MAY 2 0 1987

In Reply Refer To:
Docket: 50-285

Omaha Public Power District
ATTN: R. L. Andrews, Division Manager-
Nuclear Production
1623 Harney Street
Omaha, Nebraska 68102

Gentlemen:

This refers to the Enforcement Conference conducted in the NRC Region IV office on May 14, 1987, with you and other members of your staff and Region IV staff members to discuss the findings of the NRC inspections conducted during the periods March 23-27, 1987, and April 6-10, 1987, which were documented in our NRC Inspection Reports 50-285/87-08, dated May 8, 1987, and 50-285/87-05, dated May 8, 1987, respectively.

The subjects discussed at this meeting are described in the enclosed meeting summary.

It is our opinion that this meeting was extremely beneficial and provided a better understanding of the concerns identified during the inspection.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter will be placed in the NRC's Public Document Room.

Should you have any questions concerning this letter, we will be pleased to discuss them with you.

Sincerely,

Original Signed By
E. H. Johnson

J. E. Gagliardo, Chief
Reactor Projects Branch

Enclosure:
Attachment - Meeting Summary

cc w/enclosure:
W. G. Gates, Manager
Fort Calhoun Station
P. O. Box 399
Fort Calhoun, Nebraska 68023

PI	C:RPB	C:RPB
RPMullikin:cs	DRHunter	JEGagliardo
5/19/87	5/ /87	5/ /87

IE45

Harry H. Voigt, Esq.
LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, NW
Washington, D. C. 20036

Kansas Radiation Control Program Director

Nebraska Radiation Control Program Director

bcc to DMB (IE45)

bcc distrib. by RIV:

RPB	RRI	R.D. Martin, RA
RPSB	Section Chief (RPB/B)	MIS System
RIV File	DRSP	RSTS Operator
RSB	Project Inspector, RPB	D. Weiss, RM/ALF
R. Hall		

Attachment

Omaha Public Power District

May 14, 1987

Meeting Summary

Licensee: Omaha Public Power District (OPPD)

Facility: Fort Calhoun Station (FCS)

License No.: DPR-40

Docket No.: 50-285

Subject: Enforcement Conference Concerning NRC Inspection Findings (NRC Inspection Reports 50-285/87-05 and 50-285/87-08)

On May 14, 1987, representatives of OPPD met in Arlington, Texas, with NRC Region IV and NRR personnel to discuss the findings documented in the two NRC inspection reports dated May 8, 1987. The attendance list and licensee presentation are attached. The meeting was held at the request of the NRC, Region IV.

The NRC discussed the generic implications of the inspection findings in the areas of welding and maintenance activities. The licensee discussed the concerns and stated their views and any corrective action proposed or accomplished.

Enclosures:
1. Attendance List
2. FCS Presentation

Enclosure 1

Enforcement Conference Attendance List - Region IV

Omaha Public Power District

NRC Attendees:

R. E. Hall, Deputy Director, Division of Reactor Safety and Projects, RIV
J. E. Gagliardo, Chief, Reactor Projects Branch, RIV
D. R. Hunter, Chief, Project Section B, Reactor Projects Branch, RIV
D. A. Powers, Enforcement Officer, RIV
R. E. Ireland, Chief, Engineering Section, RIV
P. H. Harrell, Senior Resident Inspector, Fort Calhoun Station
E. B. Tomlinson, Project Engineer, NRR, HQ
J. R. Boardman, Reactor Inspector, RIV
L. D. Gilbert, Reactor Inspector, RIV
T. C. McKernon, Reactor Inspector, RIV
R. P. Mullikin, Project Inspector, RIV

Licensee Attendees:

R. L. Andrews, Division Manager, Nuclear Production, Fort Calhoun Station
K. J. Morris, Division Manager, QA and Regulatory Affairs
R. C. Liebentritt, Division Manager, Engineering
M. E. Eidem, Jr., Department Manager, Generating Station Engineering (GSE) - Mechanical
S. K. Gambhir, Section Manager, GSE
J. J. Fisicaro, Supervisor, Nuclear Regulatory and Industry Affairs
T. J. McIvor, Supervisor, Technical
M. R. Core, Supervisor, Maintenance
J. L. Skiles, Senior Quality Project Engineer, Sergeant and Lundy

ENCLOSURE 2

PROCEDURES UPGRADE PROGRAM

OBJECTIVES

- IMPROVED TECHNICAL CONTENT OF ALL OPERATING MANUAL PROCEDURES.
- ESTABLISH CONSISTENCY IN LEVEL OF DETAIL AND FORMAT FOR EACH PROCEDURE TYPE.
- INCORPORATE HUMAN FACTORS INTO ALL PROCEDURES.
- VALIDATE PROCEDURES AGAINST DESIGN BASIS.

PROCEDURES UPGRADE PROGRAM

APPROACH

- DEVELOP PROCEDURES WRITERS' GUIDE TO INCORPORATE INPO, NRC AND INDUSTRY "GOOD PRACTICES".

- PROVIDE PRELIMINARY DRAFT OF GUIDE TO ALL PERSONNEL TO BE USED AS INTERIM GUIDANCE.

- ASSIGN A MULTIDISCIPLINARY TEAM OF OPPD PERSONNEL TO CONDUCT REVIEW AND REWRITE OF THE OPERATING MANUAL.

- ESTABLISH A PROGRAM PLAN AND SCHEDULE FOR A STRUCTURED REVIEW OF EXISTING PROCEDURES AGAINST THE WRITERS' GUIDE CRITERIA AND REVISION OF THE PROCEDURES AS NEEDED.

- UPON COMPLETION OF THE DESIGN BASIS RECAPTURE PROJECT, ALL PROCEDURES WILL AGAIN BE REVIEWED AND REVISED AS NEEDED TO ENSURE COMPLIANCE.

PROCEDURES UPGRADE PROGRAM

- WRITER'S GUIDE FOR MAINTENANCE PROCEDURES WILL BE REVISED TO ENSURE TORQUE REQUIREMENTS OR OTHER MEANS OF ASSURING CORRECT TENSIONING ARE SPECIFIED FOR CQE FASTENERS WHERE APPRCPRIATE.

- ALTHOUGH CURRENTLY INCLUDED IN THE WRITERS' GUIDE, THE NEED TO DEFINE ACCEPTANCE CRITERIA FOR ANY READINGS OR MEASUREMENTS TAKEN WILL BE EMPHASIZED.

- ALL TEST EQUIPMENT TO BE USED WILL BE REQUIRED TO INCLUDE DEFINITION OF ACCEPTABLE RANGES FOR USE.

- MEGGERING EQUIPMENT WILL BE SPECIFICALLY ADDRESSED IN THE WRITERS' GUIDE FOR MAINTENANCE PROCEDURES WHERE APPROPRIATE.

PROCEDURES UPGRADE PROGRAM

NEAR TERM SCHEDULE

- APRIL 30, 1987
  - COMPLETED OP/OI WRITERS' GUIDE.
  - IMPLEMENTED WRITERS' GUIDE AS INTERIM GUIDANCE FOR ALL PROCEDURES.

- MAY 31, 1987
  - COMPLETE WRITERS' GUIDES FOR ALL OTHER OPERATING MANUAL PROCEDURES (MP, ST, RP, EPIP, ETC.).
  - ESTABLISH PROCEDURE REVIEW/REWRITE TEAM.

- JUNE 30, 1987
  - FORMALLY IMPLEMENT ALL GUIDES AFTER INCORPORATING COMMENTS.
  - COMPLETE SCHEDULE FOR FULL REVIEW AND REVISION OF OPERATING MANUAL

FORT CALHOUN STATION PLANT LIFE EXTENSION PROGRAM

- BOTH FINDINGS RELATE TO ESTABLISHING AND MAINTAINING A PROGRAM TO ADDRESS DESIGN LIFE OF SPECIFIC COMPONENTS

- OPPD HAS INITIATED A PLANT LIFE EXTENSION (PLEX) PROGRAM THAT WILL ESTABLISH A MECHANISM FOR ADDRESSING THE PLANT EQUIPMENT THAT IS SUSCEPTIBLE TO AGING DEGRADATION. THE PROGRAM WILL RESULT IN AN INTEGRATED APPROACH TO CRITICAL EQUIPMENT MAINTENANCE AND REFURBISHMENT.

- PART OF THE LOGIC TO BE BUILT INTO THE PLEX PROGRAM WILL BE A DETERMINATION OF THE ACCEPTABILITY OF CORRECTIVE VERSUS PREVENTIVE MAINTENANCE FOR CRITICAL COMPONENTS. THIS LOGIC IS BASED ON THE SAFETY AND AVAILABILTY IMPACT OF COMPONENT FAILURE.

- INDUSTRY AND VENDOR INFORMATION WILL BE USED TO DEFINE PREVENTIVE MAINTENANCE STRATEGIES FOR EACH COMPONENT.

- GOAL FOR END OF 1987 IS TO HAVE DEFINED ALL EQUIPMENT THAT MUST BE INCLUDED IN THE PLEX PROGRAM.

