT-2 shall be conducted by examining the accessible external exposed surfaces of pressure retaining components for evidence of leakage, corrosion on boric acid residue."

The procedure additionally states:

"9.4.2 On systems that are borated, the examiner shall record boric acid crystal build-up as well as the color of the crystals that have built up, and the overall dimensions of the crystal build-up, i.e., "X" times "Y."

9.4.3 Exact location of leakage/boric acid residue/corrosion should be described by referencing proximity to welds, valves, pipe supports or other components. If the component is insulated, the insulation should be removed to determine the source of the leakage.

9.4.4 For corrosion, the depth and area shall be identified."

Additionally, Procedure A-140 requires:

"3.5 The following actions shall be taken to establish the impact of the reactor coolant pressure boundary in the event of leakage of borated water near these boundaries.

3.5.1 Leaks affecting any carbon steel components of the reactor coolant pressure boundary shall be subject to these requirements.

3.5.2 Any leak from the reactor coolant system (RCS) shall be investigated utilizing Reference 2.2 or 2.3 or 2.4. In addition, any leaks from other systems containing boric acid shall have their leak-path determined. If any portion of the leak-path contacted carbon steel components of the RCS pressure boundary; the leak shall be investigated as described below.

3.5.3 Ginna Station plant personnel are responsible for investigating the leak source and leak-path.

3.5.4 Once the leakage source and leak-path have been identified, plant personnel shall determine if any carbon steel components may have been in contact with boric acid.

3.5.5 If boric acid has been in contact with carbon steel components, the extent of contact shall be documented on a Maintenance Work Request (Trouble Card) (Reference 2.6), before removal of any boric acid crystal build-up.

3.5.6 The disposition of the Trouble Card will ensure that the carbon steel components affected shall be inspected by assigned personnel, and evaluated for any evidence of possible component degradation.

3.5.7 If any degradation is noted, a Nonconformance Report (NCR) shall be initiated in accordance with Reference 2.5, and Materials Engineering shall determine the extent of degradation and forward this information to Mechanical Engineering.

3.5.8 Mechanical Engineering shall review the results of the Materials Engineering inspections and perform an evaluation of the consequences of the degradation, and provide disposition of the NCR."

Additionally, the package (RF-64, "Cycle XVIII-XIX Refueling Procedure") for the 1989 outage contained a precaution that the Reactor Engineer was to be informed of any boric acid crystals found prior to the removal of the deposits. This precaution also referenced RGE procedure A-1407.

During the site audit, there were no nonconformance reports available for review by the audit team. Therefore, the full implementation verification of the procedure could not be accomplished during this audit.

These procedures meet the intent of the Generic Letter.

E. Corrective actions taken by the licensee to prevent recurrences of similar types of corrosion.

1. The utility is actively replacing carbon steel and/or 410 stainless steel fasteners on valves with 17-4 PH stainless steel components. During the 1989 outage, 29 Residual Heat Removal (RHR) and Safety Injection System (SIS) valves were upgraded in this manner.

2. Procedures A-1407.2 states in part:

"3.6 Corrective Actions shall be considered for every NCR written as per paragraph 3.5.7 above. The concerns of Reference 2.1 shall be reviewed in preparing any corrective action recommendation.

3.6.1 Consideration should be given to previously effective corrective actions initiated at Ginna Station, such as prompt repair of all leaks identified during PT-7, seal welding of flanges or studs, etc.

3.6.2 Consideration should be given to any changes to procedures or design changes that could (a) reduce the probability of primary coolant leaks at the locations where they may cause corrosion damage and (b) entail the use of suitable corrosion resistant materials or the application of protection coatings/claddings.

3.6.3 Consideration should be given to enhanced inspection techniques or more frequent inspections, where specific primary coolant leaks have recurred."

3. A plant tour was made by the audit team which included:

Auxilliary Building
Boric Acid Transfer System Pump
Safety Injection Valves
Boric Acid Concentration System
RHR/SI Modification
* "B" Safety Injection - Heat Exchanger for bearing cooling
Containment Spray Pumps
Safety Injection Pumps
Changing Pumps/Accumulator
Condensate Return Lines
Spent Fuel Pool Pump
Spent Fuel Pit Heat Exchanger

* This item had no maintenance tag on the component but boric acid crystals were evident on the part. Maintenance ID Tag 0001535 was issued by the utility on 10/11/89 for this item.

F. Conclusions

1. The program for boric acid corrosion prevention at R.E. Ginna meets the intent of Generic Letter 88-05.

2. The Maintenance Program could be improved if a priority system for repair is incorporated. One trouble card (ID Tag) on MOV826B (Safety Injection) still awaiting man power was dated 9/16/88. Additionally, a sort/subsort for the computer program to include a leakage category could easily isolate those leaking components from other maintenance problems. This could also carry over into the NCR program.

