VIRGINIA POWER

Station Administrative Procedure

Title: Motor Operated Valve Program

Lead Department: Maintenance

Procedure Number:	Revision Number:	Effective Date:
VPAP-0805	2	11/01/90

Revision Summary:

Procedure upgraded to ACUP format.

Surry Power Station:	North Anna Power Station
Approved by: _____ SNSOC Chairman — Date: 9-11-90	Approved by: _____ SNSOC Chairman — Date: 9/19/90
Approved by: _____ Station Manager — Date: 9/11/90	Approved by: for _____ Station Manager — Date: 9/19/90

Approved by: _____ Vice President - Nuclear Operations — Date: 9-27-90

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1.0 PURPOSE

The purpose of the Virginia Power Motor Operated Valve (MOV) Program is to establish the guidelines and controls necessary to ensure motor operator reliability and operability. **[Commitments 3.2.1 and 3.2.2]**

2.0 SCOPE

2.1 This procedure applies to Station and Corporate personnel involved in activities associated with the MOV Program.

2.2 This procedure applies to the mechanical and electrical boundaries of motor operated valves as defined in Step 6.1.1.

3.0 REFERENCE/COMMITMENT DOCUMENTS

3.1 References

3.1.1 Regulatory Guide 1.1.06, Revision 1, 3/77

3.1.2 NRC Generic Letter 89-10

3.1.3 NRC IE Bulletin 85-03, MOV Common Mode Failures During Plant Transient Due To Improper Switch Settings

3.1.4 NUREG 1296, 6/88

3.1.5 American Society of Mechanical Engineers 84-NE-16, Early Diagnosis of Motor Operated Valve Mechanical and Electrical Degradations

3.1.6 EPRI Lubrication Guide NP-4916

3.1.7 Institute of Nuclear Power Operations - Motor Operated Valve Performance Update, October 4, 1988

3.1.8 NMAC Technical Repair Guidelines for the Limitorque Model SMB-000 Valve Actuator, January 1989

3.1.9 Virginia Power Engineering Standard, STD-GN-0002, MOV Sizing and Calculation Standard

3.1.10 Virginia Power Nuclear Department Standard NODS-TR-07, Training and Qualification of Contractor Employees

3.1.11 **Virginia Power Administrative Procedures (VPAPs)**

a. VPAP-0307, Repair and Replacement Program For ASME Section XI Components
b. VPAP-1601, Corrective Action Program *(When Issued)*
c. VPAP-1201, Measuring and Test Equipment (M&TE) Program
d. VPAP-2001, Station Planning and Scheduling *(When Issued)*
e. VPAP-2002, Work Requests and Work Orders
f. VPAP-2701, Station Training Program *(When Issued)*
g. VPAP-3002, Operating Experience Program *(When Issued)*

3.2 Commitments

3.2.1 NRC IE Bulletin 85-03

3.2.2 NRC GL-89-10

4.0 DEFINITIONS

4.1 Motor Operated Valve (MOV) Failure

Failure of a MOV to operate to its required position either by automatic actuation or by a single switch movement from the control board which is not in a partial service or in a maintenance condition. This includes the occurrence when the MOV control switch is positioned to stroke the valve and no valve movement is indicated, and when a subsequent stroke initiation signal is initiated and the valve operates normally.

4.2 Signature Trace

Graphical representations of data associated with sub-components of a motor operated valve (e.g. motor current or stem thrust) that when compared, provide indications of performance of the whole component under varying conditions of service.

4.3 Threshold

A calculated margin of thrust, expressed in pounds or percent, that exist as the difference of the thrust delivered at final stem loading (post control switch trip) from design limit thrust determined through weak link analysis.

SUPPLEMENTAL REFERENCE PAGES

These supplemental Reference Pages are provided to aid the procedure user in determining the appropriate procedures to use until such time that all procedures referenced in the references Section, which reflect *"When Issued,"* are approved and issued.