FORT CALHOUN WELDING PROGRAM

I. History

A. Procedures were adapted from construction procedures.

B. Original basis - high quality welds, but limited number.

C. Centralized nuclear/fossil welding program developed 1977.

D. Extensive modifications, especially structural, showed program needed improvement.

E. AWS procedures added to program in 1986.

II. 1985 SSOMI and QA audit findings

A. Workmanship - generally adequate, but could be better.

B. QC inspections - greater consistency needed among inspectors.

C. QC inpsection forms required additional detail.

D. Welder qualification and performance records needed improvement.

III. Corrective actions for SSOMI and QA audit findings

A. Maintenance training program.

B. QC inspector training - permanent employees and contractors.

C. Revised QC inspection log, documentation forms.

D. Upgraded records program.

IV. Welding program revisions - 1986

A. Developed separate Standing Order (G-12A) to address just welding. - including documentation requirements.

B. Centralized weld rod issue.

C. Added additional inspection requirements.

D. Added weld design data forms.

V. 1987 Welding Inspections

A. Les Gilbert - 3/87

B. John Tetreault - ANI/ANII - 3/87-4/87.

C. Hartford steam boiler ANSI N626.1 and ASME Section XI, Division 1 4/87.

D. OPPD Quality Assurance audit of welding program 4/87.

E. Summary of problems identified.

1. Weld procedures should have additional detail - code references, materials, etc.
2. Qualification records are scattered, maintenance of qualification is difficult to verify.
3. Additional detail is needed in QC inspection records - code references, etc.

F. Basic reason for problems - lack of awareness.

VI. Generic program improvements (in progress)

A. Additional Technical review and revision of ASME welding procedures.

B. Additional Technical review and revision of AWS welding procedures.

C. Automated welder qualification documentation program. - ready for data entry

D. Additional Technical review and revision of NDE procedures.

VII. Specific responses to Inspection Reports 87-08 and 87-14

A. Welder qualification records

1. Complete review of all available documentation back to 1973 - 8 man weeks.
2. One safety-related weld made by a welder whose certification had lapsed.
3. Evaluation to be completed prior to restart.

B. WPS-51 thickness range - to be corrected by revision to program.

C. F1 vs F4 filler metal - believed to be a typographical error - to be corrected by revision to program.

D. Postweld heat treatment for WPS-1 to be corrected by revision to program. PWHT will not be used unless it is adequately addressed in a procedure.

E. Completion of MR-81-180

An engineering analysis has been performed to address the strength requirements of as-built configuration. A flare-bevel procedure has been developed and qualified using the same techniques that were used to make the field welds. Field welds will be reinspected and this data will be used to provide additional support for the justification of the existing welds.

F. Pentrameter placement on radiography of EFWST

OPPD believes we are on solid technical ground, position is supported by ANI. Nevertheless, all radiography of repair welds since inspection 87-14 has been done with the penetrameter on the source side and the first two repair welds have been re-examined in this manner.

G. Hydrostatic test pressure.

Has been revised to 55 psig (1.1 X design pressure) per ASME Section XI. Note: operating pressure is 0.5 psig N_2 over head pressure.

VIII. 1987 Refueling Outage

As a result of SSOMI, strong emphasis has been placed on high quality welds and inspections. Quality has been demonstrated on jobs such as replacement of pressurizer spray valves and piping, installation of RCS root valves and replacement of HCV-247 and HCV-248. The efforts have also extended to structural welding on such modifications as the inverter bypass transformers and the storage platform in the containment. OPPD does not believe that the problems identified are serious enough to affect restart of the unit. They are largely documentation problems and not problems with weld quality. The problems, however, will be corrected.

IX. Corrective action schedule

A. Confirmatory reviews of welding and NDE in progress.

B. Procedure revisions to be in place by 9/1/87.

C. Automated qualification records program under development. - ready for data entry

D. Welder qualifications to be updated and records system fully operational by 10/1/87 (Revised welding procedures must be in place first).

X. Safety related welding

A. Will be done by qualified people using qualified procedures.

B. Special attention during interim until all upgrades are in place.

EMERGENCY FEEDWATER TANK AND OTHER EATON TANKS

I. Discovery

A. Planned to sandblast and recoat.

B. High crowns and rough welds on inside of tanks- concerned about coating adhesion.

C. Decided to grind welds flush - MT to verify no surface or wear-surface defects.

D. MT showed substantial indications.

E. RT of all tanks welds to determine extent of repairs required.

II. Design conditions

A. ASME Section VIII, Division 1, 1965.

B. Base metal A 285 grade C plate, nominal thickness 1".

C. Weld metal

1. Inside - manual using Lincoln Shield Arc 85 rod (equivalent to 7010-A1).

2. Outside - submerged arc multi-pass after air arc gouge to root pass.

D. Design pressure 50 psig - hydrostatically tested to 75 psig.

E. Seismic joint efficiency - 85% - partial RT

F. Built by Eaton Metal Products, 1969.

III. Operating conditions - 0.5 psig N_2 over head pressure

IV. Probable cause and extent of defects

A. Cracks, slag inclusions, lack of fusion.

B. Approximately 40% of total weld requires repair.

C. Probable cause - contributing factors

1. Use of Shield Arc 85 rod without preheat - shrinkage.

2. Improper cleaning of copper deposits from arc gouge - leads to lack of fusion.

3. Poor workmanship.

D. Metallurgical analysis - brittle fracture, no fatigue (not service - induced)

V. Repair procedures

A. Grind or arc gouge to remove defects.

B. QC inspection to verify cleaning, MT to verify that defect has been removed.

C. Weld repair using E7018 rod, 200°F preheat.

D. MT and RT following repair.

E. Hydro to 55 psig following completion of repairs.

F. EFW tank is part of our ISI program. Examined under ASME Section XI. Repaired to ASME Section III, Subsection ND 1983, summer 1984.

G. Repair procedure approved by ANI.

VI. Eaton tanks

A. Survey performed to determine what tanks were constructed by this manufacturer, followed by failure assesment.

B. EFW tank is most critical.

C. Diesel generator fuel oil tank.

1. Cleaned and inspected 1987 - no readily apparent problems.
2. Petro-Tite leaks test performed - ok.
3. Buried tanks - soil support.
4. Engine and wall-mounted day tanks.

D. CCW tank

1. Operating pressure is a fraction of design (20%).
2. Fluid is clean, non-corrosive.
3. Hydrotest to 55 psig in 1983.
4. RW is installed back up.

VII. General considerations on return to operation

A. Catastrophic failure is unlikely.

B. Leaks are detectable.

C. Leaks can be dealt with - commercial consideration, not a nuclear safety problem.

POTENTIAL VIOLATION

FAILURE TO IDENTIFY AND RETRIEVE RECORDS

3.b.2 THE NRC INSPECTOR REQUESTED THE ORIGINAL DESIGN BASE CALCULATION AND ORIGINAL INSTALLATION RECORDS ("CODE DATA PACKAGE") FOR THE MS SAFETY RELIEF VALVE LINE FLANGE JOINT BOLT STRESS LEVEL. THE LICENSEE WAS UNABLE TO RETRIEVE THESE RECORDS.

. . .VIOLATION OF 10 CFR 50 APPENDIX B CRITERIA XVII.

3.c.2 THE NRC INSPECTOR REQUESTED ORIGINAL DESIGN BASE CALCULATIONS AND INSTALLED RECORDS FOR THE PRESSURIZER SRV LINE FLANGE JOINT BOLT STRESS LEVEL AND BOLT TORQUE.

. . .VIOLATION OF 10 CFR 50 APPENDIX B CRITERIA XVII.

3.d.3.a THE FAILURE OF THE LICENSEE TO IDENTIFY AND RETRIEVE ORIGINAL DESIGN CALCULATIONS FOR BLADE ANGLES ON FANS VA-3A, VA-38, VA-7C, AND VA-7D IS ANOTHER EXAMPLE OF POTENTIAL VIOLATION (285/8705-02), FAILURE TO MEET 10 CFR 50, APPENDIX B, CRITERION XVII.

SUMMARY

1. DESIGN BASIS RECORDS ARE NOT EASILY RETRIEVABLE.

2. TORQUE VALUES FOR THREADED FASTENERS ARE NOT TRACEABLE TO THE DESIGN BASIS DOCUMENTS.

SHORT TERM CORRECTIVE ACTIONS:

PLANT STAFF HAS DEVELOPED AN INTERIM PROCEDURE FOR VERIFYING TORQUING REQUIREMENTS FOR SELECTED SAFETY RELATED EQUIPMENT WHICH WERE DISASSEMBLED AND/OR MAINTAINED DURING THIS OUTAGE.

THREADED FASTENER ANALYSIS

DOCUMENT NUMBER MO SRDCO MP	PRC APPROVED PROCEDURE PROC? YES or NO
ITEM OR TAG NUMBER	
FASTENER SIZE AND PITCH / /	FASTENER MATERIAL
LUBRICANT	ALLOWABLE STRESS
TORQUE VALUE =	IMPOSED STRESS

BASIS (REFERENCE CODE/VENDOR DATA):

SUPPORTING DOCUMENTATION: (SAFETY ANALYSIS, TELECON, ETC.)