3. The training modules examined were very good. The use of a mock-up for leaks used by the materials engineering group should be used for the site people (Aux operators, SROs/ROs) to familiarize themselves with what to look for in the field.

These items were discussed with the utility at an exit critique.

G. Documents Reviewed

1. Letter Response to USNRC Generic Letter 88-05, 5/31/88.

2. Procedure A-1407, "Program to Prevent Degradation of Reactor Coolant Pressure Boundary," Rev. 1, 5/31/89.

3. Interoffice Correspondence to: S. Spector, From: R. Morrill, Subject: "OAP Effectiveness Review," 9/13/89.

4. Procedure PT-7, "Hydro Test of Reactor Coolant System," Rev. 38, 6/5/89.

5. Procedure S-12.2, "Operator Action in the Event of Indication of Significant Increase in Leakage," Rev. 24, 9/27/89.

6. Procedure S-12.4, "RCS Leakage Surveillance Record Instructions," Rev. 23, 6/13/89.

7. Interoffice Correspondence to: E. Voci, From: L. Prill, Subject: "1989 AI&O Valve Refurbishment Carbon Steel and 410 SS Fastener Upgrade to 17-4 PH and 316 SS," 12/15/88.

8. Procedure NDE-100-8, "Visual Examination Acceptance Standards," Rev. 2, 1/30/88.

9. Learning Module, "Visual Examination for Leakage," 5 PS, EPRI.

10. Procedure NDE-100-12, "Visual Examination for Leakage," Rev. 0, 3/10/89.

11. Lesson Plan for Auxilliary Operators NAD08C, "Motor Operated Valves," Rev. 4, 3/7/89.

12. Lesson Plan for ROS/SROS, RAD15C, "Program to Prevent Degradation of RCS Pressure Boundary," Rev. 0, 9/12/89.

13. RF-64, "Cycle XVIII-XIX Refueling Procedure," 1989 Outage, 3/15/89, pp. 31-35.

14. Ginna Station Event Report, 89-131, 10/10/89.

H. Personnel Interviewed

1. The following personnel were present at the entrance meeting:

K. Parczewski	NRC
C. Czajkowski	BNL
E. Yachimiak	NRC Resident (acting)
N. Perry	NRC Sr. Resident (acting)

RGE Personnel:

D. Filkins	HP/Chem Mgr.
J. St. Martin	Corr. Action Coordinator
T. Schuler	Operations Mgr.
R. Marchionda	Dir. Outage Planning
S. Spector	Plant Mgr.
S. Adams	Tech. Mgr.
J. Widay	Supt. Production (Ginna)
T. Alexander	Q.C. Engr. - Oper.
R. Wood	Supr. Nucl. Security
R. Carroll	Ginna Training Mgr.
R. Morrill	Oper. Exper. Coordinator
N. Goodenough	Maint. Tech. Analyst
M. Lilley	Nucl. Assur. Mgr.

2. The following personnel were interviewed during the audit:

R. Morrill	Oper. Exper. Coordinator
J. St. Martin	Corr. Action Coordinator
R. Roth	Section Foreman Pipe
J. Wahl	Mech. PM Analyst
W. Gallowary F. Klepacki, Jr.	ISI Engr.
J. Smith	Mgr. Materials Engineer & Inspection Service
W. Brehse	Training Spec. Operations
P. Lewis	Materials Engineer
D. Horning	Maintenance Planner

3. The following personnel were present at the Exit Critique:

K. Parczewski	NRC
C. Czajkowski	BNL
N. Perry	NRC Resident
D. Horning	RG&E
S. Spector	Ginna Plant Mgr.
S. Jones	Corrective Action
R. Marchionda	Dir. Outage Planning
R. Carroll	Training Mgr.
C. Edgar	Ginna Maintenance
M. Lilley	Mgr., Nuclear Assur.

ATTACHMENT I
BORIC ACID CORROSION OF CARBON STEEL REACTOR PRESSURE BOUNDARY COMPONENTS

EQUIPMENT	CARBON STEEL COMPONENTS	SYSTEM	COMMENTS
1) REACTOR	HEAD REACTOR VESSEL HEAD STUDS HEAD NUTS CONOSEAL BOLTING	RCS	
2) REACTOR COOLANT PUMPS	LEAK OF FLANGE BOLTING (3) MAIN FLANGE STUDS MAIN FLANGE NUTS MOTOR STAND BOLTS	RCS	
3) PCV 431 A 4) RCV 431 B 5) AOV 427 6) AOV 294 7) AOV 296 8) AOV 392 A 9) AOV 392 B 10) AOV 310 11) AOV 200 A 12) AOV 200 B 13) AOV 202 14) HCV 123	BONNET STUD BONNET NUTS PACKING GLAND STUD PACKING GLAND NUTS GLAND FOLLOWER	RCS RCS RCS RCS RCS RCS RCS RCS RCS RCS RCS RCS RCS	
15) PCV 430 16) PCV 431 C	BONNET STUD BONNET NUT GLAND HEX NUT GLAND FOLLOWER	RCS RCS	PACKING GLAND STUDS ARE TYPE 410 STAINLESS STEEL

