OCONEE - 1,2,3

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

*** CLEARED ***

FILE: 1302
Contract 620-00 03
SPR 444
TITLE RC V1 STEAM LEAK
DATE 6-4-73

To W.C. Butt - NSE For Information
R.G. Burnley - NSE
G. Kulynych - Sr. Project Manager
C. C. Plunkett - Contract Admin.
Central Engineering Files
M. V. DeCarli - Quality Assurance
R.J. McConnell - S.O.M. (2)

The attached, cleared SPR is submitted for your information.

TO:
- ✓ R. S. Embrey
- G. E. Kulynych
- ✓ J. McFarland
- ✓ G. M. Olds
- ✓ R. T. Schomer
- ✓ E. G. Ward
- ✓ J. Kaelin - Arkansas
- ✓ J. Kennedy - SMUD
- ✓ K. Suhrke
- ✓ H. Worsham
- ✓ J. Phinney - MET ED

Attached is one copy of Site Problem Report No. 444 which has been processed on Contract 620-00 03. Your contract or contracts may have the potential for a similar problem. The Site Problem Report is being forwarded for your information and use to prevent problems from recurring on following contracts. A more complete file on the problem is available in the Nuclear Service area.

REMARKS: Refer also to SPR 461 for related problems

cc:

R. O. Maggi
NUCLEAR SERVICE SUPPORT ENGINEER

7910040 547

PDS-21091-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company | CONTRACT NO. NSS 3 | SPR NO. 444 | SPR REV NO. 2

VENDOR Rockwell | P.O. NO. 31480 | COMP. NO. 28 | GROUP NO. 41 | SEQ NO. 1

PRIMARY DOCUMENTS: | SPEC NOS. | PRIORITY

DWG NO. | EQUIP CODE/LEVEL/DATE

QA LEVEL | QA SPEC NO.

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
H. Hennicke			

TITLE (MAX. 30 SPACES) RCV Steam Leak

DESCRIPTION OF PROBLEM

In addition to the problems described in Rev. 1, the design of the back seal does not seem to be adequate. (refer to SPR 461).

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

[redacted] ACTION [redacted] BY [redacted] SITE PERSONNEL
Recommended

(1) Re-design back seat.

RECOMMENDED ACTION

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	H Hennicke	11/7/73
SITE CONSTR. REP.		
SITE OPER. MGR.	P.M. McConnell	11/19/73
NS SUPPORT ENGR.	R.L. Pittman	1-22-73
PROJECT MANAGER		

DOCUMENTS AFFECTED / ACTION TAKEN

- ☐ Drawings
- ☐ Proc. Specs
- ☐ Instr. Books
- ☐ Operating Procedures
- ☐ Tech. Specs
- ☐ PSAR/FSAR
- ☐
- ☐ Recommended Bids Change

Field Change Req. ☐

Field Change No. ____

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 SPR 444

Cost Category ☐ None ☐ C ☐ D ☐ O ☐ L | Auth. Charge No.

RESPONSIBILITY ASSIGN. | Date Completed ____ By: ____

OTHER CONTRACTS AFFECTED | DEVIATIONS ☐ NONE ☐ SEE REV. ____

INSTRUCTIONS FOR PDS-2105 - SITE PROBLEM REPORT

Initiated by Nuclear Service

1. ORIGINATOR - Fill In: Customer; Contract No.; Vendor; PO No., Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature, Date.

2. SITE OPERATIONS MANAGER - Fill In: SPR No. and Rev. No.; Priority; Site Engineer; Early Start Date; Required Completion Date. Approval Signature; Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. NUCLEAR SERVICE SUPPORT ENGINEER - Fill In: Primary Documents; Documents Affected; Cost Category, Authorized Charge No., Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal nuclear service expenditures) are not to be incurred, take the following steps: (a) Approve SPR, (b) Indicate "N.F.C. Required" in space provided for project manager's approval, and (c) Distribute as indicated in step 5 below.

   If field change is not required but additional costs (over and above normal nuclear service expenditures) are to be incurred, approve SPR and forward to project manager for approval (step 4).

   If field change is required, see procedure No. NPG-0402-07; obtain field change No. from project manager, and indicate field change No. on SPR.

4. PROJECT MANAGER - Approve SPR and Return to Nuclear Service Support Engineer.

5. NUCLEAR SERVICE SUPPORT ENGINEER - Distribute in Accordance With Procedure No. NPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

6. SITE OPERATIONS MANAGER - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-04. Return completed SPR to nuclear service support engineer.

Initiated by B&W Construction Company

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SENIOR CONSTR. CO. SITE REPRESENTATIVE - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer. Early Start Date, Required Completion Date; Approval Signature, Date.

   Note: Assign priority No. 1 or 2 defined as follows.

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. PROJECT MANAGER - FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No.; Responsibilities Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal construction Co. expenditures) are not to be incurred, take the following steps: (a) Approve SPR, and (b) Distribute in accordance with procedure No. NPG-0402-05.

   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration, approve and distribute in accordance with procedure No. NPG-0402-05.

   If field change is required, see procedure No. NPG-0402-07; assign field change No., have approved and distribute in accordance with procedure No. NPG-0402-05.

4. SENIOR CONSTR. CO. SITE REPRESENTATIVE - Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-05. Return completed SPR to the project manager.

PDS-21091-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company CONTRACT NO. 620-0003 SPR NO. 444 SPR REV. NO. 1

VENDOR Rockwell P.O. NO. 081480 COMP. NO. 28 GROUP NO. 41 SEQ NO. 1

PRIMARY DOCUMENTS
DWG NO. _____
QA LEVEL _____
SPEC NOS. _____
EQUIP CODE/LEVEL/DATE _____
QA SPEC NO. _____

PRIORITY: 1

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
J. L. Hollis			

TITLE (MAX. 30 SPACES) RCV-3 Steam Leak

DESCRIPTION OF PROBLEM

1. Valve has excessive travel and yoke bushing threads were cut by stem.
2. During Replacement of yoke bushing, steam was leaking past RC 3.
3. Valve could not be packed without removal of operator and yoke bushing.

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

See Attached Sheet

~~FURTHER~~ ACTION ~~REQUIRED BY OTHER THAN~~ SITE PERSONNEL Rockwell to inspect valve disk, ~~[illegible]~~ disk nut, and stem to determine reason for failure. Rockwell to bring Service engineer from Raleigh Plant and limitorque Service rep to inspect RC-3 and RC-1 after HFT.

~~RECOMMENDED ACTION~~

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	J. L. Hollis	1-4-73
SITE CONSTR. REP.		
SITE OPER. MGR.	SDP A. M. McGowan	1-4-73
NS SUPPORT ENGR.	R. L. Pittman	1-9-73
PROJECT MANAGER		

DOCUMENTS AFFECTED / ACTION TAKEN

- ☐ Drawings
- ☐ Proc. Specs
- ☐ Instr. Books
- ☐ Operating Procedures
- ☐ Tech. Specs
- ☐ PSAR/FSAR
- ☐
- ☐ Recommended Site Change

Field Change Req ☐

Field Change No. _____

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M2 SPR 444

Cost Category ☐ Nuc ☐ C ☐ O ☐ O ☐ L

Auth. Charge No.

RESPONSIBILITY ASSIGN.

Date Completed _____

By: _____

OTHER CONTRACTS AFFECTED

DEVIATIONS
☐ NONE
☒ SEE REV 0

INSTRUCTIONS FOR PDS-21091 – SITE PROBLEM REPORT

Initiated by Site Nuclear Service.

1. ORIGINATOR – FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date.

2. SITE OPERATIONS MANAGER – FILL IN: SPR No. and Rev. No.; Priority; Site Engineer; Early Start Date; Required Completion Date, Approval Signature; Date.

   Note: Assign priority No. 1 or 2 defined as follows:

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   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. NUCLEAR SERVICE SUPPORT ENGINEER – FILL IN: Primary Documents; Documents Affected; Cost Category, Authorized Charge No.; Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal nuclear service expenditures) are not to be incurred, take the following steps: (a) Approve SPR, (b) Indicate "N.C.R. Required" in space provided for project manager's approval, and (c) Distribute as indicated in step 5 below.

   If field change is not required but additional costs (over and above normal nuclear service expenditures) are to be incurred, approve SPR and forward to project manager for approval (step 4).

   If field change is required, see procedure No. SPG-0402-07; obtain field change No. from project manager, and indicate field change No. on SPR.

4. PROJECT MANAGER – Approve SPR and Return to Nuclear Service Support Engineer.

5. NUCLEAR SERVICE SUPPORT ENGINEER – Distribute in Accordance With Procedure No. SPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

6. SITE OPERATIONS MANAGER – Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. SPG-0402-05. Return completed SPR to nuclear service support engineer.

Initiated by B&W Construction Company

1. ORIGINATOR – FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature, Date.

2. SENIOR CONSTR. CO. SITE REPRESENTATIVE – FILL IN: SPR No. and Rev. No.; Priority; Site Engineer. Early Start Date; Required Completion Date; Approval Signature, Date.

   Note: Assign priority No. 1 or 2 defined as follows:

   1. Implementation must be complete by required completion date to avoid delay in project completion.
   2. Implementation must be complete by required completion date to obtain maximum project effectiveness.

3. PROJECT MANAGER – FILL IN: Primary Documents; Documents Affected; Cost Category; Authorized Charge No.; Responsibility Assignment; Other Contracts Affected.

   Verify or establish proposed resolution working with appropriate engineering units, purchasing, and others as required.

   If field change is not required and additional costs (over and above normal construction Co. expenditures) are not to be incurred, take the following steps: (a) Approve SPR, and (b) Distribute in accordance with procedure No. SPG-0402-05.

   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration approve and distribute in accordance with procedure No. SPG-0402-05.

   If field change is required, see procedure No. SPG-0402-07, assign field change No., have approved and distribute in accordance with procedure No. SPG-0402-05

4. SENIOR CONSTR. CO. SITE REPRESENTATIVE – Implement Resolution; Upon Completion, Fill in Actual Start Date, Date Completed, and By.

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. SPG-0402-05. Return completed SPR to the project manager.

STATUS - ACTION TO DATE

1. Status - valve bonnet, stem, disk assembly, gland assy's replaced with RC-1 parts from Unit II. Spline gear which connects stem to limitorque operator also replaced. Valve placed back in limited service until completion of HPT. i.e. not to be used except during cooldown.

2. Action - Inspected valve internals with Clinton L. Sumrall (Sales Representative) of the Atlanta sales office of Rockwell.

Mr. Sumrall took valve internals with him to ship to the Raleigh, NC plant for analysis and expects to have an answer/analysis for reason of failure by 1/4/73.

He also agreed to try and have a service representative from the Raleigh, NC, Rockwell Plant and a Limitorque representative here on site on 1/8/73 for RC-1 and RC-3 removal and inspection.