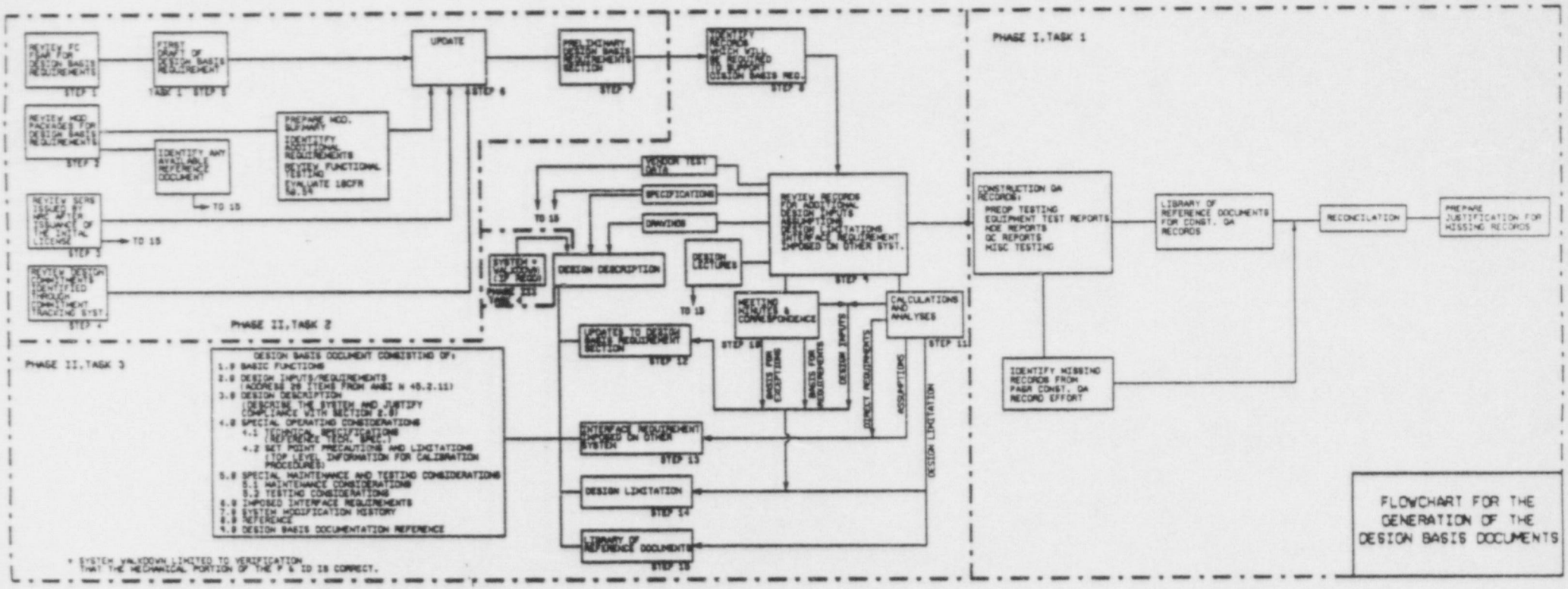
STUDS RETORQUED? Y N

STUDS CHANGED? Y N

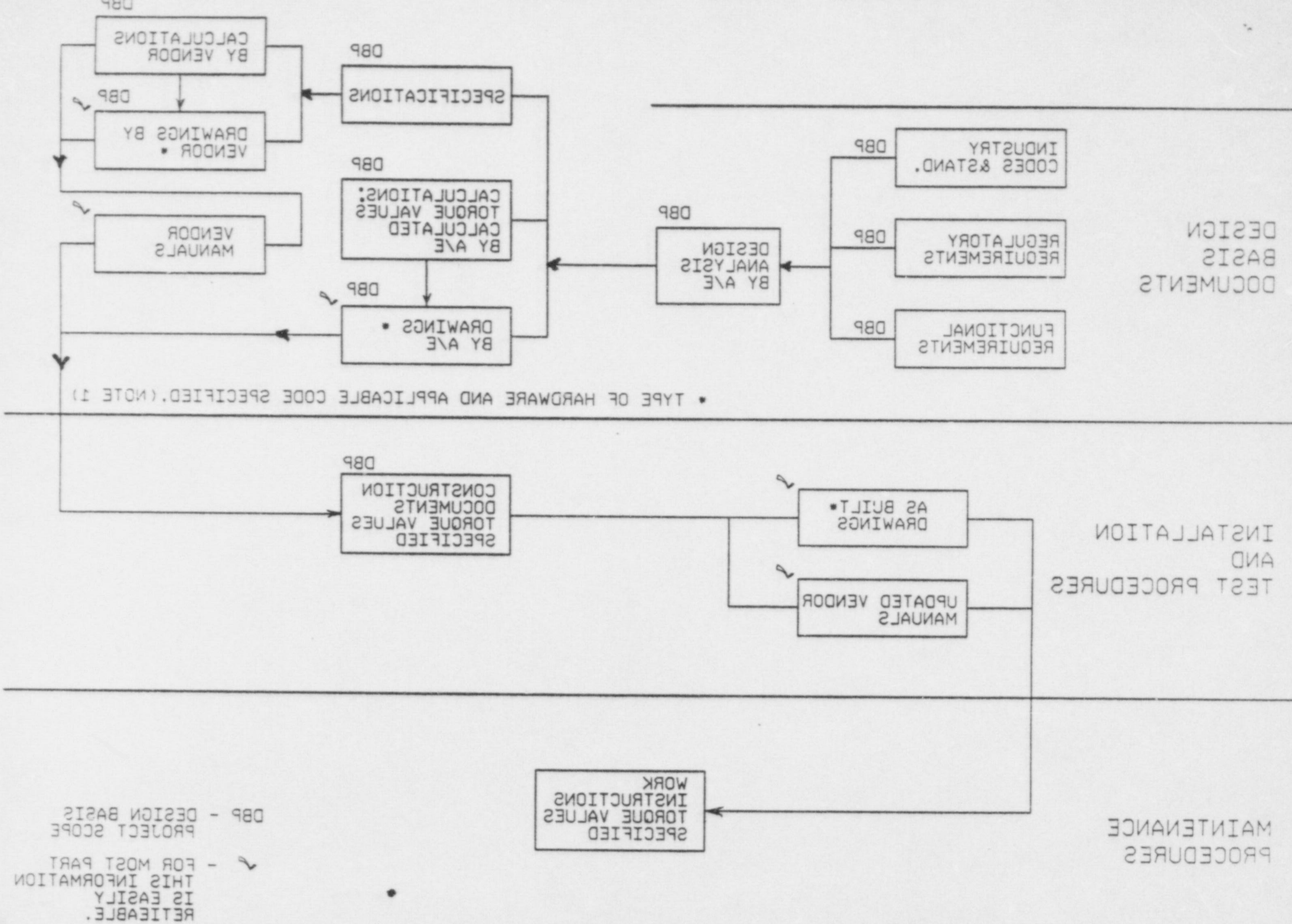
PROCEDURE CHANGED? Y N

} any needed justification for no provided

COMPLETED BY:	DATE:
REVIEWED BY:	DATE:


REVIEW FC TASK FOR DESIGN BASIS REQUIREMENTS
STEP 1
FIRST DRAFT OF DESIGN BASIS REQUIREMENT
TASK 1, STEP 5
UPDATE
STEP 6
PRELIMINARY DESIGN BASIS REQUIREMENTS SECTION
STEP 7
REVIEW MOD. PACKAGE FOR DESIGN BASIS REQUIREMENTS
STEP 2
IDENTIFY ANY AVAILABLE REFERENCE DOCUMENT
TO 15
PREPARE MOD. SUMMARY
IDENTIFY ADDITIONAL REQUIREMENTS
REVIEW FUNCTIONAL TESTING
EVALUATE 10CFR 50.59
REVIEW SCRS ISSUED BY NRC AFFECTING OPERATION OF THE FACILITY
STEP 3
TO 15
REVIEW DESIGN COMMITMENTS IDENTIFIED THROUGH COMMITMENT TRACKING SYST.
STEP 4
PHASE II, TASK 2
PHASE II, TASK 3
DESIGN BASIS DOCUMENT CONSISTING OF:
1.0 BASIC FUNCTIONS
2.0 DESIGN INPUTS/REQUIREMENTS
(ADDRESS 20 ITEMS FROM ANSI N 45.2.11)
3.0 DESIGN DESCRIPTION
(DESCRIBE THE SYSTEM AND JUSTIFY COMPLIANCE WITH SECTION 2.0)
4.0 SPECIAL OPERATING CONSIDERATIONS
4.1 TECHNICAL SPECIFICATIONS (REFERENCE TECH. SPEC.)
4.2 SET POINT PRECAUTIONS AND LIMITATIONS (TOP LEVEL INFORMATION FOR CALIBRATION PROCEDURES)
5.0 SPECIAL MAINTENANCE AND TESTING CONSIDERATIONS
5.1 MAINTENANCE CONSIDERATIONS
5.2 TESTING CONSIDERATIONS
6.0 IMPOSED INTERFACE REQUIREMENTS
7.0 SYSTEM MODIFICATION HISTORY
8.0 REFERENCE
9.0 DESIGN BASIS DOCUMENTATION REFERENCE
* SYSTEM WALKDOWN LIMITED TO VERIFICATION THAT THE MECHANICAL PORTION OF THE P & ID IS CORRECT.
VENDOR TEST DATA
SPECIFICATIONS
DRAWINGS
REVIEW RECORDS FOR ADDITIONAL DESIGN INPUTS DESIGN BASIS LIMITATIONS INTERFACE REQUIREMENT IMPOSED ON OTHER SYST.
STEP 9
SYSTEM * WALKDOWN (IF NEEDED)
PHASE III, TASK 4
DESIGN DESCRIPTION
DESIGN LECTURES
TO 15
VENDOR & CONTRACTOR CORRESPONDENCE
STEP 10
CALCULATIONS AND ANALYSES
STEP 11
UPDATED TO DESIGN BASIS REQUIREMENT SECTION
STEP 12
BASIS FOR EXCEPTIONS
BASIS FOR REQUIREMENTS
DESIGN INPUTS
DIRECT REQUIREMENTS
ASSUMPTIONS
DESIGN LIMITATION
INTERFACE REQUIREMENT IMPOSED ON OTHER SYSTEM
STEP 13
DESIGN LIMITATION
STEP 14
LIBRARY OF REFERENCE DOCUMENTS
STEP 15
PHASE I, TASK 1
CONSTRUCTION QA RECORDS:
PREOP TESTING
EQUIPMENT TEST REPORTS
NDE REPORTS
QC REPORTS
MISC TESTING
LIBRARY OF REFERENCE DOCUMENTS FOR CONST. QA RECORDS
RECONCILIATION
PREPARE JUSTIFICATION FOR MISSING RECORDS
IDENTIFY MISSING RECORDS FROM PAST CONST. QA RECORD EFFORT
FLOWCHART FOR THE GENERATION OF THE DESIGN BASIS DOCUMENTS