ATTACHMENT 1

ATTACHMENT I
BORIC ACID CORROSION OF CARBON STEEL REACTOR PRESSURE BOUNDARY COMPONENTS

EQUIPMENT	CARBON STEEL COMPONENTS	SYSTEM	COMMENTS
17) MOV 515 18) MOV 516	YOKE CLAMP STUDS YOKE CLAMP NUTS GLANT STUD GLAND NUT YOKE CLAMP JAM NUTS	RCS RCS	
19) MOV 720	GLAND STUD	RHR	
20) V 594 21) V 595 22) V 596 23) V 598 24) V 599		RCS RCS RCS RCS RCS	STAINLESS STEEL VALVE, WITH NO NUTS OR BOLTS. PACKING NUT IS STAINLESS STEEL.
25) V 500 A 26) V 597		RCS	STAINLESS STEEL WELDED BONNET. PACKING GLAND, PACKING NUTS, PACKING BOLTS ARE STAINLESS STEEL.

ATTACHMENT I
BORIC ACID CORROSION OF CARBON STEEL REACTOR PRESSURE BOUNDARY COMPONENTS

EQUIPMENT	* CARBON STEEL COMPONENTS	SYSTEM	COMMENTS
27) AOV 521	BONNET STUDS BODY STUD NUTS GLAND STUDS GLAND NUTS	RCS	
28) V 517		RCS	STAINLESS STEEL BONNET,
29) V 518		RCS	NUT, AND BELLOWS.
30) V 533		RCS	STAINLESS STEEL
31) V 534		RCS	WELDED BONNET,
32) V 534 A		RCS	PACKING GLAND,
33) V 549 C		RCS	SPLIT RING,
34) V 509		RCS	EYE BOLT NUTS, AND
35) V 510		RCS	EYE BOLTS.
36) V 536		RCS	
37) V 509 A		RCS	
38) V 511		RCS	
39) V 512		RCS	
40) V 537		RCS	
41) V 511 A		RCS	
42) V 952		RCS	
43) V 950		RCS	
44) V 535		RCS	
45) V 523		RCS	
46) V 524		RCS	
47) V 501		RCS	
48) V 954		RCS	
49) V 504		RCS	
50) V 507		RCS	
51) V 540		RCS	
52) V 543		RCS	
53) V 503		RCS	
54) V 541		RCS	

ATTACHMENT I
BORIC ACID CORROSION OF CARBON STEEL REACTOR PRESSURE BOUNDARY COMPONENTS

EQUIPMENT	* CARBON STEEL COMPONENTS	SYSTEM	COMMENTS
55) MOV 878 A 56) MOV 878 B 57) MOV 878 C 58) MOV 878 D	GLAND STUD GLAND NUTS	SIS SIS SIS SIS	
59) V 434 60) V 435	CAP & BONNET STUDS CAP & BONNET NUTS INLET FLANGE BOLTS INLET FLANGE NUTS	RCS RCS	
61) V 297 62) V 383 A 63) V 877 A 64) V 877 B		RCS RCS RCS RCS	ALL STAINLESS STEEL.
65) PRESSURIZER	PRESSURIZER VESSEL CARBON STEEL BOLTS MANWAY COVER		
66) STEAM GENERATOR	CARBON STEEL BOLTS S/G VESSEL MANWAY COVER		

ATTACHMENT I
BORIC ACID CORROSION OF CARBON STEEL REACTOR PRESSURE BOUNDARY COMPONENTS

EQUIPMENT	* CARBON STEEL COMPONENTS	SYSTEM	COMMENTS
67) SV 590		RCS	ALL STAINLESS STEEL.
68) SV 591		RCS	
69) SV 592		RCS	
70) SV 593		RCS	
71) V 544		RCS	STAINLESS STEEL
72) V 506 A		RCS	WELDED BONNET,
73) V 506 B		RCS	PACKING GLAND,
74) V 506 C		RCS	SPLIT RINGS,
75) V 505		RCS	EYE BOLT NUTS, AND
76) V 501 A		RCS	EYE BOLTS.
77) V 501 B		RCS	
78) V 501 C		RCS	
79) V 502		RCS	
80) V 519		RCS	STAINLESS STEEL
81) V 520		RCS	BODY AND BONNET.
82) V 522		RCS	PACKING NUT IS
83) V 525		RCS	STAINLESS STEEL.