Mr. Sumrall said that this valve is designed to back seat to a limit switch - not a torque switch, and that this is set in the Raleigh Plant prior to shipment. He agreed that the limit switch apparently failed or was improperly set.

Upon inspection of the stem Mr. Sumrall said that we probably had a bad stem, i.e. the flanged end which keeps the stem attached to the disk and disk nut assembly was too thin. The stem should be ≈ 3/8 inches thich and appears to have been ≈ 1/16 inch at most.

* During replacement of yoke bushing by DPC they found that the valve cannot be repacked without removing the valve operator and yoke bushing. This is due to the size of the bonnet being so small that the gland seal and latern gland, when pulled back for packing prohibits the insertion of packing below the latern gland. Mr. Sumrall agrees that this is an unsatisfactory design and stated that Rockwell has extended bonnets which would allow packing with operator in place. He agreed to investigate the possibility of supplying these longer bonnets (this would also require a longer stem) but, was not sure what the delivery date would be or who would pay. See photo # 3

NOTE: Mr. R. Burnley, B & W Engineering, indicates that the following 83 valves at this site are of the same design. We do not know which, if any, have the longer bonnet and valve stem.

B & W valve #'s for Oconee I, II, & III.

#	SIZE
RCV-1, 5	(2 1/2")
CFV-2A, 2B, & 3A, 3B	(1")
CAV-1, 2, 3, 4A, 4B, 5A, 5B	(1" or 1/2")
HPV-1A, 1B, 2A, 2B, 3	(2 1/2")
HPV-4, 43A, 43B, 43C, 43D	(1 1/2")
HPV-12, 13, 24A, 24B	(4")

Oconee I only (Westinghouse Pumps)

#	SIZE
HPV-48, 49	(1")

2. Inspection of valve shows the following: See photo #1

Stem - End of stem has seperated below disk nut. Stem shows evidence of excessive wear at disk end for ≈ 2 inches and is marked on the entire lenth.
See photo #1

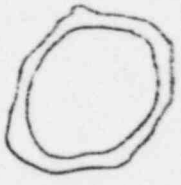
Disk - Disk back seat (on disk nut) is heavily scored while main seat remains in good condition. The inner surface of the disk nut is heavily scored with material deposited on it, possibly from stem.

Question: Should the contack area on the end of the stem and the disk nut be of a bearing material? When the valve is back seated this area has force and twist applied and will therefore, have a cutting action if limit switch fails.

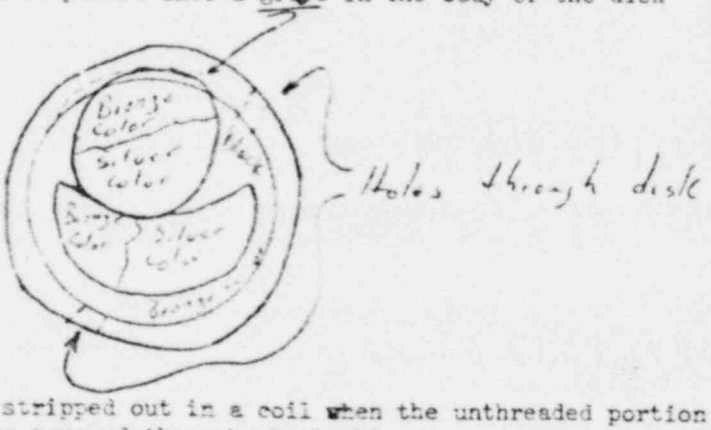
The disk nut tack weld was drilled out and the disk & disk nut were inspected.

a. The bottom of the disk nut shows evidence of wear on the inside diameter surface. See photo #2

b. A bronze colored ring was found lose under the disk nut. Thickness was .017 to .030 inches
See photo #2



c. Under stem there is an area which could be the stellite bearing pushed and broken, or it could be the bottom of the stem, ≈ 1/32 of an inch thick. This piece is pushed into a groove in the body of the disk
See photo #2

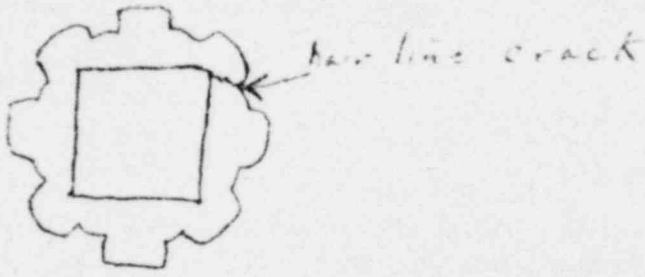


Yoke Bushing - Inner threads stripped out in a coil when the unthreaded portion of the stem was torqued through the bushing.

Junk Ring - Outer surface shows evidence of galling and wear.

Bonnet - Back seat area shown excessive wear as does back seat area of disk nut.

spline - Connects valve stem to operator - shows evidence of excessive wear and has a hair line crack.



PDS-2109-1

SITE PROBLEM REPORT

BABCOCK & WILCOX-NPG

CUSTOMER Duke Power Company CONTRACT NO. 620-0003 SPR NO. 444 SPR REV NO. 0

VENDOR P.O. NO. COMP. NO. 59 GROUP NO 10 SEQ NO. 01

PRIMARY DOCUMENTS: SPEC NOS. PRIORITY

DWG NO. EQUIP CODE/LEVEL/DATE

QA LEVEL QA SPEC NO.

SITE ENGINEER	EARLY START DATE	ACTUAL START DATE	REQ'D COMP. DATE
R. J. Baker			

TITLE (MAX. 30 SPACES) RC - V1 Steam Leak

DESCRIPTION OF PROBLEM

See Attachment

STATUS-ACTION TO DATE INCLUDING PERSONS CONTACTED, COMMITMENTS MADE, ETC.

None

FURTHER ACTION REQUIRED BY OTHER THAN SITE PERSONNEL

Yes, Lynchburg Engineering investigate to see if any damage may have occured to the spray nozzle.

~~RECOMMENDED ACTION~~ Resolution

APPROVALS

TITLE	APPROVAL SIGNATURE	DATE
ORIGINATOR	R. J. Baker	12/20/72
SITE CONSTR. REP.		
SITE OPER. MGR.	for B.M. McConnell	12/22/72
NS SUPPORT ENGR.	W. Walter	12/29/72
PROJECT MANAGER		

DOCUMENTS AFFECTED / ACTION TAKEN

- ☐ Drawings
- ☐ Proc. Specs
- ☐ Instr. Books
- ☐ Operating Procedures
- ☐ Tech. Specs
- ☐ PSAR/FSAR
- ☐
- ☐ Recommended Site Change

DISTRIBUTION

SITE OPS MANAGER
PROJECT MANAGER
N.S. SUPPORT ENGR.
COGNIZANT ENGR.
CONTRACT ADMIN.
NPG QA
FILE 12M.2 ____

Cost Category ☐ Harm ☐ C ☐ D ☐ O ☐ I

Auth. Change No. ____

RESPONSIBILITY ASSIGN.

Date Completed ____

By: ____

Field Change Bad ☐

Field Change No. ____

OTHER CONTRACTS AFFECTED

All

DEVIATIONS

☐ NONE

☐ SEE REV. ____

Closed B.M. McConnell 5-23-73

INSTRUCTIONS FOR PDS-71091 - SITE PROBLEM REPORT

Initiated by SI Nuclear Service.

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title, Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature; Date

2. SITE OPERATIONS MANAGER - FILL IN: SPR No. and Rev. No.; Priority; Site Engineer; Early Start Date; Required Completion Date, Approval Signature; Date.

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5. NUCLEAR SERVICE SUPPORT ENGINEER - Distribute in Accordance With Procedure No. NPG-0402-04; Initial Action Taken Box (on Support Engineer's File Copy) When Documents Affected Have Been Corrected.

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Initiated by B&W Construction Company

1. ORIGINATOR - FILL IN: Customer; Contract No.; Vendor; PO No.; Component No.; Group No.; Sequence No.; Drawing No., Title; Description of Problem; Status; Further Action Required by Other Than Site Personnel; Recommended Action; Approval Signature, Date.

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   If field change is not required but additional costs (over and above normal construction Co. expenditures) are to be incurred, obtain abnormal cost charge No. from contract administration, approve and distribute in accordance with procedure No. NPG-0402-05.

   If field change is required, see procedure No. NPG-0402-07; assign field change No., have approved and distribute in accordance with procedure No. NPG-0402-05.

4. SENIOR CONSTR. CO. SITE REPRESENTATIVE - Implement Resolution, Upon Completion, Fill in Actual Start Date, Date Completed, and By

   Note: If necessary to deviate from the approved SPR, note deviation on approved SPR and obtain revised SPR in accordance with procedure No. NPG-0402-05. Return completed SPR to the project manager.

DESCRIPTION OF PROBLEM

RC - V1 developed a steam leak out of the stem leak off connection on 12/18/72. This leak lasted for about 6.5 hours at a rate of about 6 gpm. Plant conditions during this time were as follows:

R. C. Temperature 530°F
R. C. Pressure 2150 psig
Pressurizer temperature 645°F
4 R. C. Pumps running.

To repair the leak, spray flow was secured for 10 minutes by shutting RC 3 and RC 9. Since RC 1 was shut during the leak, and RC 2 was throttled to maintain minimum required spray flow, there probably was no spray flow to the pressurizer for the entire duration of the leak. Instead, the flow probably was out of the pressurizer through the spray nozzle and out RC - V1 to the R. B. atmosphere. With RC-V1 shut the leak was located on the pressurizer side of RC-V1.

This was in violation of DP 1101 01, section 1.2-6 which requires 0.75 gpm spray flow at all time when RC Temperature is greater than 200°F.

After RC-V1 was repaired, spray flow was reinstated very slowly to minimize the thermal shock to the spray nozzle.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

RL Fitzhugh

To: LR ALLEN - PROJECT MANAGEMENT

From: RG BURNLEY - AUX. SYSTEMS (2281)

BDS 063.5

Cust.: DUKE POWER Co.

File No. NSS-3/1242
or Ref. NSS-3.4.9/3A30.41

Subj.: ROCKWELL VALVES SPR-444 & 461

Date: FEBRUARY 2, 1973

This letter to cover one customer and one subject only

Ref: 1. SPR - 444 File 1242
2. SPR - 461 " "
3. Memo AL Lowe, Jr. to LR Allen 1-23-73, SPR-444 File 1242
4. Ltr., DPCo. to GF Kulynych, 1-12-73, Subj. Rockwell Valves

The writer and GT Sund (Purchasing) met with Rockwell personnel, Jan. 31, 1973, at their plant in Raleigh N.C. The Following Rockwell personnel attended:

Harry O Crane, Product Reliability Manager
RL Lawson. Chief Product Design Engineer
JC Morris, Mgr. Customer Service & Sales Orders

The following items were discussed with the objective of formulating resolutions to the problems and questions described in the references noted above:

1. Backseating Problem

The design and effectiviness of the Univalve backseat is questioned by 1 or more of the referenced above. Rockwell disassembled and examined the component parts of RC-V5. We also visually examined these parts and discussed the problem.