TORQUE VALUES FOR FASTENERS



NOTE 1 - NEEDS TO BE VERIFIED

LONG TERM CORRECTIVE ACTIONS

1. REVIEW MAINTENANCE PROCEDURES TO VERIFY THAT APPLICABLE DESIGN DRAWINGS/ CODES AND/OR VENDOR MANUALS ARE REFERENCED ON THE MAINTENANCE PROCEDURES.

2. REVISE MAINTENANCE PROCEDURES TO INCLUDE INSTRUCTIONS THAT ONLY ONE FOR ONE FASTENER REPLACEMENT IS ACCEPTABLE.

3. TORQUE VALUES SPECIFIED SHALL BE CONSISTENT WITH THE TYPE OF HARDWARE PER EPRI PUBLICATION AND DESIGN DRAWINGS AND APPLICABLE CONSTRUCTION CODE REQUIREMENTS.

4. GSE REVIEW APPLICABLE DESIGN DRAWINGS TO ENSURE THAT ACCURATE FASTENERS DATA IS AVAILABLE ON DESIGN DRAWINGS REFERENCED IN MAINTENANCE PROCEDURES. (PIPE SUPPORTS, PIPING ISOMETRICS, SEISMIC SUPPORTS FOR MECHANICAL AND ELECTRICAL EQUIPMENT.)

5. DEVELOP THE FOLLOWING DOCUMENTS TO SUPPLEMENT THE ABOVE ACTIONS:

   - CRITERIA FOR USE OF FASTENERS (SPECIFY ACCEPTABLE FASTENERS, APPROVED LUBRICANTS, STRESS VALUES, TORQUE REQUIREMENTS, ETC.).

   - DESIGN GUIDE - DISCUSS APPLICATION OF THE CRITERIA.

   - FC STANDING ORDER ON FASTENERS TO DOCUMENT REVIEW PROCESS.

SCHEDULE

THE ABOVE ACTIONS ARE PLANNED TO BE COMPLETED BY 6/88.

POTENTIAL VIOLATION

50-285/8705-14

FAILURE TO USE REQUIRED LUBRICANT IN ELECTRICAL EQUIPMENT QUALIFIED (EEQ) LIMITORQUE VALVE OPERATORS.

THE LICENSE INDICATED THAT HCV-383-4-0, HCV-347-0, HCV-348-0, HCV-331-0, HCV-383-3-0, AND HCV-333-0 LIMITORQUE OPERATORS CONTAINED A MIXTURE OF NEBULA EP-1 AND MARFAK GREASES WHICH THEY CONSIDERED QUALIFIED EVEN THOUGH SUCH PRACTICE CONTRADICTED THE SPECIFIC REQUIREMENTS OF THE APPLICABLE LIMITORQUE TYPE SMB INSTRUCTION AND MAINTENANCE MANUAL, BULLETIN SMB1-828. THE DOCUMENT USED AS JUSTIFICATION WAS BOLT AND ASSOCIATES LETTER DATED JUNE 17, 1986, "MIXING MARFAK WITH NEBULA EB OR (SUN OIL COMPANY) PRESTIGE 50 EP."

THE LETTER BEGINS WITH A STATEMENT THAT NO PROBLEM EXISTS WITH LIMITORQUE OPERATORS BECAUSE OF MIXING, SINCE INCOMPATIBILITY IS LIKELY TO RESULT IN "SOFTENING" (A DE-HYDROLYZATION OR DE-SAPONIFICATION OF THE GREASE INCREASING ITS FLUIDITY). THE LETTER STATES THAT THIS WOULD BE NO PROBLEM SINCE THE GREASE IS CONTAINED IN THE GEAR BOX. ADVERSE CHEMICAL REACTIONS (BEARING CORROSION, ETC.), REDUCTION OR LOSS OF EXTREME PRESSURE (EP) CHARACTERISTICS, OR SEPARATION OF OIL FROM THE MIXTURE, ALL OF WHICH MAY RESULT FROM INCOMPATIBILITY OF THE GREASES, WERE NOT ADDRESSED.

THE LETTER SUMMARIZES WITH A PARAGRAPH WHICH STATES:

> "I DO NOT WISH MY COMMENTS ON MIXING GREASES TO BE CONSTRUED AS ENDORSING SUCH A PRACTICE. I AGREED WITH LIMITORQUE (BULLETIN SMBL-80) THAT THIS SHOULD NOT BE DONE AS A MATTER OF POLICY. IT IS NOT A GOOD IDEA, PARTICULARLY IF THE GREASES MIXED INVOLVE DIFFERENT GELLING AGENTS, AS IS TRUE WITH THE SITUATION AT HAND. THE BEST PRACTICE IS TO PICK AN APPROVED GREASE (NEBULA IS THE ONLY ONE APPROVED FOR EVERYTHING) AND STAY WITH THIS PRODUCT DOWN THE ROAD. IF MORE THAN ONE SUPPLIER IS DESIRED OR AS OTHER PRODUCTS ARE QUALIFIED, IT WOULD KEEP WITH MATERIALS CONTAINING AT LEAST THE SAME GELLING AGENTS."

MARFAK AND NEBULA EP GREASES HAVE DIFFERENT GELLING AGENTS.

LIMITORQUE HAS STATED THAT QUALIFICATION OF THEIR OPERATORS IN CONTAINMENT IS CONTINGENT UPON THE SOLE USE OF EXXON NEBULA EP GREASES.

FAILURE TO USE THE REQUIRED GREASE IS A POTENTIAL VIOLATION OF 10 CFR 50.49 (285/8705-14).

Bolt & Associates

Consulting Services

Lubricants • Lubrication • Radiation Effects

June 17, 1986

Robert O. Bolt, Ph.D.

Mixing Marfak with
Nebula EP or
Prestige 50 EP

Mr. J. E. Thomas
Duke Power Company
Design Engineering Department
Box 33189
Charlotte, North Carolina 28242

Dear Jim:

(1) You ask if a problem exists with Limitorques as a result of the above. The simple answer is no, and I will detail the reasons here.

Incompatibility due to mixing or radiation and thermal stresses are likely to result in softening of the grease mixtures. This softening creates increased possibility of leaks away from parts to be lubricated. This is no concern with Limitorques because the lubricant is contained in a sealed gear case. A grease or an oil is quite satisfactory in such equipment. A grease is specified just to reduce leakage through seals. The

(2) base oil and additives that perform the lubrication function will do their job irrespective of the softness of the lubricant in the gearboxes.

You can satisfy yourself on incompatibilities (even though I do not believe there is a problem) through periodic inspection of the lubricants in the gear cases. Visual observation should suffice, but representative samples can also be taken for analy-

(3) sis. For direct observation, use a spatula and poke it into the grease to work the lubricant around to judge consistency. This should be after having done the same thing with the fresh product to become familiar with the "feel" of the material. Look for any leakage through seals, as well. Such leakage leaves behind increased concentrations of gelling agent and a harder grease mixture. If one has to add say 15% as make-up due to leakage, the Limitorque should be removed from service for repair.