Rockwell personnel do not believe that a cause for this backseat leaking can be found. They did state that they have thousands of the Univalves in service since 1963. and the design and effectivness are proven. They also stated that their valves are given a backseat test at shell hydro pressure (5400psig for these valves) with packing in but with the gland loose.

examined

SPR-444 also questioned the backseat design in the stem to disc nut area; the assumption made that the SS stem shoulder rotated against the SS disk nut. Rockwell advises the lower end of the disk nut is in fact stellited (see attachment #1).

Rockwell does not believe it credible that the stem shoulder was only 1/16" thick as was reported in SPR-444. The attached sketch shows the actual size of the component parts and the entire stem is machined from a single piece of bar stock. Based on visual observations by the writer, it appears that the end of the stem was worn away be the grinding action due to repeated

cycling of the valve after initial damage occurred. The two holes in the disk are to prevent pressure buildup in the cavity inside the disk.

2. RC-V5 Cracked Seat & Scored Stem

A dye check was performed on the seat of this valve while we were at Rockwell's plant. There is a small crack across the Stellite seat.

Rockwell feels it is not possible to determine the cause. Although it does not occur with any great frequency, cracks in stellite seats does happen occasionally. Rockwell will either repair this unit or furnish a new one.

The scored stem was visually observed and compared with an actual size detailed drawing. Considering the location of the scored portion, the relative locations of junk ring, lantern gland and travel distance of stem, the scoring had to occur in the lantern ring zone. Again, cause is indeterminate, but it is highly probable that the scoring is the result of the lantern ring being cocked in the stuffing box. Rockwell stated they have never before seen or had reports of this type of damage. If the valve was repacked at the site the lantern ring could have been slightly cocked and subsequent cycling of the valve could have caused the scoring of the stem. There is no evidence or indications on the lantern ring of this, but since the lantern ring is stellite it probably wouldn't show. Rockwell also feels that it is possible the lantern ring could have been slightly cocked when initially installed at the factory. Regardless of how or when the problem occurred, Rockwell will replace this stem-disk assembly.

It was further stated by Rockwell that the inconel wire insert in the John Crane 187-I packing could not have caused the scoring on the stem.

3. Lantern Ring - Repacking Problem

Without question Rockwell agrees that the arrangement as furnished does not allow repacking the lower stuffing box without removing the operators. It is a design error by Rockwell. They have designed a four piece lantern gland to solve this problem. The new Lantern Glands will consist of 2 pieces of the part shown on Rockwell dwg. B-182952 and the split cylinders part shown on dwg. B182953.

Two sets of these are finished and Rockwell will have the rest completed the week of Feb. 5 for the eleven (11) Oconee I valves.

4. Grafoil Packing

Grafoil packing was discussed with the Rockwell Raleigh personnel and also with Mr. Roger Norden, Rockwell Pittsburgh. Rockwell has not formally stated their corporate position regarding the use of Grafoil. They pointed out that the test work was performed to establish some data on use of grafoil in valves. They have not done further work than that described in their report V REP 72-1. A portion of Rockwell's report showing their conclusions is reproduced and included as attachment #2. After the conference call with Mr. Norden it was concluded that Rockwell feels that their Univalve is suitable for use with Grafoil packing provided the following items are done properly:

a. Tolerances are critical. The interference fit recommended by the makers of Grafoil (Union Carbide) must be used - that is a diametrical interference of 0.009 to 0.010 relative to the stuffing box and 0.002 to 0.005" with the stem.

b. The rings of packing should be inserted two (2) max. at a time and compressed 25 to 35% and the steps repeated for each additional set of two rings.

c. The user must assure himself that he has obtained the highest quality, low chloride content Grafoil, TYPE GTM.

d. Some type of special tooling will be required for the Univalve with deep stuffing box such as we have. Rockwell has not developed any tooling or procedures since they feel it is the user's decision, at this point in time, whether or not to use Grafoil.

Please note that with respect to item C above, Rockwell is aware of a report from some plant where Grafoil was installed in various valves. Subsequently, it was found that there was severe pitting of valve stems and it was later confirmed that the Grafoil used had 1600 ppm leachable chlorides. It is reported today that Union Carbide now designates the grafoil for nuclear use as GTM. It is more expensive and the manufacture performs additional work to assure that chlorides are 200 ppm or less. It is also reported that this designated packing is being supplied with sacrifical metal wafers for insertion between rings of packing to prevent corrosion attack on the valve stems.

5. Rockwell will submit failure analysis reports on both RC-V1 and RC-V5.

Summation and Recommendations:

1. The Univalve backseat design is considered more than adequate and effective by Rockwell.

2. Replacement parts for RC-V1 are being manufactured. Rockwell will not assume responsibility since the damage was not due to design or faulty components.

3. Replacement parts for RC-V5 are being supplied by Rockwell at their expense since the damage is of indeterminate cause.

4. New lantern glands to allow repacking without removing operators are being supplied by Rockwell at their expense.

5. B&W should advise the customer that if they choose to use Grafoil it should be their responsibility because there are too many unknowns about Grafoil. Also, at the time B&W purchased these valves, Grafoil was unknown; therefore B&W should not be expected to retro fit. There could be additional problems such as extrusions of the Grafoil in valves which do not have the junk ring and close tolerances that are characteristic of the Rockwell Univalve.

6. The stem material used in the Rockwell valves is not the 400 series stainless steel referred to in the DPCo letter, reference 4. The stems were to ASTM Spec 461 grade 630 17-4 PH. Mr. AL Lowe's memo. Ref. 3, covers this subject.

Based on this writing, SPE's 444 & 461 should be cleared.

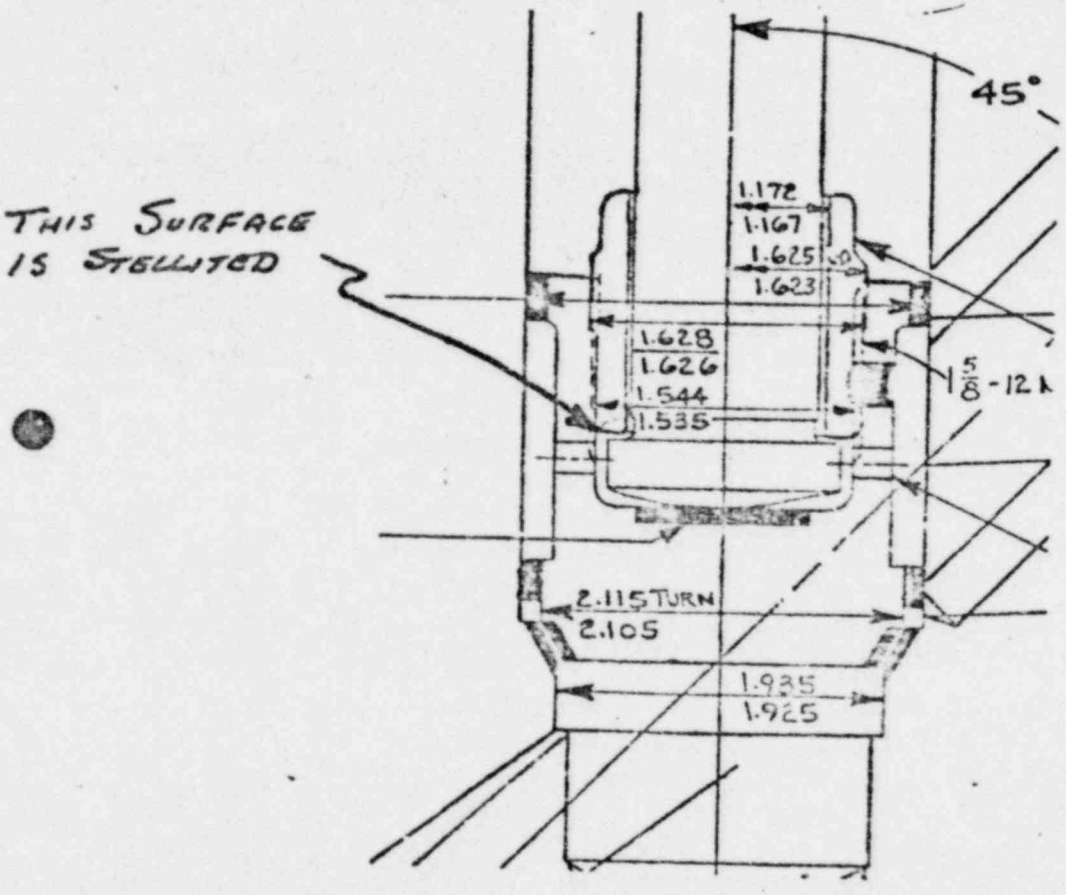
RGB: jgc

CC: WC Butt w/att
TA Morg w/att
RL Pittman w/att
O Puttgruber w/att
K Schroeder w/att
T Stables w/att
GT Sund w/att

R. G. Barnsley

DETAIL OF UNIVALVE DISK ARRANGEMENT

OBTAINED FROM ROCKWELL MFG. RALEIGH, N.C. 1-31-73



ATTACHMENT #1

RGB 2-1-73

FIGURE 5 – Grafoil Packing, Test Nos. 1 thru 5, Bonnet No. 17. This is one of the original Grafoil stuffing boxes. Note the almost complete absence of crystal deposits around the stem and gland.

Grafoil is essentially expanded graphite produced by subjecting flake, powder or chip graphite particles, with a high degree of atom orientation, to an oxidizing medium such as sulfuric acid and nitric acid. The oxidizing agent forms openings between the layers of carbon networks in the graphite. When removed from the acid and then rapidly heated, the gas trapped within the graphite layers expands, in turn expanding the graphite. This expanded mass is then compressed or compacted to the desired density by mechanically rolling, producing a sheet material. An expansion of 80 to 200 times the original thickness is preferred because this will produce a cohesive sheet material without the need for binders, leaving the product virtually pure graphite.

Graphite has excellent mechanical properties at elevated temperatures, good friction properties, is radiation resistant and chemically inert, and possesses the necessary basic properties of a good compression packing material for nuclear service. Other packing materials possess many of these same properties, particularly the graphite filament packings, but one important property all the others lack is a high resistance to compression set. It is this characteristic, the ability to maintain its preload on the valve stem and stuffing box walls despite thermal and pressure cycling, that makes *Grafoil* an exceptional packing material.

While most packings lose weight from temperature exposure (due to a loss of volatiles), *Grafoil* does not, and in fact, weighed samples showed an increase due to probable moisture absorption. Sets removed from bonnets 5, 15 and 17 averaged a 27 percent weight increase. By comparison, *J-C 1871X* lost an average four percent. *J-C 1625GF* was not evaluated but it should not show significant change.