The grease specified by Limitorque for use inside containment is Exxon Nebula EP. This is a calcium-complex-gelled product. The Texaco Marfak is a sodium soap-gelled grease. I have no

data directly on these two products. However, data are available on similar materials with the same two gelling agents (F. S. Meade, "Compatibility of Lubricating Greases," Report No. 61-2132, Rock Island Arsenal Laboratory, Department of the Army, 1961). No appreciable incompatibility showed up on simple mixing.

The Sun Prestige 50 EP grease is gelled with lithium hydroxy stearate. No direct data are available on it either with mixtures of the Texaco grease. However, similar greases showed no difficulty in the Rock Island Arsenal study.

4 I would expect irradiation to cause an additional amount of softening, but one would have to go above 10^8 rads to induce a great effect--a high dose for normal situations. Again, though, softening is no problem with Limitorques. Limitorque actually has qualified Nebula EP greases to doses of 2×10^8 rads and 140°F ambient with a transient of 340°F. It also qualified the Sun product to 2×10^7 rads at 120°F ambient and 250°F transient.

5 I do not wish my comments on mixing greases to be construed as endorsing such a practice. I agree with Limitorque (Bulletin SMBL-80) that this should not be done as a matter of policy. It is not a good idea, particularly if the greases mixed involve different gelling agents, as is true with the situation at hand. The best practice is to pick an approved grease (Nebula is the only one approved for everything) and stay with this product down the road. If more than one supplier is desired or as other products are qualified, I would keep with materials containing at least the same gelling agents.

You have our prepublication draft or piece, "Radiation Effects on Lubricants." This is being published by EPRI. It is designed for use by engineering and design personnel as an education paper. Jim Carroll and I are working on a second piece--"Lubrication in Nuclear Power Plants." This is for operations personnel and details various lube applications and suppliers of products for these. It also addresses such application problems as the consequences of mixing greases. We expect this publication to be out as another EPRI report in the Fall of 1986.

I hope this information will serve your needs. Please call if I can be of further help.

Very truly yours,

cc: Mr. R. N. Kubik, EPRI
Mr. J. G. Carroll

LIMITORQUE LUBRICATION DISCUSSION

BACKGROUND:

- UP UNTIL AUGUST OF 1986, OPPD'S POSITION ON LIMITORQUE LUBRICATION WAS THAT TEXACO MARFAK GREASE ALONG WITH LIMITORQUE QUALIFIED EXXON EP-0, AND A MIXTURE OF MARFAK AND EP-0 WERE ADEQUATE FOR USE IN VALVE OPERATORS.

- THE MARFAK WAS JUDGED ADEQUATE BASED ON INFORMATION SUPPLIED BY TEXACO AND THE MIXTURE WAS CONSIDERED ADEQUATE BASED ON INFORMATION WHICH TOLD OPPD TO MIX THE GREASE AND SEE IF IT SEPARATED, WHICH IT DID NOT. (LIST REFERENCE AND SUMMARIZE)

- MIXING IS BELIEVED TO HAVE OCCURRED IN 383-3 AND 383-4.* THIS STANCE WAS BASED ON THE ANALYSIS WHICH OPPD BELIEVED TO BE ALLOWED UNDER THE DOR GUIDELINES. (NEED COPY OF DOR GUIDELINES)

- OPPD HAD INFORMED THE NRC EARLIER IN THE 1984 TER MEETING RESPONSE THAT MARFAK GREASE WAS CONSIDERED QUALIFIED.

- ON AUGUST OF 1986, OPPD LEARNED THROUGH INFORMATION SUPPLIED ON TVA AND DUKE POWER STATIONS AUDITS THAT OPPD'S POSITION ON LIMITORQUE LUBRICANTS SHOULD BE RE-EXAMINED.

*EXXON EP-0 WAS CONSIDERED TO BE THE PRIMARY LUBRICANT.

- BASED ON INFORMATION SUPPLIED BY DUKE POWER, IT WAS LEARNED THAT MIXING IS NOT A GOOD PRACTICE AND THAT THE MARFAK 2 ANALYSIS MAY BE INADEQUATE.

- TO ENSURE THAT NORMAL OPERATION COULD CONTINUE AND COULD BE CONSIDERED SAFELY, A JCO WAS PREPARED AND DOCUMENTED IN GSE-FC-86-822.

- GREASE CHANGE OUT DURING THE 1987 REFUELING OUTAGE WAS RECOMMENDED.

- TO DATE, NEARLY ALL OF THE GREASE HAS BEEN CHANGED OUT INCLUDING 383-3 AND 383-4.

- DISCUSSION WITH PLANT MAINTENANCE INDICATED THAT NO DAMAGE TO THE GREASE AND BEARINGS HAS OCCURRED WITH ANY OF THE GREASE CONFIGURATION.

- IN ADDITION, THE GREASE THAT WAS FOUND IN 383-3 AND 383-4 LOOKED IN GOOD CONDITION.

- THE GREASE WAS FOUND TO BE OF A "DIFFERENT COLOR" DUE TO MIXING, BUT SHOWED NO SIGNS OF SEPARATION OR HARDENING.

- MOV TESTING BY MOVATS INDICATED THAT MOV VALVE OPERATORS AT FCS WAS NOT BEING IMPACTED BY SUCH THINGS AS LUBRICANTS SUBSTANTIATING OPPD'S BELIEF THAT LUBRICATION WAS ADEQUATE.

- A MAY 11, 1987 CONVERSATION WITH EPRI'S LUBRICANT CONSULTANT DR. ROBERT O. BOLT, INDICATED THE FOLLOWING:

  - THERE SHOULD BE NO CHEMICAL REACTION ONLY A POSSIBLE CHANGE IN THE GELLING AGENT COULD OCCUR. IF THE GREASE HAD NOT HARDENED OR SEPARATED IT SHOULD BE OK - WHICH IT APPEARED TO BE.

  - THE BEST WAY TO DETERMINE DAMAGE VIA LUBRICATION PROBLEMS, WOULD BE TO INSPECT. THE GREASE CHANGE OUT PLUS MOVAT TESTING SHOWED NO GEAR OR BEARING PROBLEMS.

  - COLOR IS NOT A PROBLEM - IT IS COSMETIC ONLY.

- DURING EARLIER REPLACEMENT OF MARFAK WITH EP-0 IN THE 1983-1984 TIME FRAME, THERE WAS NO LUBRICATION DAMAGE QUESTION RAISED, WHICH FURTHER SUBSTANTIATED OPPD'S JUDGMENT WHICH DETERMINED THAT A JCO COULD BE SUPPORTED.

CONCLUSIONS

- IN 1985, BASED ON GOOD FAITH, OPPD CONCLUDED THAT MIXED GREASES WERE ACCEPTABLE PER DOR GUIDELINES.

- AFTER LEARNING THE RESULTS OF DUKE POWER AUDIT, OPPD TOOK PROMPT ACTION TO ANALYZE THE SITUATION AND PREPARED A JCO.

- DURING 1987 OUTAGE GREASES IN ALL LIMITORQUES WERE REPLACED WITH EP-0 GREASE.

- MOVAT TESTING HAS VERIFIED THAT NO DAMAGE WAS CAUSED BECAUSE OF MIXED GREASE.

UNRESOLVED ITEM (285/8705-13)

LUBRICATION OF CONTAINMENT COOLING FAN MOTORS AND LIMITORQUE OPERATORS

THE LICENSEE WAS LUBRICATING RELIANCE MOTORS IN CONTAINMENT ON AN 18-MONTH (REFUELINC OUTAGE) IN LIEU OF 3-6 MONTH PERIODICITY, AND HAD USED MARFAK LUBRICATION IN LIEU OF NEBULA EP-0 IN LIMITORQUE OPERATORS IN CONTAINMENT. THIS WILL REMAIN AN UNRESOLVED ITEM PENDING FURTHER REVIEW DURING A SUBSEQUENT INSPECTION (285/8705-13).

CONTAINMENT FAN LUBRICATION

VA-3A, 3B, 7C, 7D

- THE LUBRICATION FREQUENCY OF THE CONTAINMENT VENTILATION FAN MOTORS (VA-3A, 3B, 7C, 7D) IS BASED ON APPENDIX B, "GENERAl DESIGN COMMENTS FOR RELIANCE MOTOR . . .," OF "SIMULATED ENVIRONMENT TEST FOR JOY AXIVANE FAN/MOTOR FOR NUCLEAR CONTAINMENT FOR THE FORT CALHOUN NUCLEAR POWER STATION. . .," WHICH RECOMMENDS A MAXIMUM LUBRICATING FREQUENCY OF TWO YEARS.

- THIS INFORMATION WAS REVIEWED BY S&L AS PART OF OUR 1985/1986 EEQ COMMITMENT TO REVIEW MOTOR MAINTENANCE IN THE EEQ PROGRAM TO CLOSE OUT THE 1985 INSPECTION REPORT ON OPPD'S EEQ PROGRAM.

- BASED ON THE ABOVE INFORMATION, A MAINTENANCE FREQUENCY OF EVERY REFUELING OUTAGE IS ADOPTED FOR LUBRICATION OF THE FAN MOTORS.

- OPPD BELIEVES THAT OUR PRESENT LUBRICATION SCHEDULE IS ADEQUATE.