In regard to the second question, the reason for the two *Grafoil* failures: it was concluded that these resulted from the fact that the rings were not tailored dimensionally for the Univalve stuffing box. That is, the manufacturer recommends a diametrical interference of 0.005 to 0.010" relative to the stuffing box and 0.002 to 0.005" with the stem. For unknown reasons, the rings used apparently did not provide these fits. A review of the valve dimensions and the probable packing dimensions, based on unused rings, shows that the two failed *Grafoil* packings, bonnets 3 and 15, probably had clearances of several thousandths around the bottom rings. The top rings probably ranged from zero to 0.002" interference, still less than half the minimum 0.005". Performing a similar analysis on the other five sets all of which performed very well with minimum crystal deposits only, all had *some interference* on both or either of the top and bottom rings, ranging from a probable minimum of 0.000" to 0.004" maximum. This is still not the optimum five to ten thousandths, but does support the "improper fit" theory.

A review of the leakage of the *Grafoil* sets shows that all but one of the seven had fewer deposits around the stem compared to the gland O.D., suggesting the fit with the stuffing box was not perfect. (This was an anomaly at first, because static seals are normally superior to a stem, or moving seal); it is, therefore, most important that *Grafoil* rings are designed to fit the specific dimensional range (i.e., including normal manufacturing tolerances) of the valve stuffing box. It may not be possible to use "off the shelf" rings, and communication with the *Grafoil* supplier must be adequate to assure that the proper rings are manufactured.

Comments on the appearances of the packings observed during the post-test examinations may also be of interest. *Grafoil* was essentially unchanged, except that it could not be removed easily as whole rings and would break into layers. The *J-C 1625GF* graphite filament packings varied considerably, some being intact as when installed and others breaking down into very short fibers. Some rings were much like new, still soft and resilient, while others were hard and stiff. Some were rather wet, others very dry. It would appear that high mechanical loading causes the fibers of *J-C 1625GF* to fracture. The *J-C 1871X* packing was generally somewhat harder and less resilient than when new. In summary, the greatest change was shown by *J-C 1625GF*, the least by *Grafoil*.

Operating torques of the valve stems were never excessive, except for packing *E-1* in Tests 1 and 2. *Grafoil* in particular had rather low stem operating torques at full operating pressures.

CONCLUSIONS

1. Traditional braided asbestos-graphite impregnated packings are not recommended for critical nuclear services where high pressure borated water is encountered and periodic gland adjustments cannot be performed.

2. Most packings fail by compression set, or a loss of resiliency, thereby removing the preload necessary for an effective, maintenance-free stem seal.

3. Union Carbide *Grafoil* packing is superior to all other types examined in this project in terms of sealability and minimal maintenance, due to its inherent properties of incompressibility, temperature and radiation resistance, and freedom from compression set.

4. *Grafoil* packing can be satisfactorily installed in valves now in service with standard dimensions and finishes without extraordinary cleaning procedures.

5. When installing *Grafoil* in new or used valves, the manufacturer's specifications for interference fits with both the stuffing box bore and stem diameter must be followed for low leakage performance.

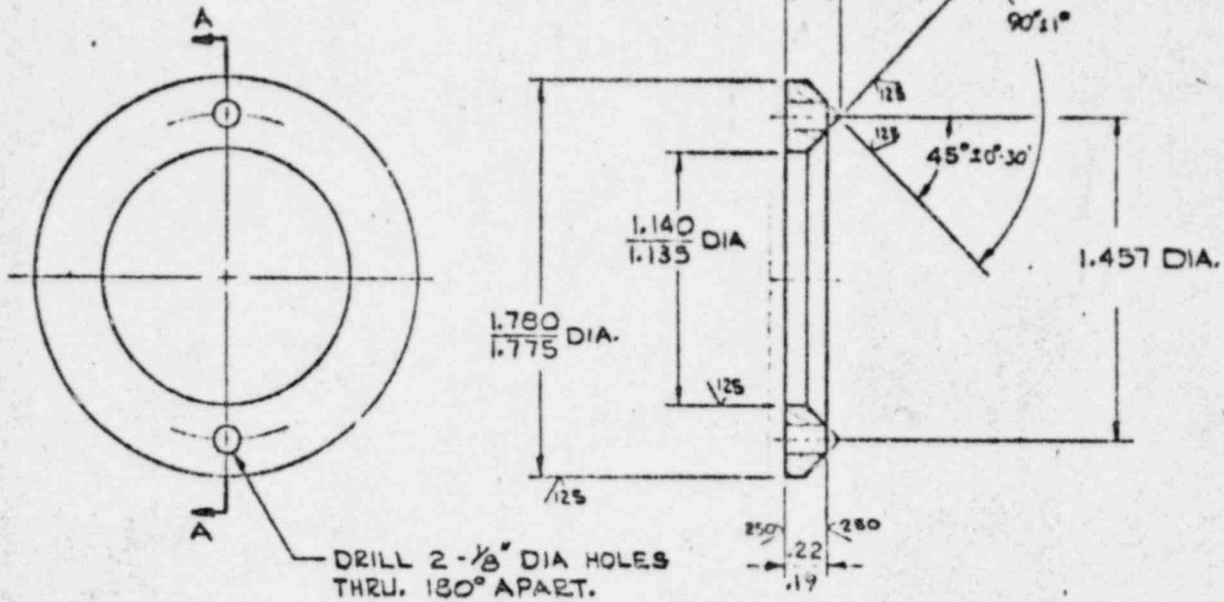
6. A composite packing using one *Grafoil* ring and *J-C 1625GF* for the other rings will greatly reduce the cost of a full *Grafoil* system, but at the probable expense of higher leakage and shorter service life.

The author wishes to thank the packing manufacturers for their assistance in conducting these tests. In particular, the cooperation of the Crane Packing Company and the Union Carbide Corporation is acknowledged, which enabled testing to proceed with minimum delay in several instances when additional test samples were needed.

ATTACHMENT #2

B-182952

R	A	B	E	G	H	IT	K
	P	R	S	T	BA	MS	



SECTION 'A-A'

REV	CHG. NO.	DATE	BY	PART NO.	MADE FROM	MATERIAL	REMARKS
				52952	04821		

GENERAL TOLERANCES

MACH. FINISH ✓
REMOVE SHARP EDGES
CHAMFER 1ST THREAD

Rockwell

2½" 3628 J
FLG., LANTERN GLAND

SPEC L-2469

DRAWN | CHKD | APPD | SCALE 2X | DATE

B-182952

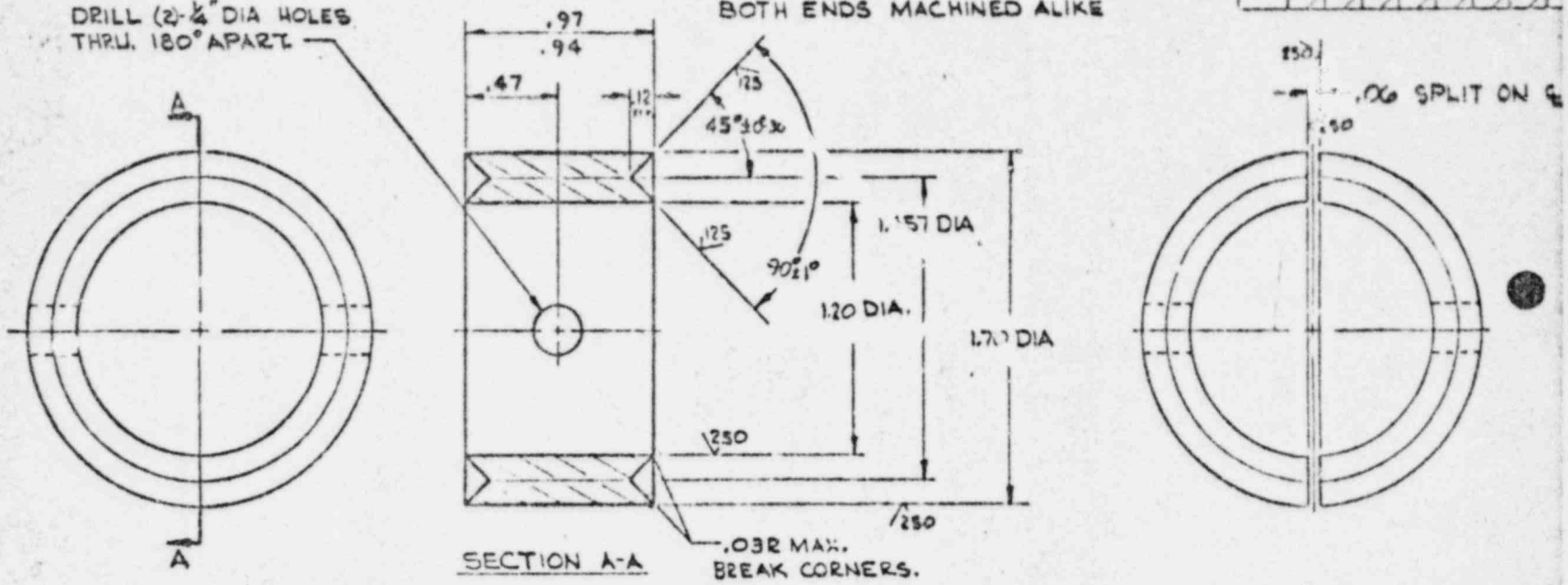
PRINTED IN U.S.A.

B-182953

R	A	B	E	G	H	M	N
	P	R	S	T	BA	MZ	

DRILL (2)-¼" DIA HOLES THRU. 180° APART

BOTH ENDS MACHINED ALIKE



STEP #1

STEP #2

REV	CHG. NO	DATE	BY	PART NO.	MAKE FROM	MATERIAL	REMARKS
				182954		02920	
				182953		02710	

GENERAL TOLERANCES
.X ±
.XX ±
.XXX ±
ANGULAR ±
MACH. FINISH ✓
REMOVE SHARP EDGES
CHAMFER 1ST THREAD

Rockwell

2½" 3628 J
WEB, LANTERN GLAND

DRAWN	CHKD	APPD	SCALE 2X	DATE 11/13
[illegible]	[illegible]			

B-182953

PRINTED IN U.S.A.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To
K. SCHROEDER - MANAGER - AUXILIARY SYSTEMS

From
L. R. ALLEN, ASSOCIATE PROJECT MANAGER (EXT. 2310)

EDS 663.5

Cust.
DUKE POWER COMPANY

File No. or Ref.
12E28

Subj.
PRESSURIZER - SPRAY VALVE

Date
3/29/73

This letter to cover one customer and one subject only

Reference: Memo R.G. Burnley to K. Schroeder dated March 16, 1973, Subject : Pressurizer Spray Line Valve Leakage Problems (RC-V1 & RC-V5)

The referenced memo summarized the observations made and the conclusions drawn during the site visit made by Messrs. Butt, Burnley, and Putzgruber. I feel that this visit was helpful and that this memo provides badly needed documentation to this problem.

I am attaching for your information, Product Specification M202 which describes Belfab's nuclear valve stem bellows. During a recent visit to Belfab I discussed this product with Chuck Turcotte and Bob Rhein. Belfab is currently fabricating several of these bellows, Model B150, for Copes-Vulcan. These valves will be installed in a Westinghouse plant. I was not able to determine the exact service of these valves, only that it was high pressure, high temperature, borated water service. .I understand that these are globe valves in the 2 1/2" to 4" size range.

It may be worthwhile to pursue this with Copes-Vulcan in the event we continue to experience problems with the Rockwell valve.

L. R. Allen

LRA:ch
cc: W. C. Butt
R. G. Burnley
O. Putzgruber
R. L. Pittman
R. V. Straub

Attachment

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To

K. SCHROEDER - MANAGER - AUXILIARY SYSTEMS

From

R. G. BURNLEY - AUXILIARY SYSTEMS (2281)

BDS 663.5

Cust.

DUKE POWER COMPANY

File No. or Ref. NSS-3/12M2 & NSS-3,4,9/8A30.41 Rockwell

Subj. PRESSURIZER SPRAY LINE VALVE LEAKAGE PROBLEMS (RC-V1 & RC-V5)

Date MARCH 16, 1973

This letter to cover one customer and one subject only

References:
1. SPR-444 File 12M2
2. SPR-461 File 12M2
3. SPR-496 File 12M2
4. Ltr. DPCo. to G.E. Kulynych 1-12-73 - Rockwell Valves
5. Memo R.G. Burnley to L.R. Allen 2-12-73, File 12M2
6. Telecopy Memo B.L. Day to L.R. Allen 3-12-73

The writer, W.C. Butt, and O. Putzgruber were at the Oconee Site Tuesday afternoon March 13 and most of Wednesday March 14 to assist in assessing the application of the two B&W valves in the Pressurizer Spray and to formulate a resolution to the latest leakage problem covered by -496 Rev. 1.

Briefly summarized, the references above have covered numerous problems including broken stem/disc assemblies, cracked seat, damaged operator parts, repacking problems and excessive stuffing box leakage. The latest problem was excessive leakage through the stuffing box and out the stem leakoff connection.

In addition to the Auxiliary Systems personnel, the following personnel were involved in several discussions at different times to come up with a resolution:

Clint Summerall - Rockwell Sales
Neil West - Rockwell Service Engr.
James Sigman - DPCo Maintenance
R.J. McConnell - B&W Site Service
B.L. Day - B&W Site Service
Bob Baker - B&W Site Service

Upon arrival at the site, we went to the area where the valves are mounted. The two Rockwell people, two Duke Maintenance workers and B. Day were already there removing the Grafoil packing. B. Day had already checked the accessible area of the valve stem with a dial indicator by manually actuating the operator. In the area checked, there was one point of .001" runout detected and this could have been some grease or foreign matter on the stem. It was concluded that the stem is not bowed or out of alignment in the area checked.

One interesting observation made by both Duke and B&W site personnel is that prior to and during the first hot functional test, there were no leakage problems. During this time, the stem leakoff connections were either capped or welded closed. The leakage began after the leakoff connections were hooked up. This may or may not be significant. To speculate, it could be that during the first tests the additional packing above the lantern gland was sufficient even though there was some leakage up through the first set of packing rings. It may be that the lantern gland and stem leakoff are not necessary. As previously discussed, the letdown cooler valves have not leaked excessively and the stem leakoff is plugged. Mr. Sigman has suggested to Duke Engineering that a small manual valve be added in the leakoff line for isolation to find out if the packing will hold without stem leakoff open.

A verbal report has just been received from B. Baker, B&W Site (3-16-73, 0800 hrs) that the repacking and testing has been completed. There is no leakage @ 1000 psig applied on the stuffing box. RC-V5 will be checked in the same manner and if there is leakage, it will be repacked using the same procedure as used for RC-V1.

RGB:ebc

R. G. Bromley

cc: LR Allen
WC Butt
BL Day/B Baker
J Ittner
GE Kulynych
R Pittman
O Putzgruber

As far as possible, the stem area in the stuffing box was visually inspected and no scoring of the stem was observed. Note that it is not possible to see the stem area in the lower stuffing box. We later tried to observe this area with a Fibrescope, but this was not successful. There is no reason to suspect stem scoring in the lower stuffing box since it was previously concluded that scoring occurred in the lantern ring zone.

During several discussions Wednesday, March 14, it was confirmed by Mr. Sigman that Grafoil had been installed, but no procedure was used to assure conformance with the recommendations of Union Carbide, the manufacturers of this packing. Without some special tools for compressing this material, it is not possible to install properly in valves with deep stuffing boxes, lantern gland, and gland nut arrangement such as we have. It was concluded that the valve had been packed improperly and this was the cause of excessive leakage.

The plan of corrective action is as follows:

1. Duke will make necessary tools as required to pack valves using Grafoil.

   NOTE: It is Duke's decision to use Grafoil packing.

2. Valve is to be packed in the prescribed manner as recommended by packing manufacturer.

3. Check torque to assure each gland nut is tightened equally.

4. Cycle valve by hand and check stem alignment using dial indicator.

5. Pressurize packing chamber through stem leakoff connection with portable hydro pump:

   a. Pressurize to 500 psig, hold and cycle. Check for leakage.

   b. Increase pressure to 1000 psig, cycle and check for leakage.

   After each cycle, it may be necessary to further tighten gland nuts. This should be done in accordance with packing manufacturer's recommendations.

This procedure and testing are to be observed by B&W with the results documented and reported upon completion. The real proof of the packing efficiency cannot be checked on this valve until the system is back to temperature and pressure.

We do not believe there is any reason for disqualifying the Univalve for service in the spray line. The inlet and outlet valves for the letdown coolers are identical with the exception of a smaller Limitorque, and there are no reports of excessive leakage. The operation of RC-V1 is slightly different in that it goes to 40% open whereas the letdown valves are either fully open or fully closed. However, the 40% travel should not be of concern because the stem moves only about 3/4" of its total stroke of 1 7/8."

LONGHAND MEMORANDUM — THE BABCOCK & WILCOX COMPANY

TO: Bob Burnly — R L PITTMAN

R J. Baker

CUST.

Duke Power Co.

SUBJ. SPR-444

Packing RC-VI with Grafoil packing

FILE NO. OR REF.

DATE 3/16/77

The following is the procedure actually used to pack and test RC-VI.

1. The valve was packed using the attached recommended procedure. The thickness of each ring of packing was 1/4" before being compressed. The valve after being packed has 11 ring below and 3 rings above the lantern ring. The lantern ring is lined up with leak off hole. This was verified by inserting a stainless steal wire into the leak off line and having contact with metal. The torque on the packing gland nuts after packing was 40 ft lbs.

2. A hydro pump (manual) was connected to the leak off line and using demin water, the lantern ring space was pressurized to 500 psi and 1000 psi and held at each pressure for 5 min. No leakage was observed and no decrease in hydro pressure was seen.

3. The pressure was reduced to 500 psi and the valve was cycled two times electrically. No leakage was observed and the gage remained at 500 psi.

4. The pressure was increased to 1000 psi and again the valve was cycled fully two times electrically. After 10 min, no leakage or pressure drop was observed.

LONGHAND MEMORANDUM — THE BABCOCK & WILCOX COMP

TO

FR

CUST. | FILE NO. OR REF.

SUBJ. | DATE 3/16/73

5. The pressure was dropped to 0 psi and the hydro pump disconnected. Today, Duke plans to insert a small piece of tubing into the leak off line and blow the water out with filtered air. This should prevent the water from corroding the stem.

6. The packing gland nuts were checked and found to be at about 20 ft. lbs. torque after the hydro, so the nuts were retorqued to 40 ft. lbs.

The actual time required to repack this valve with two men was about 45 hours (15 hrs. to remove the old packing and 30 hrs. to install new packing).

Because this packing procedure takes so long, it requires near constant supervision to prevent short cuts from being taken.

cc SAK
ELP

[illegible]

Installation of Preformed Impregnated GRAFOIL Rings
For Globe Valve Packing

GRAFOIL is a low, flexible and resilient form of graphite produced by Union Carbide Corporation. When impregnated and packed in stem seals, it is found to be an exceptionally high performance valve packing material. This type of packing is unlike any other packing material; therefore, to obtain optimum valve sealing, these instructions must be carefully followed.

Inspection of the Valve Chamber and Valve Before Packing.

1. The housing must be clean and free from extraneous material before packing with GRAFOIL. If packing a new valve, wiping with a clean rag should be sufficient. If repacking a previously packed valve, care should be used to remove all old packing. The use of such sharp types of packing tools to remove old packing is not recommended since it is likely to result in scored stem. Flat pick type of packing removal tools are preferred. An air blast may be advantageously used to remove all loose material. Inspection should be made of all packing surfaces in the valve, especially the stem finish.

2. Recommended finishes on the stem are 32 RMS or better for hand operated valves and 16 RMS or better for control type valves. Scratches and pits on the stem will accidently increase the probability of leakage, since the GRAFOIL will mold to these non-smooth surfaces and be torn in subsequent valve operation.

3. Recommended finishes for the valve housing I.D. are 125 RMS or better. Although the contact of GRAFOIL with this surface does not require a moving seal, the packing must mold into the surface and be constrained there. Too rough a housing finish will require excessive gland pressure for correct compressive molding to prevent leakage around the outside of the packing.

4. Radial clearances in the packing box from stem to wall must not exceed 0.020" radially. This applies to the bottom of the packing chamber and also to any lantern ring clearances. Radial clearances greater than the recommended 0.020" can result in extrusion of the GRAFOIL into the annular space under compression with deformation of the basic structure of the packing ring. Correction of excessive radial clearances in existing valves may be made by the use of an anti-extrusion washer (back ring) made from a compatible metal or carbon. The use of a carbon ring will remove any chance of the washer galling to or galling the stem finish. Care must be taken in the case of metal washers with respect to thermal expansion of the stem and housing under service temperature conditions. The use of abrasive type of anti-extrusion rings are

not recommended since with aging this type of material can lose [illegible] between the packing and stem. This condition can result in abrasion of the stem and progressive leakage.

Installation of GRAFOIL Packing Rings.

1. Rings of packing are generally shipped in pairs (two per box). Split rings are sealed in the bags as matched pairs and should be installed in the valve chamber as matched pairs.

2. Packing rings are designed dimensionally for interference fits to both valve body and gland I.D. This is necessary for proper sealing. If the ring drops loosely into the bottom of the chamber without the application of pressure, poor sealing will result and the ring should not be used.