GSE-B-2-2 Form	PREPARED BY J.K. Fischer	SH. 1 CONT. ON SH. F
Rev. 10/85	CHECKED BY [illegible]	
MR No.	APPROVED BY H. Faulhaber	
	REV. 4 DATE 4/3/86	OMAHA PUBLIC POWER DISTRICT GENERATING STATION ENGINEERING

ELECTRICAL EQUIPMENT QUALIFICATION

DOCUMENTATION FILE

EEQ-H-08

5.0 MAINTENANCE REQUIREMENTS

EQUIPMENT: Reliance
Fan Motors

QUALIFIED LIFE: 40 YEARS

MAINTENANCE REQUIRED TO MAINTAIN QUALIFIED LIFE:

Per the E.Q. Analysis, S&L CQD-020062 the fan motors VA-3A, VA-3B, VA-7C, and VA-7D require relubrication of the bearing at a frequency of 2 years. Procedure PM-EE-12 provides the direction to perform this maintenance. The Q.L. Program schedules the performance of PM-EE-12 for the four tag nos. at a minimum frequency of every outage.

PERIODIC TESTING REQUIREMENTS TO MAINTAIN QUALIFIED LIFE:

None Required

ADDITIONAL MAINTENANCE REQUIREMENTS:

In S&L Letter No. CQD-026793 of January 3, 1986 it is stated that there needs to be drainage path for moisture condensation in the conduits that go to the fan motors. The conduits that carry the power feed to these motors runs horizontally from the terminal boxes. The conduits that carry the power feed to the terminal box enter the terminal box from the bottom. This will provide adequate drainage.

6) Chemical Spray

Per Reference 3, page 12 and Reference 2, page 4 the boric acid 5000 PPM (2.5 pounds of boric acid in 500 pounds of water) was injected into the chamber during accident environment performance test. It envelops our requirements of 2000 PPM Boron.

7) Submergence and Flood Level

As per Electrical Equipment Qualification Manual, the level of flooding for containment is 1000.9'. The subject motors are located above the flood level (per SCEWs) and submergence is, therefore, not applicable.

3) Operability

The functional operability of the motor is shown in the Accident Environment Performance Test (See Reference 2, pages 4 and 5, Section 4.2. Since the motor was energized for the test, the operability of the moter is verified.

)) Synergism

There is no known synergistic effect identified on the materials of the subject equipment.

)) Maintenance and Surveillance

Re-lubricate the motor bearing at a maximum of 2 years intervals as recommended by the vendor (Reference 1, page 10)

) Main Steam Line Break (MSLB) Analysis

MSLB analysis performed by the District indicates a temperature transient of 355°F in containment. This transient shows that the containment temperature exceeds the predicted LOCA temperature of 305°F for a period of 35 seconds.

Since during the "Rapid Pressure Rise Cycles" testing motor was operated in the chamber at temperature at 400°F and with full electrical load the MSLB requirements are met.

SARGENT & LUNDY ENGINEERS CHICAGO

Calcs. For	Reliance Motor Fan Motor	Calc. No.	COD-020062
		Rev. 00	Date 4-8-85
X Safety-Related	Non-Safety-Related	Page 1	of 7

Client	OPPD	Prepared by	Date 4-8-85
Project	Fort Calhoun - Unit 1	Reviewed by	Date 4-8-85
Proj. No.	7236-40 Equip. No. See below	Approved by	Date 4-8-85

Purpose

Perform engineering evaluation and analysis to show that the components identifed below are environmentally qualified for use at Fort Calhoun Unit 1 Nuclear Station.

References

1) Wyle Laboratories Report No. 26333-28, Thermal Aging Analysis of Containment Ventilation Fan Motors Manufactured by Reliance Electric, dated June 22, 1982.

2) Joy Manfacturing Company Report No. FF-12521, Test Procedure for Accident Environmental Testing of Fan for Nuclear Fueled Power Generating Station, dated July 31, 1970.

3) Joy Manufacturing Company Report No. X-377A, the Simulated Environment Test for Joy Axivan Fan/Motor for Nuclear Containment, dated September 3, 1970.

4) OPPD Interoffice Memorandum #GSE-FC-82-222, dated March 2, 1982.

5) Letter from R. D. Schilz of Joy Manufacturing to M. Watson of Stone & Webster with attachment, dated April 5, 1983.

Equipment Identification

Tag No.	Name	Serial No.	Function	Location
VA-3A	Motor	2X321793A1-CV	Fan Motor	Containment
VA-3B	"	2X321793A2-CV	"	"
VA-7C	"	1X321793A2-CV	"	"
VA-7D	"	1X321793A1-CV	"	"

Assumptions

It is assumed that the non-metallic materials of motors for fans VA-7A & 7B are same as those for fans VA-3A & B since both have the same insulation Class 'N'.

5.0 CONCLUSION

The intent of this report was to identify materials susceptible to significant thermal aging degradation when subjected to the specified temperatures for the durations associated with each temperature.

Based on a degradation parameter of 50 percent loss of dielectric strength as the critical property, all materials of the motor insulation system are not considered susceptible to significant degradation when evaluated for the time/temperature degradation effects of the environmental service conditions of Section 2.1. If the motor bearings are relubricated at maximum two (2) year intervals as recommended in Reference 6, time/temperature aging affects are not anticipated to significantly degrade the lubricating grease.

6.0 REFERENCES

1. Docket No. 50-285; Omaha Public Power District's Response to the USNRC Safety Evaluation Report on Environmental Qualification of Safety-Related Electrical Equipment at the Fort Calhoun Station; Enclosures 1 and 16.

2. Letter to Mike Capella (OPPD) from Jim Thompson (Wyle) dated April 27, 1982. Subject: Containment temperatures, Fort Calhoun Station, Unit 1.

3. Contact Report: Mike Capella (OPPD) to Bruce Vatthauer, Jim Thompson (Wyle) dated June 14, 1982. Subject: Containment ventilation motor (items VA-3A/3B) operating time requirements and plant specific levels for post-accident duration and environmental temperature.

4. Elements of Polymer Degradation, Leo Reich, et. al., McGraw-Hill Book Company, New York, 1971, Library Code 256-80.

5. "IEEE Guide for the Statistical Analysis of Thermal Life Test Data," IEEE 101-1972, Library Code 265-80.

6. "General Design Comments - Reliance Electric Co. Motor Fan Drive for Reactor Containment Building Ventilation and Cooling System," Joy Manufacturing Company.

7. "PYRE-M.L. Wire Enamel," E. I. duPont de Nemours & Company, Bulletin #19 (Revision #5), January, 1977, Library Code 399-80A.

8. "Life Equations - DuPont's U.L.-Recognized Insulation Systems," April 21, 1979, and "Properties and Performance of Nomex Type 410 Aramid Paper," DuPont Bulletin No. NX-7, November, 1977, Library Code 145-78A.

9. DuPont U.L. File No. E 39505, November 15, 1968, Library Code 173-78A.

10. "Temperature Indices of Industrial Thermosetting Laminates," NEMA Pub. L15-1969, March 19, 1969, Library Code 001-78A.

11. "Varnished Glass Cloth, Exremely Flexible Class 180C," Westinghouse Electric Corporation Technical Data No. 64-580, February, 1979, Library Code 459-81.

12. "Thermal Stability of Electrical Varnish," April 30, 1954, Dow Corning Number CE50A, Library Code 371-80A.

Report On The

SIMULATED ENVIRONMENT TEST FOR JOY AXIVANE FAN/MOTOR FOR NUCLEAR CONTAINMENT REFERENCE JOY MANUFACTURING CO. FF12521

For
FORT CALHOUN NUCLEAR POWER STATION
OMAHA PUBLIC POWER DISTRICT
FORT CALHOUN, NEBRASKA

CUSTOMER:

WALDINGER CORPORATION

Thru

AMERICAN AIR FILTER COMPANY
LOUISVILLE, KENTUCKY
AAF P.O. No. 7391-CN481-108 (SECTION 21)

JOY AXIVANE FAN MODEL 60-30-1200(MM) NUCLEAR
SERIAL NO. GF-13111 PART NO. 500722-49

Incorporating a Motor of
RELIANCE ELECTRIC CO. MANUFACTURE
FRAME 5008 SERIAL NO. 2X321793A1-CV
RATED 460V/3 PH/60 CY

FORT CALHOUN : SECTION 21 : UNIT VA 3A/B

MR. DICK FOOTE
216-339-8200

NEW PHILADELPHIA DIVISION
JOY MANUFACTURING COMPANY
328 SOUTH BROADWAY
P. O. BOX 431
NEW PHILADELPHIA, OHIO 44663

GENERAL DESIGN COMMENTS
RELIANCE ELECTRIC CO. MOTOR FOR FAN DRIVE
FOR
REACTOR CONTAINMENT BUILDING
VENTILATION AND COOLING SYSTEM

The following delineated conditions were the basis for the motor/fan design specification:

1. Radiation. Maximum dosage of 10^9 Rads of Gamma Radiation during the life of motor.
2. Short time temperature during emergency mode of 300° F. ambient for 3 to 4 hours duration, then a gradual decay to 150° F.
3. Vapor pressure of 80 psig during emergency mode.
4. Short time exposure to 100% relative humidity during emergency mode. With vapor droplets and slightly caustic atmosphere.
5. Normal air pressures of 18.3 psia.
6. Normal exposure to 50% relative humidity, at 125 to 150° F.
7. Average motor winding temperature of 180° C. (Class H Hotspot).
8. Design life of 40 years.