3. The number of GRAFOIL packing rings supplied in a packing set are sufficient to more than fill the packing housing as designed by the valve manufacturer. The use of anti-extrusion rings in the bottom of the packing housing and at either side of the lantern rings (if any) may result in spare packing rings. These may be collected and used on other valves of the same manufacturer.

Packing Procedure.

1. Back-seat valve or bleed off all line pressure.

2. Remove gland nuts, flange, gland, and any lantern rings.

3. Remove all old packing (if repacking) and blow out chamber with compressed air.

4. Inspect chamber as recommended above for scratches and pits.

5. Install anti-extrusion ring if necessary (see above, Inspection of Valve Chamber, Step 4).

6. Gently ease one packing ring (or one set of matching halves if a split ring is used) into the entrance chamber. The gland ring or equivalent must be used at this point. Do not roll or prod the packing ring with pointed tools. The interference fit of the ring into the chamber requires that care be taken at this point to uniformly press the packing ring to prevent cocking and structural damage to the ring. If the ring is split, place the first ring in the chamber with the beveled ends facing up. Place the second split ring into the chamber with the beveled ends facing down. Make sure the split in each packing ring is staggered by 90° so that the splits on succeeding rings are not aligned.

7. Using a split ring follower (for example, a piece of proper radial dimensions cut lengthwise), press the rings to the bottom of the chamber. Do not attempt to seat more than two rings at one time as the pressure applied may not be sufficient to seat the lower rings and to densify them.

8. With the split ring follower (or the gland if dimensionally possible) in place, replace the gland flange and gland nuts and torque each set of two rings to at least a unit load of 1,000 psi (20-40 ft. lbs. torque for most packings) uniformly. This compression molds the rings to the stem, chamber wall and uniformly compacts all rings.

9. Remove gland nuts, gland, and split follower (if used) and repeat Steps 6, 7, and 8 until housing is completely within. Lantern rings and anti-extrusion rings must be installed in such a manner to ensure that drain location in chamber will coincide with the lantern.

10. When packing chamber housing is totally full and gland and gland nuts are in place, compress the packing to such a degree that the final height of the packing in the gland is 60% to 70% of the original uncompressed height. (Corrected for any anti-extrusion rings and lantern rings used.) This last compression insures that a load has been placed on the rings to have them yield and densify into the elastic region, assuring a good seal.

11. One or two additional rings of packing may be added if the final compression step seats the gland flange to the chamber top. The gland flange should be free from seating by 1/2" or more.

12. Operate the valve two full cycles (open to close to open or closed to open to closed is considered a cycle). [illegible] fly type valves operate a complete 360° to [illegible] packing and reverse 360° to effect a cycle.

13. Pressurize the packing and check for leakage. If necessary, tighten by turning each gland nut one-fourth (1/4) turn and recheck for leakage. Repeat if necessary until leakage is stopped. If it is necessary to tighten the packing after Step 13 above, operate the valve one cycle after each tightening.

The above torque values, 20-40 ft. lbs., are based on well lubricated threads.

The above procedure is based on normal expected conditions and may have to be modified. The basic sealing properties of preformed [illegible] depend on interference fit, stem and chamber wall, followed by sufficient compression to densify, reform and hold the ring in the [illegible]. Subsequent gland pressure, working the packing material in the [illegible], then affords the sealing action.

Copy to:
Larry Allen
3-12-73

Supplementary Information to SPR's 444
447
496

RC-V1

1. First Failure

Symptom - Cross leakage through packing - excessive travel.

Inspection: Button sheared from end of stem - stem no longer connected to plug. Stem scored by lantern gland ring. Yoke nut stripped.

Action: Replaced valve internals, yoke and yoke nut.

Evaluation: Limitorque improperly set up. Backseating on torque switch. Reset to shutoff on limit switch so as not to coast into back seat. Backseating to be done by hand. Some cycles on new internals prior to resetting operator.

Comments: Both yokes were loose in the threads on the valve body. Stem scoring attributed by Rockwell (Ray Green) to mis - alignment.

2. Second Failure

Symptom - Valve stuck shut.

Inspection: Stem had to be cut to permit dis-assembly. Seat in body and on plug damaged. Stellite gone on one side of plug. Stem scored by lantern gland. Backseat damaged. Limitorque gears damaged.

Motor side of clutch in close direction per sketch. Hand wheel side of clutch in open direction (no heat marks) in similar condition. Handwheel damage probably occured during attempts to backseat valve during 1st failure. Yoke nut destroyed during disassembly.

Action: Lapped in seat. Replaced plug & stem. Refaced limitorque operator mounting plate to improve alignment. Repacked with "Graffoil", and installed split lantern ring. Repaired operator.

Evaluation: Possibly partial engagement of clutch on motor gear allowed slippage and repeated hammer blows to drive valve into seat without opening torque switch. Heat marks and damage to limitorque gears suggest this. Operator would eventually stop on thermal overloads.

Comments: Ray Green (Rockwell Engineer) stated that he still suspects mis-alignment. No way to measure with valve installed. Operate and inspect stem for repeated scoring. Stem scoring & loss of stellite are symptoms of mis-alignment. Fix is to replace yoke if mis-alignment confirmed. Yoke has already been replaced once. DPC. maintenance personnel report that both yokes were loose in the threads and the threads would not provide alignment. Top of yoke was bowed due to excessive stem thrust. New yoke nut

would not screw in until threads were partially machined away.

3. Third Failure

Symptom: Cross packing leak (1st Set Only)

Inspection: To begin Tuesday 3/13 with Rockwell service man. Observation of operation gives impression (no quantitative measurement) that stem is whipping as it rotates and is moving laterally at the valve seats.

BLD/elc

cc: E. R. Kane
B. L. Day

Telecopy to Larry Allen.

Copy to each SPR involving RC-V1

Copy to Nuclear Service Support Engineer.

L. L. Patterson

Babcock & Wilcox

Power Generation Division
P.O. Box 1260, Lynchburg, Va. 24505
Telephone: (703) 384-5111

February 6, 1973

B73-034

Mr. S. K. Blackley
DUKE POWER COMPANY
P. O. Box 2178
Charlotte, N. C. 28201

Attention: Mr. T. F. Wyke

Subject: Oconee 1, 2 & 3
Rockwell Valves

Reference: Duke letter dated January 12, 1973, Sbj: Rockwell Valves

Gentlemen:

The following is submitted to comments made on the subject valves in the referenced letter:

1. Stem Material: The stem material of valves supplied by Rockwell is ASTM-A461, Grade 630. This material is not a ferritic stainless steel. It is, however, a precipitation hardened 17-4 pH material. This type material is used in numerous other places in the reactor coolant system and is considered to be completely compatible with boric acid solutions at high temperatures. For this reason we see no reason to pursue stem placement on the subject valves.

   In addition, Rockwell is supplying a replacement for the damaged stem from 1 RC-V1. The replacement stem will be ASTM-A638, Grade 660. We have reviewed this material for this application and find it to be acceptable.

2. Scored Stem: The scored stem from 1RC-V5 was visually examined by B&W and Rockwell personnel at Rockwell's Raleigh Plant. The stem was compared with a full sized detail drawing. Considering the location of the scored portion, the relative locations of the junk ring, the lantern gland, and the travel distance of the stem, the scoring had to occur in the lantern ring zone. The exact cause of the scoring is not known, however, it is highly probable that it was the result of the stellite lantern ring being cocked in the stuffing box. Rockwell personnel stated that they had not seen this type of damage before. They further stated that the lantern ring could have been installed in a cocked position at the factory or after repacking in the field. There was no evidence of wear or indications on

Pittman

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: L. R. Allen - Associate Project Manager - Reactor Contracts

From: A. L. Lowe, Jr. - Materials-Development - Component Engr. (2170) BDS 663.5

Cust.: Duke Power Company

File No. or Ref.: NSS-3 SPR444/1 12N2

Subj.: Rockwell Valve Stem Material

Date: January 23, 1973

This letter to cover one customer and one subject only

Reference: Memo From R. L. Pittman To L. R. Allen, Subject: Rockwell Valves, File No. As Above, Dated 1/22/73.

I would like to clarify the statement in the above referenced memo concerning valve stem material.

The currently used material is 17-4 PH which is a precipitation-harde ing stainless steel that was probably purchased to ASTM A-461, Grade 630. Although a stainless steel, it is only a distart cousin to Type 304 stainless steel. The 17-4 PH is considered compatible with the borated water environment of PWR's provided it is in the proper heat treated condition, (i.e., Condition H1150).

The ASTM dropped the A-461 specification and replaced it with a new specification for 17-4 PH. This new specification is A-564 but is so new that it did not make the 1972 Edition of the ASTM Standards. Because of this change in specifications, the vendor apparently has chosen a readily available new alloy for the stem. This new alloy is included in ASTM A-638 as Grade 660. The material is known commercially as A-286 Alloy which we use for several applications in our nuclear systems. The alloy is a stainless alloy, but its only similarity to 17-4 PH is the fact it is precipitation-hardening.

Please keep Duke Power Company correctly informed.

ALL,Jr./ja

cc: R. R. Beach
R. G. Burnley
J. C. Deddens
H. Hennicke
J. P. Ittner
G. S. Kulynych
P. J. McConnell
R. L. Pittman
R. V. Straub
G. T. Sund
S. S. Walker
Files

File NSS- 3

1242-SPR- 444/2

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To W.C. Butt - NSE For Action

R.G. Burnley - NSE

To R.J. McConnell - SOM For Information

J. Kaelin

J. Kennedy

K. Suhrke

H. Worsham

T. Sund - Punch

CONTRACT 620-00 03

SPR 444/2

TITLE RCV/STEAM LEAK

DATE 1-23-73

Date Reply to Be Submitted To Nuclear Service Support Engineer
Feb 1, 73

Action Requested: W.C. Butt Is REQUESTED TO Review this SPR and advise Nuclear Service on what action will be taken to resolve this problem.

R. L. Pittman

Nuclear Service Support Engineer

cc: G. E. Kulynych
E. G. Ward
G. M. Olds
R. T. Schomer
N. S. Embrey
J. McFarland
C. C. Plunkett - Contract Admin.
Central Engineering Files
E. V. DeCarli - Quality Assurance
STEVE DEW
O Putts gruber

MANHOUR LIMITS SR

COST LIMITS 500 SR 461

CHARGE No.

APPROVED:

Project Manager

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To
L. R. ALLEN, ASSOCIATE PROJECT MANAGER

From
R. L. PATTMAN, NUCLEAR SERVICE (2805)

BCS 663.5

Cust.
DUKE POWER COMPANY

File No. NSS-3 SFR 444/1
or Ref. 18M2

Subj.
ROCKWELL VALVES

Date
JANUARY 22, 1973

This letter to cover one customer and one subject only

Reports from the B&W site office have indicated that doubts are being expressed by some parties, concerning the compatibility of the stem material in our RC-V5 and RC-V1 with borated water.

Since this question has arisen, a complete review of these materials has been conducted.

These valve stems were manufactured from a 304 stainless steel; precipitation hardened to further enhance its strength characteristics. Upon completion of this hardening process, this material met all requirements of the ASTM 461, Grade 630. In summary, this material is a 17-4 pH stainless steel, which is considered compatible with high temperatures and borated water.

An order has already been placed with the Rockwell Corporation to furnish a replacement stem for RC-V1 which was damaged during hot functional testing. Since the original stem material is no longer available, it will be necessary to furnish a similar grade of 17-4 pH stainless steel, which meets the requirements of ASTM 638, Grade 630, and is considered by our Materials personnel as being acceptable for its proposed application.

Preliminary failure analysis to determine reasons for failure on 1-RC-V1 is that it was caused by a faulty limit switch setting. I have been advised by our Engineering Department that this is a setting performed in the field by the customer, which should alleviate B&W of any liability for this problem (SFR 444/1).

Please advise Duke Power Company of this matter.

RLP:nw

cc: R.R. Beach
R.C. Burnley
J.C. Deddens
H. Hennicke
J.P. Ittner
G.E. Kalinych
A.L. Lowe
R.J. McConnell
R.V. Straub
G.T. Sund
S.S. Walker

Pittman

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To
R. G. Burnley - Auxiliary Systems

From
A. L. Lowe, Jr. - Materials-Development - Component Engr.

- 70) BDS 663.5

Cust.
Duke

File No.
or Ref. NSS-3/8m30.41
Rockwell

Subj.
Valve Stem Materials-Spray Line Valve RC-V1

Date
January 17, 1973

[1] This format to cover one customer and one subject only.

I have reviewed Rockwell Manufacturing Company's proposed replacement stem material ASTM A533 Gr. 660 and find it acceptable for the proposed application.

Should they wish to continue to use this replacement stem material, I would recommend that it be specified in accordance with ASTM A564-72, "Hot-Rolled And Cold-Finished Age-Hardening Stainless And Heat-Resisting Steel Bars And Shapes."

I expect that one of their reasons for wanting to change this material is that they were not aware of the new specification covering Gr. 630 alloy.

ALL, Jr./ja
cc: L. R. Allen
D. F. Levstek
B. W. McDonald
W. L. Pittman
K. Schroeder
Files

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

To: A. L. Lowe - Principal Materials Engineer

From: R. G. Burnley - Auxiliary Systems (2281)

BDS 663-9

Cust.: Duke

File No. or Ref.: Rockwell NSS-3/8A30.41

Subj.: Valve Stem Material - Spray Line Valve RC-V1

Date: January 16, 1973

This letter to have one carbon and one subject only.

Due to damage that occurred to the original stem due to an improper set limit switch, the stem for the subject valve must be replaced.

The original stem material was furnished to ASTM A461 Grade 630. This ASTM spec was discontinued in 1971 and was replaced by A637, A638 and A639.

Rockwell Mfg. Co. proposes to furnish a replacement stem to ASTM A638 Gr 660. Maximum design conditions for the location of this valve (spray line to pressurizer) as 2500 psig @ 670F. Normal operation will be ~2200 psig @ 555 to 580F.

Please review this proposed valve stem material and let us have your recommendations, Per AI Manual, procedure NPG-0408-08.

Mr. Larry Allen, Proj. Mgmt., has given verbal approval for time required to be charged to 620-0003-98-05.

RGB:ebc

R. G. Burnley

cc: LR Allen
K Schroeder/WC Butt
RL Pittman

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

Distribution

From
R. L. Pittman, Nuclear Service (2805) RLP

BDS 663-5

Cust.
Duke Power Company

File No.
or Ref. NSS-3 SPR 444

Subj.
Rockwell Valves (SPR 444- NSS 3)

Date
January 15, 1973

This letter to cover one customer and one subject only

Distribution

R. P. Beach
J. P. Ittner
G. E. Kulynych
L. R. Allen
R. V. Straub
R. G Burnley
R. J. McConnell
H. Hemmicke
G. T. Sund
S. S. Walker
J. C. Dediens

On 1-12-73 a conference call was placed to the Rockwell Corporation in Raleigh, North Carolina to discuss the problems which have been recently experienced at the Oconee site.

The following personnel participated in the call from B&W:

L. Allen
R. Burnley
T. Sund
S. Walker
R. Pittman

The call was placed to Harry Crane, Dick Lawson and Jim Morris, all assigned to the Rockwell plant in Raleigh.

Among the several items discussed, Mr. Crane was informed of the immediate requirement for replacement parts to repair RC-V1 on Unit II, since parts had been removed from this valve during HFT to repair the damaged valve on Unit 1. Dick Lawson replied that spare parts for this valve were not stocked and it would require 3-4 months for machining and delivery unless it was of such urgency as to necessitate hand carrying them through the shop. Since these parts shall be used on 2 RC-V1, a target of one month was requested. Mr. Crane was advised that a Rockwell Service Engineer is requested to be at the Oconee site to re-assemble 2 RC-V1 when the parts are ready for shipment. Mr. Crane stated that the cause for failure on 1 RC-V1 was determined to be a faulty limit switch on the operator and that since this is a setting made by the customer, Rockwell is considered relieved of the financial responsibilities associated with this incident. This point was mutually agreed upon by both parties and a written report of this failure analysis was requested and promised for immediate delivery.

Mr. Crane was them reminded that there are at least 83 Rockwell valves at the Oconee job site that cannot be repacked with the operator in place and B&W is awaiting a

solution to this apparent design discrepancy. It was explained t us that a lantern ring similar to the existing one shall be utilized except that it will be in four pieces so it may be lifted up and removed from the valve allowing easy access to the lower packing rings. Mr. Crane was advised that this was considered by B&W as a Rockwell responsibility, and we needed an estimate of time involved before the correction will be made. He also agreed that the responsibility associated with this problem belonged to Rockwell and that they will make every effort to have these lantern rings machined and delivered to the job site during the first week of February, 1973. However, this is the plan for only 12 of the 83 valves concerned (the 2½" valves) because the remaining 1" valves were produced at the Rockwell plant in Sulphur Springs, Texas. Tom Sund agreed that he will contact the local Rockwell sales representative to coordinate the same solution for this problem on the remaining Rockwell valves, as agreed upon for the 2½" valves.

The next item presented to Rockwell was "that we question the ability to repack these valves in service by back seating them" as was specified by B&W when they were ordered. They were informed that two holes are in each disc plug which will seemingly allow system pressure inside the plug and into the area of the packing thus preventing packing removal under pressure. Dick Larsen explained that this valve has two backseats; one in its usual location and the second on the end of the stem, seating against the underside of the disc nut which prevents system pressure on the packing gland when the valve i backseated. According to the drawing of this valve it appears that this would indeed perform as Mr. Larsen had stated. Hart Hennicke has now informed me that when 1-RC-V5 was disassembled, that the backseat apparently would not seat because there was a sufficient amount of steam coming from the packing gland cavity to cause concern. If it 's determined that other valves of this type are also leaking past the backseat, then it must be resolved with Rockwell. This should be established by the site if probable, considering other scheduled committments.

Mr. Crane was advised that as soon as 1 RC-V5 is cut from the system it shall be returned to him for repairs to the cracked seat. It is his opinion that this valve can be readied for return to the site within 3-4 months. Meanwhile, the valve from Unit III will be borrowed and installed in Unit 1. It was mutually agreed that responsibility for this valve belongs to Rockwell.

Finally, Jim Morris stated that the stem material originally used to machine RC-V1 was no longer available (ASTM 461, grade 630). He stated that this material was a 316 SS, precipitation hardened, further enhancing its strength characteristics and meets the specifications of ASTM 461, grade 630. The new stem will be made from a similar material that is also considered acceptable for use with high temperatures and high concentrations of boric acid. The orginial material is a 17-4 ph SS, thus suitable for its application.

RLP/cs

LONGHAND MEMORANDUM — THE BABCOCK & WILCOX COMPANY

TO
SPR 444/1 File
R. Pittman

CUST.
DUKE Power Co.

FILE NO. OR REF.
NSS 3 SPR 444/1

SUBJ.
RCV-1

DATE
1-12-73

Internals from RCV-1 (Unit 2) was used to replace the damaged ones on Unit I. Parts are being made to reassemble the Unit II Valve.

R. Pittman

File NSS- 3
1242 - SPR - 444

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R.G. Burnley - NSE For Action
T. Sund - Purch.

To R.J. McConnell - S.D.M. (2) For Information
J. Kaelin - ARK
J. Kennedy - SMUD
K. Suhrke
H. Worsham
G.E. Kulynych
E.G. Ward
G.M. Olds
R.T. Schomer
J. McFarland
C.C. Plunkett - Contract Admin.
Central Engineering Files
H.F. Dobel - Quality Assurance

CONTRACT 620-00-03
SPR 444
TITLE RCV STEAM Leak and DAMAGE
MANHOUR LIMITS
COST LIMITS
DATE 1-9-73
CHARGE NO.

ACTION REQUIRED Bob Burnley and T. Sund are requested to review the initial specs required by B&W and determine if B&W received the valves as they were specified ie (cannot repack w/o removing the operator.) A meeting shall then be arranged to decide what course of action will be taken to resolve the problem on this "and" the other valves listed in this SPR with the same problem. Rockwell Rep is on site.

DATE FOR ACTION TO BE COMPLETED ASAP

RECOMMENDED R. L. Pattman
Nuclear Service Mgr
Support Engineer

cc:
STEVE DEW
O. Puttsgruber

APPROVED R. V. Shank
Project Manager

NCR Implementation No.	
16	620-0003-28-41

File MSS-3

12M2 - SPR - 444

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R.E. Ham - C.E. ~~For Action~~

To R.V. Straub - PM For Information

J.N. Kaelin - SOM

J.P. Kennedy - SOM

R.J. McConnell - SOM

K.E. Suhrke - Mgr Field Eng.

G.E. Kulynych
E.G. Ward
G.M. Olds
R.T. Schomer
J. McFarland
C.C. Plunkett - Contract Admin.
Central Engineering Files
E.F. Dobel - Quality Assurance

CONTRACT 620-00 03

SPR 444

TITLE RC-V1 Steam Leak

MANHOUR LIMITS

COST LIMITS

DATE 1/3/73

CHARGE NO.

ACTION REQUIRED

After discussion with Bob Ham concerning possible damage to the spray nozzle, it was resolved that no damage was done considering the AT existing at the time. This should resolve this SPR and the Site should clear SPR-444 Rev 00 upon reciept of this transmittal.

DATE FOR ACTION TO BE COMPLETED

cc: R.G. Bunley - S.E.