CORROSION PROTECTION

For added moisture and corrosion resistance protection, an epoxy resin is applied to all internal motor metal surfaces and over the varnished radiation resistant winding. This epoxy coating has been used by Reliance for over 10 years and has performed satisfactorily in special chemical and weather-proof a-c motors. It has been demonstrated that this epoxy is not affected by a 10% Sodium Hydroxide Solution.

BEARINGS AND LUBRICATION

Bearings both thrust and radial will be of the anti-friction type, double shielded ball bearings. Bearings will be held in place by a cast iron cartridge enclosure. This enclosure provides for a large capacity grease reservoir and incorporates the "Metermatic" lubrication system which provides an automatic grease relief along the shaft preventing overgreasing. Bearings shall have calculated B-10 Life in the magnitude of 100,000 hours.

Lubrication, grease, shall be suitable for the radiation and temperature exposure. Grease will be Aeroshell No. 5 or Chevron BRB No. 2. In the interest of maintaining maximum reliability, it is recommended that the bearings be relubricated at two (2 year intervals (maximum interval).

STANDARD FACTORY TESTS

Each furnished motor shall undergo standard factory test as follows:

1. Running light current.
2. Running light watts.
3. Resistance, stator.
4. Hipot Test.
5. Cold insulation meggar.
6. Air gap measurement.
7. Generated noise in operation.

LUBRICATION OF MOTORS

MOTORS furnished in all JOY Series 800/1000/2000/3000 fans have been lubricated with Chevron SRI #2 grease and it is recommended that the customer continue to use this lubricant in future lubrications. If this grease cannot be obtained, the only other suggested lubricants are:

OPERATING TEMP. —25° C. (—15° F.) to 50° C. (120° F.)

CHEVRON OIL	SRI No. 2
SHELL OIL CO.	DOLIUM R
TEXACO, INC.	PREMIUM RB

MINIMUM STARTING TEMP. —75° C. (—100° F.)

SHELL OIL CO.	AEROSHELL #7

Using a hand operated grease gun only, pump in the following recommended grease volume:

FRAME SIZE	VOLUME IN CUBIC INCHES	
	1800 RPM And Slower	3600 RPM
182 Thru 215	0.5	0.5
254 Thru 286	1.0	1.0
324 Thru 365	1.5	1.5
404 Thru 449	2.5	1.0
5000	2.5	1.5

Lubrication frequency per the following schedu

HORSEPOWER	*STANDARD CONDITIONS	**SEVERE CONDITIONS
1 thru 7½ 1800 RPM and slower	3 years	1 year
10 thru 75 1800 RPM and slower	2 years	6 to 12 mon
100 and greater 1800 RPM and slower	1 year	<6 months
All over 1800 RPM	6 months	3 months

***STANDARD CONDITIONS:** Eight hours per day, normal or l loading, clean, @ 40° C. (100° F.) maximum ambient.

****SEVERE CONDITIONS:** Twenty-four hours per day operatio shock loading, vibration, or in dirt or dust @ 40-50° C. (120° F.) ambient.

Motors with Class H, Type RN or Class H, Type RH in lation systems, nuclear applications, must be lubrica with Chevron SRI #2 with no substitutions permit

Some high horsepower motors have special bearir These fans have a motor lubrication instruction pl mounted on the outside of the fan near one of the gre fittings. Follow the instructions on this plate in lieu the standard instructions printed here.

143T and 145T frame motors are assembled with suffici grease in the bearing cavities to lubricate the bearings for Therefore, no grease fittings are provided on these

LUBRICATION OF CONTROLLABLE PITCH MECHANISMS

CONTROLLABLE PITCH FANS require periodic lubrication for fan pitch control mechanisms and blade bearings (depending upon hub size or style) in addition to the fan motor bearings. An external grease fitting is located on the actuating bar of the lever assembly or on the casing near the actuating bar or on the mechanism hood bell. PUMP BY MEANS OF HAND GREASE GUN AS INDICATED BELOW **AT SIX (6) WEEK INTERVALS:**

BALL BEARING CONTROL MECHANISMS	
MECHANISM PART NUMBERS	LUBRICATION AMOUNT
P/N 500988-84, 85, 86, 87 for 26½" dia. hubs P/N 500988-115, 116, 117, 118 for 17½" dia. hubs	Hold the grease relief cap closed and carefully pump in grease until it is seen oozing between the bearing housing and the adjusting disc. Rotate fan rotor slowly by hand while lubricating to insure grease cavity is completely filled.

CAUTIONS:

- Grease slowly to prevent rupture of the bearing shield.
- Use only SRI #2 or Joy recommended equivalent grease.

ROLLER BEARING CONTROL MECHANISMS		
MECHANISM PART NUMBERS	LUBRICATION INSTRUCTIONS	
	*STANDARD CONDITIONS	**SEVERE CONDITIONS
P/N 500988-152, 156, 157 for 26½" dia. hubs P/N 500988-151, 164, 165, 166 for 17½" dia. hubs P/N 500988-167 for 30" dia. hubs	¾ cu. in.	1¼ cu. in.

***STANDARD CONDITIONS:** Eight hours per day, normal or lig loading, clean, @ 40° C. (100° F.) maximum ambient.

****SEVERE CONDITIONS:** Twenty-four hours per day operation shock loading, vibration, or in dirt or dust @ 40-50° C. (1(120° F.) ambient.

RECOMMENDED LUBRICANT FOR CONTROLLABLE PITCH MECHANISMS:

TEXACO PREMIUM RB No. 2
Operating Temperature
−35°C (−30°F) to +150°C (+300

BLADE BEARINGS in textile service rotors and large horsepower units have lube fittings at the base of eac blade. These should be greased once per year.

HISTORY

NRC CONCERN #285/8705-03 APPLICABLE CODE AND SPECIFICATION REVISIONS FOR PIPING SYSTEM DESIGN

NRC CONCERN:

1. LICENSEE PLANT ENGINEERING PERSONNEL WERE UNABLE TO IDENTIFY TO THE NRC INSPECTOR WHICH REVISION OF THE CODE WAS BEING USED BY FORT CALHOUN STATION OR, DURING PREVIOUS PERIODS OF TIME, WHICH REVISIONS WERE APPLICABLE.

NRC CONCERN:

2. SINCE NEBRASKA IS A CODE STATE, LATER PIPING SHOULD HAVE BEEN TO THE ASME B & PVC, WHEN CODE WAS EXTENDED TO PIPING.

APPLICABLE CODES (PIPING, VESSELS) WHEN FORT CALHOUN STATION DESIGN WAS STARTED

USAS B31.1 - PIPING

ASME SECTION III - VESSELS - NUCLEAR

VIII TANKS/H/E/VESSLES

LATE 1960'S - 1967 - 1968

USAS B31.1 - NON "NUCLEAR" PIPING

USAS B31.7 - NUCLEAR PIPING

CL. 1, 2, 3

ASME SECTION III - NUCLEAR VESSELS

VIII - VESSELS

EARLY 1970'S - 1973 - 1974

ASME SECT. III NUCLEAR VESSELS - PUMPS - VALVES - PIPING

FORT CALHOUN STATION DESIGN

CODES

RCL PIPING: USAS B31.1 & WITH A STRESS ANALYSIS MEETING REQUIREMENTS OF ASME SECT. III - 1967

CQE PIPING: USAS B31.7 1968

OTHER PIPING: USAS B31.1 1967

DESIGN BASIS CODES

LOCATION

USAR

SYSTEM (SEE RC FOR EXAMPLE)

APPENDIX (SEE APP. F FOR EXAMPLE)

DRAWINGS

GO TO P & ID - PICK OFF IC DRAWING

LOOK AT IC DRAWING - GIVES DESIGN BASIS

OTHER DRAWINGS GIVE DESIGN BASIS ("D" DRAWINGS ALSO)

APPLICABLE VENDOR DRAWINGS

APPENDIX N

DID NOT REDESIGN OR RECONCILE (AS REQUIRED BY SECTION XI) ANYTHING IN ORDER TO UTILIZE NEWER CODES - A NEW SET OF DESIGN BASIS CALCULATIONS (RECONCILIATION CALCULATIONS) MUST BE DONE

CQE LIST EXPLAINS WHAT RECLASSIFY MEANS IN USAR APP. N

SUMMARY:

RESOLUTION OF NRC CONCERN:

1. DEVELOPE PROGRAM/TRAINING SESSION TO INFORM PLANT ENGINEERING OF DESIGN BASIS CODES, WHERE THEY ARE LOCATED.

RESOLUTION OF NRC CONCERN:

2. ASME SECTION XI DOES NOT REQUIRE MODIFICATIONS TO BE ACCOMPLISHED TO THE LATEST CODES. WHAT IT DOES REQUIRE IS MEETING OR EXCEEDING THE ORIGINAL DESIGN CODES.