Stanley S. Walker
Nuclear Service Support Engineer

File NSS-3

1242 - SPR - 444

TRANSMITTAL SLIP

FIELD OPERATIONS SITE PROBLEM REPORT

To R.E. Ham - C.E. For Action

To R.V. Straub - PM For Information
J.N. Kaelin - SOM
J.P. Kennedy - SOM
R.J. McConnell - SOM
K.E. Subske - Mgr Field Eng
G.Z. Kulynych
E.G. Ward
G.M. Olds
R.T. Schoner
J. McFarland
C.C. Plunkett - Contract Admin.
Central Engineering Files
H.P. Dobel - Quality Assurance

CONTRACT 620-00 03

SPR 444

TITLE RC-VI Steam Leak

MANHOUR LIMITS

COST LIMITS

DATE 12/29/72

CHARGE NO.

ACTION REQUIRED

R.E. Ham is requested to investigate the possibility of damage to the spray nozzle as a result of the operations performed to stop the steam leak on RC-VI.

DATE FOR ACTION TO BE COMPLETED ASAP after HET

cc: R.G. Burnley

Stanley L. Hulbert
Nuclear Service Support Engineer

J.R. Allen

SD21807-4 (6.72)

REQUISITION -- EQUIPMENT & SERVICES

BABCOCK & WILCOX NPGD

TO: Purchasing	Date: 1/12/73	Serial No. NSS3/435-00		
FROM: Contract ☑	EDO ☐	Proposition ☐	Other ☐	
Contract, EDO or Proposition No. Contract	Comp No. 28	Group No. 41	Seq No. 1	☐ Normal Cost ☒ Abnormal Cost

If Abnormal Cost: Charge No. 620-00003-98-05

Customer: Duke Power Company

Req. for Quotation	☐	Mfg Release	☒	Attachments
Placement of Order	☐	Other	☐	SPR 444/1
Change Order	☐			

Please issue a purchase order to Rockwell Corp. to manufacture the following parts to be used as replacements for the ones removed from RCV-1 on Duke Unit II.

1. disc
2. disc nut
3. stem
4. lantern gland
5. junk ring
6. gland
7. yoke bushing
8. stem adaptor
9. set of packing

When these parts are ready for installation we shall require a service engineer from Rockwell at the site for rebuilding this valve as well as making the proper operator limit switch adjustments.

Any charges which have accrued up to this date as a result of Neil West's site visit and the failure analysis which is being forwarded by Rockwell should be included in this P.O.

Preliminary indications (telecon) has indicated that the reason for this failure is attributed to a faulty limit switch setting. Since this is a setting made by the customer, all charges associated with this problem should be back charged to Duke Power Company.

THIS MUST BE ESTABLISHED AND FIRMLY DEFENDED AGAINST VENDOR CHARGES

Page 1 of 1

Distribution	Approvals		Date
Originator P. L. Pittman	Originator	R L Pittman	1-12-73
Unit Mgr. R. E. Beach	Mgr.	R R Beach	1/12/73
Proj. Mgr. R. W. Straub	Proj. Mgr.		
QCD QA E. W. Dalzell			
Mgr. Contract Admin. (NSS Only) C. C. Pinkout			
Mgr. Fuel Contract (NSC Only)			
Contract File NSS-3 SPR 444/1			
12M2			
1283-98-05			

PDS-21053-

BABCOCK & WILCOX

REQUEST FOR C,D,G,L ORDER — POWER GENERATION GROUP - NPGD

DATE: 1/11/73	CUSTOMER: Oconee I	CONTRACT NO: 620-0003

SCOPE OF WORK AND REASON:

Procure replacement internals for RC-V1 which were damaged as a result of incorrect limit switch setting by Duke.

REFERENCE: SPR 441-1

REQUIRED START DATE Jan. '73 — REQUIRED COMPLETION DATE Jan. '73

OPINION OF RESPONSIBILITY:

- VENDOR ☐ _____ (VENDOR) _____ (P.O NO.)
- S&W ☐ _____ (RESPONSIBLE ORGANIZATION)
- OTHER ☒ Duke Power Co. (SPECIFY)

WORK CATEGORY:

- C (CORRECTIVE) ☐
- D (DESIGN CHANGE) ☐
- G (GUARANTEE) ☐
- L (LICENSING) ☐
- S (Suspense) ☒

ESTIMATED COST:

	MATERIALS	LABOR & EXP.	OTHER	TOTAL
ERECTION				
MANUFACTURING				
ENGINEERING 20 hrs. CC 350				300.00
VENDOR Rockwell Mfg.				
OTHER				1,700.00
TOTAL				$2,000.00

DISTRIBUTION:

PROJECT MANAGER	G. E. Kulynych
MGR. CONTRACT ADM.	C. C. Plunkett
CONTROLLER, NPG	G. F. Boatright
MANAGER, NPG QA	E. V. DeCarli
UNIT MGR., NPG	K. Schroeder
*MGR., NUCLEAR SERVICE	J. C. Dedlens
*PLANT MANAGER	
*SHOP MANAGER	
*QC MANAGER	
*MGR., SITE OPERATIONS	
*MGR., REACTOR CONTRACTS	
*GEN.MGR., FUEL DEPT.	
*PURCHASING MANAGER	R. A. Beal
*DEPARTMENT MANAGER	

*AS APPLICABLE

REQUESTED BY: R. L. Dixon 1/11/73

PREPARED BY: J. T. Williams 1/11/73

APPROVALS	SIGNATURE	DATE
PROJ. MGR.		1/11/73
MGR. REAC. CONTRACTS		
MGR. NUC. SERV.		
GEN. MGR. REAC. DEPT.		
VICE PRES. NPG		

UPON APPROVAL OF THIS ORDER, CHARGE AUTHORIZED WORK AND COSTS TO THE FOLLOWING: 620-0003-08-05

MGR. CONTRACT ADM. _____ (SIGNATURE) 1-11-73 (DATE)

REV.NO. -0-

REV.DATE _____

REQUISITIONER'S COPY

THE BABCOCK & WILCOX COMPANY

POWER GENERATION GROUP
P.O. Box 1260, Lynchburg, Va. 24505

B23-1/435-00

REQUISITIONED BY & DATE
R. Pittman 011273

ADDRESS

PURCHASE ORDER

DATE	NUMBER
022773	B259001.2

Bonwell Mfg. Company
300 N. Lexington Ave.
Pittsburgh, Pa. 15208
Attention: Mr. R. Boyle

SHIP TO

VENDOR NUMBER	CONTRACT NUMBER
	B26000326-1

THE REQUIRED DATE LISTED BELOW IS THE DATE MATERIALS/ITEMS ORDERED ARE REQUIRED AT DESTINATION IN U.S.A.

SHIP VIA | F.O.B. | TERMS OF PAYMENT

LINE	QUANTITY	U/M	DESCRIPTION	SHOP	CWT	COMM CODE	$ PRICE PER U/M	U/M
			CONFIRMING PURCHASE ORDER TO J. C. MORRIS RALEIGH PLANT.					
			Purchase the following replacement parts for valve mark MC-V1 furnished on B&W P.O. B146018, subject to original terms & conditions.					
	1		Disc, disc nut & stem assembly				$523.00	
	1		Jam ring				11.38	
	1		Gland				32.76	
	1		Yoke bushing				22.56	
	1		Stem adaptor				43.36	
	1		Set packing (9 rings)				17.48	
	1		Canopy ring				62.50	
	1		Lantern gland				N/C	
			Furnish sufficient amount of lantern glands, split design, for replacement of one (1) piece lantern glands on 24" up size valves. There is to be no additional charges to B&W for these lantern glands.					
			The above parts were received at the Duke Power job-site Thursday February 8, 1973.					
			Material Certs. for the disc and stem assembly are to be forwarded to B&W Lynchburg.					
			Furnish service representative to job-site for disassembly and reassembly of valve MC-V1. This was performed starting Fri. night February 16, 1973.					

---continued on next page

PLEASE FURNISH THE ITEMS ABOVE TO THE TERMS & CONDITIONS ON BACK HEREOF.
ACKNOWLEDGE THIS ORDER PROMPTLY AND STATE DEFINITELY WHEN SHIPMENT WILL BE MADE.

SALES TAX STATUS [E] EXEMPT [ ] NON EXEMPT STATE S.C. NO. 1002

PURCHASE ORDER, CONTRACT, ITEM AND FOLIO NOS. MUST BE SHOWN ON ALL PACKAGES, INVOICES, PAPERS AND DRAWINGS.

INVOICE IN QUADRUPLICATE SHOWING OUR PURCHASE ORDER NO., CONTRACT NO., ITEM NO., FOLIO NO., WHETHER PARTIAL OR FINAL BILLING AND MAIL TO THE ACCOUNTS PAYABLE DEPARTMENT AT THE ABOVE ADDRESS.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

BY _____
AUTHORIZED SIGNATURE

FOR INFORMATION REGARDING THIS ORDER PLEASE COMMUNICATE WITH OUR BUYER

REQUISITIONER'S COPY

THE BABCOCK & WILCOX COMPANY

POWER GENERATION GROUP

PURCHASE ORDER

DATE 022775 NUMBER 02596012

VENDOR NUMBER CONTRACT NUMBER

THE REQUIRED DATE LISTED BELOW IS THE DATE MATERIALS/ITEMS ORDERED ARE REQUIRED AT DESTINATION IN U.S.A.

REQUISITIONED BY & DATE

TO Rockwell Mfg. Company
Page 2

SHIP TO

SHIP VIA F.O.B. TERMS OF PAYMENT

CHARGES FOR FACTORY SERVICEMEN

	Monday thru Friday	Saturday	Sunday and Holidays
Daily Base (8 hours)	$128.00	$180.00	$240.00
Overtime Rate, Per Hour	22.50	22.50	45.00

Minimum charge per day is the eight-hour base for the first day. On any following day when less than eight hours are worked, the charge per hour will be calculated at the overtime rate subject to a minimum charge of four hours and a maximum not to exceed the daily base for that day of the week.

In addition, all transportation and living expenses at actual cost.

PLEASE FURNISH THE ITEMS ABOVE TO THE TERMS & CONDITIONS ON BACK HEREOF.
ACKNOWLEDGE THIS ORDER PROMPTLY AND STATE DEFINITELY WHEN SHIPMENT WILL BE MADE

SALES TAX STATUS ☐ EXEMPT ☐ NON EXEMPT STATE ______ NO. ______

PURCHASE ORDER, CONTRACT, ITEM AND FOLIO NO. MUST BE SHOWN ON ALL PACKAGES, INVOICES, PAPERS AND DRAWINGS.

INVOICE IN QUADRUPLICATE SHOWING OUR PURCHASE ORDER NO., CONTRACT NO., ITEM NO., FOLIO NO., WHETHER PARTIAL OR FINAL BILLING AND MAIL TO THE ACCOUNTS PAYABLE DEPARTMENT AT THE ABOVE ADDRESS.

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

BY ______________________
AUTHORIZED SIGNATURE

FOR INFORMATION REGARDING THIS ORDER PLEASE COMMUNICATE WITH OUR BUYER