Memorandum

Date: September 16, 1986 GSE-FC-86-822

From: S. K. Gambhir

To: J. K. Gasper
W. G. Gates

SUBJECT: Electrical Equipment Qualification Program
Limitorque Motor Operator Lubricants

Reference: GSE-FC-86-783, "Limitorque Motor Operator Qualification"

The referenced letter, GSE-FC-86-783, indicated that a potential problem may exist in the qualification of the lubricant used in the EEQ Program Limitorque Motor Operators. This concern was amplified in the Safety System Functional Inspection Report Nos. 50-269/86-16, 50-270/86-16, and 50-287/86-16 conducted at Duke Power Company's Oconee Nuclear Station.

The concerns are centered on two issues:

1. The qualification of lubricants other than the lubricant used by Limitorque (Exxon Nebula EP-0, or EP-1) in the qualification testing.

2. The potential incompatibility of greases of different gelling agents (lithium, sodium, calcium) when mixed in the gear cases of the Limitorque operators as a result of maintenance over the years.

Although the concerns had been addressed in the EEQ-TER meeting response, it was judged that the issued should be re-examined based on the information contained in the TVA's and Duke Power Company's reports.

Based on the information supplied in Table 1, it appears both concerns may exist at the Fort Calhoun Station. From Table 1, eight operators are known to contain Texaco Marfak Multi Purpose 2, nineteen are known to contain Exxon EP-2 and three may contain a mixture of Marfak 2 and other grease.

To resolve this issue and determine a course of action, additional information was obtained from Duke Power Company, a laboratory test for the gelling agent in HCV-347 was performed, and a Justification for Continued Operation was prepared, see the attached copy.

The justification although technically adequate, relies on engineering judgment to support the material (grease) which was analyzed and determine the type of grease in HCV-383-3 and HCV-383-4.

Based on the JCO, continued operation to the 1987 refueling outage is justified. GSE recommends all Marfak 2 grease be changed out to Exxon Nebula EP-0 in the 1987 refueling outage.

Please review this letter and the JCO carefully and indicate your concurrence. If there any questions, please contact GSE.

S. K. Gambhir
Section Manager
Generating Station Engineering

SKG/HOF/RFM:lz

ATTACHMENTS

xc: M. R. Core
J. J. Foley
J. J. Fisicaro
D. J. Munderloh
J. R. Tucker
EEQ File

ELECTRICAL EQUIPMENT QUALIFICATION
LIMITORQUE MOTOR OPERATOR LUBRICANT
JUSTIFICATION FOR CONTINUED OPERATION

I. PURPOSE

The purpose of this analysis is to determine if adequate justification exists to insure (1) that Texaco Marfak Multi Purpose 2 grease and (2) a mixture of Marfak Multi Purpose 2 and the grease previously installed in three operators will not degrade resulting in the inability of the valves to perform their DBA/Post DBA functions, (see Reference 4, 5 and 6).

II. METHOD

Material analysis, test results, and functional requirements will be assessed to determine operability. Valves with similar functions will be assessed as a group.

III. INPUT DATA

1. EEQ Manual
2. EOP 1, 3, 5, & 20
3. USAR Section 14
4. NRC Inspection Report 50-269/86-16, 50-270/86-16, & 50-287/86-16
5. EPRI-EQAG Attachment 24
6. GSE-FC-86-783
7. Texaco Letter - C. R. Olives to Mike Watson dated 3/18/83
8. Bolt & Associated Letter - Robert O. Bolt to J. E. Thomas of Duke Power dated 6/17/86
9. Professional Service Industries, Inc., Report 174-53186-1
10. Rock Island Arsenal Laboratory Report 61-2132
11. Lubricant Summary Table 1
12. EEQ-EQDF Records File

IV. ANALYSIS

A. The Use of Marfak 2 Grease:

1. High Pressure Safety Injection Valves HCV-314, HCV-315, and HCV-321: These valves open on receipt of a Safety Injection Actuation Signal (SIAS), (see Reference 2 and 3), in the first seconds of a LOCA or MSLB, and remain open until long term core cooling is established, if required, during the first 24 hours following a LOCA, (see Reference 2). These valves must operate in a LOCA/MSLB as defined in Reference 1, SCEW 4-29.

It should be noted that the one year operating time (see Reference 1) is primarily passive and is used in the aging calculation, the 24 hours referenced previously is the active operation, based on the Large Break LOCA long term core cooling, to prevent boron precipitation.

Other actions such as safety injection termination after leak isolation are not expected to stress the operator as severely as the Large Break LOCA, (see Reference 1 and 2).

A review of the environmental performance data for Marfak 2 indicates that no significant degradation is expected. Reference 7 indicates adequate thermal properties, with short time exposures to 350°F permissible. The gear case is expected to protect the grease and gears from significant amounts of chemical spray, and moisture, only the grease surface is expected to be exposed to any moisture, no degradation is expected. Pressure on the grease is not expected to affect the properties of the lubricant.

It should be noted that the grease is expected to expand thus further reducing the potential for any leakage. Radiation levels of 1.74×10^7 Rads (1000 HR dose) are expected. Reference 7 indicates an acceptable dose of 2.3×10^7 Rads and Reference 8 supports the conclusion that the grease will not degrade preventing valve operation.

The 1985 refueling outage inspection required by the EEQ program (References 1 and 2) indicate that the grease has not degraded.

In summary, the HPSI valves are expected to perform their intended function with Marfak 2 grease.

2. How Pressure Safety Injection Valves HCV-327, HCV-329, HCV-331, and HCV-333: These valves open on receipt of a Safety Injection Actuation Signal (SIAS) and remain open, for a LOCA/MSLB (see Reference 2). These LPSI valves may be used to establish shutdown cooling within the 24 hour time frame if the Reactor Coolant System condition permits (see reference 2). Environmental conditions are given in Reference 1 SCEW 4-34.

The LPSI valves have the similar operating requirements to the HPSI valves discussed in IV A.1 (operating time 1000 HRS). Based on that discussion these valves should perform the intended DBA/Post LOCA DBA function.

3. Shutdown Cooling (SDCS) Suction Line Isolation HCV-348, (see Reference 11): This valve may be used in conjunction with the LPSI valves, (see Section IV A.2.), to establish Shutdown Cooling, (see Reference 2). The environmental conditions are given in Reference 1, SCEW 4-45. The operating requirements are to open for shutdown cooling, there is no automatic operation in a DBA. Based on that similarity (note HCV-348 is qualified for 250 HR post DBA operation vs. 1000 HR for the HPSI valves) HCV-348 can be considered operational for a DBA.

4. Shutdown Cooling Valve HCV-347: This valve is the second SDCS suction line isolation valve, located in Room 13, see Reference 1 SCEW 4-44. The operation of this is the same as HCV-348 and is related to the 24 hour LTCC requirement. Although listed as "mixed grease," a laboratory test (see Reference 9) indicates a sodium based grease which is the base of Marfak 2 (see Reference 8). Since HCV-347 in room 13 would see less severe DBA condition than HCV-348, HCV-347 is considered operational.

B. Mixed Greases

1. Post Accident Containment Sump Recirculation Valves, HCV-383-3 and HCV-383-4: These valves are required to open at Recirculation Actuation to provide the safety injection pumps with a suction from the containment sump. This may occur from 20 minutes after a LOCA to several hours after a LOCA depending on break size, (see Reference 2). These valves are located in the containment extension and see a temperature and radiation stress only, (see Reference 1 SCEW 4-50, note SCEW temperature is incorrect, the value is 174°F).

   The type of grease in HCV-383-3 and HCV-383-4 at the time of mixing is judged to be Marfak 2. This judgment is based on visual examination of samples of grease taken during the 1983 refueling outage, and a recent laboratory test (Reference 9) of grease samples taken from HCV-347. The grease samples taken in 1983 were very dark in color with the same appearance as Marfak 2. Laboratory tests on the HCV-347 lubricant which contained both "original" and Marfak 2 indicated virtually identical concentrations of the gelling agent (sodium) at the top and bottom of the grease. Based on the similar appearance and laboratory analysis, the lubricant is believed to be Marfak 2.

All Limitorque valve operators appear to have had their lubricant change out at some point in time as evidenced by the samples. No maintenance records of this were found. It is known that Limitorque originally supplied the operators with a Exxon Nebula EP calcium based lubricant which is tan in color. It should be noted that industry records indicate that Limitorque supplied certain non-containment operators with a Sun Oil grease which is lithium based, which also supports the change out judgment.

Based on the above discussion it appears that no mixing occurred and the Marfak 2 can be considered adequate. If for whatever reason either of the original greases remains in the operators, Reference 8 indicates adequate compatibility with either the Exxon or Sun Oil products. Given these conditions, the valves should operate satisfactorily.

ATTACHMENT

1. NRC Inspection Report 50-269/86-16, 50-270/86-16, & 50-287/86-16.
2. EPRI-EQAG Attachment 24
3. GSE-FC-86-783
4. Texaco Letter
5. Bolt & Associated Letter
6. Professional Service Industries, Inc., Report 174-53186-1
7. Rock Island Arsenal Laboratory Report 61-2132
8. Lubricant Summary Table 1