Virginia Power Administrative Procedures (VPAPs)

a. **Upgraded Procedure Reference**

VPAP-1601, Corrective Action Program *(When Issued)*

The following existing procedures shall be used until such time that the new referenced procedure is approved and issued:

1. ADM-16.0, Corrective Action (North Anna)
2. SUADM-LR-13, Station Deviation Reports (Surry)

b. **Upgraded Procedure Reference**

VPAP-2001, Station Planning and Scheduling *(When Issued)*

The following existing procedures shall be used until such time that the new referenced procedure is approved and issued:

1. ADM-16.9, Preventive Maintenance Scheduling (North Anna)
2. ADM-16.18, Planned Maintenance Scheduling (North Anna)
3. SUADM-M-10, Work Planning and Tracking System (Surry)

NOTE: This Supplemental Reference Page shall be removed and processed as directed upon notification from Records Management.

c. **Upgraded Procedure Reference**

VPAP-2701, Station Training Program *(When Issued)*

The following existing procedures shall be used until such time that the new referenced procedure is approved and issued:

1. ADM-2.2, Station Training Program and Training Qualifications (North Anna)
2. SUADM-TR-01, Qualification and Training (Surry)

d. **Upgraded Procedure Reference**

VPAP-3002, Operating Experience Program *(When Issued)*

The following existing procedures shall be used until such time that the new referenced procedure is approved and issued:

1. ADM-6.19, Processing of Significant Operating Experiences (SOER) - (North Anna)
2. ADM-6.20, Operating Experience Review (OER) - (North Anna)
3. SUADM-LR-03, Operating Experience Review (Surry)
4. SUADM-LR-07, Failure Trending and Analysis of Safety Related Equipment (Surry)

NOTE: This Supplemental Reference Page shall be removed and processed as directed upon notification from Records Management.

5.0 RESPONSIBILITIES

5.1 Superintendent - Maintenance

The Superintendent - Maintenance is responsible for overall implementation of the MOV Program at the Station. This includes the following:

5.1.1 Ensuring sufficient resources are available to support continuing program requirements and development.

5.1.2 Providing qualified individuals for participation in the MOV Program.

5.1.3 Ensuring personnel performing MOV maintenance meet training requirements specified in this procedure, including MOV data acquisition through advanced signature analysis and interpretation.

5.1.4 Ensuring contract personnel are qualified to perform MOV maintenance, if assigned that task.

5.1.5 Assuring that MOV PMs are scheduled and completed in accordance with the PM schedule.

5.1.6 Reviewing and discussing MOV operability problems with staff personnel, as required.

5.1.7 Reviewing Root Cause/Failure Analysis Reports or evaluations, and verifying implementation of any Maintenance Department corrective actions recommended in the reports.

5.1.8 Ensuring a qualified individual is assigned to fill the position of the MOV Coordinator in his absence.

5.1.9 Ensuring that elements of the MOV Program are reviewed and assessed periodically. This includes assigning corrective actions and ensuring follow-up for each area needing improvement, as required.

5.2 Superintendent - Engineering

The Superintendent - Engineering is responsible for supporting the overall engineering aspects of the MOV Program.

5.3 Supervisor - System Engineering

The Supervisor - System Engineering is responsible for the following:

5.3.1 Assigning an individual in System Engineering as the MOV Engineer.

5.3.2 Supporting the MOV Program by providing System Engineering support, as required.

5.3.3 Ensuring a qualified individual is assigned to fill the position of the MOV Engineer in his absence.

5.4 Supervisor - Maintenance Engineering

The Supervisor - Maintenance Engineering is responsible for the following:

5.4.1 Assigning an individual in Maintenance Engineering as the MOV Coordinator.

5.4.2 Supporting the MOV Program by providing Maintenance Engineering support, as required.

5.5 Supervisor - Mechanical Maintenance

The Supervisor - Mechanical Maintenance is responsible for the following:

5.5.1 Ensuring MOV PMs are accomplished, as scheduled.

5.5.2 Notifying the MOV Coordinator when unexpected MOV problems are encountered, which require engineering resolution.

5.5.3 Ensuring mechanical personnel receive adequate training and are qualified to perform MOV maintenance and Post Maintenance Testing.

5.5.4 Ensuring that qualified mechanics are assigned to the MOV Team, as required.

5.5.6 Ensuring that any MOV work (e.g., Minor Maintenance), not performed by the MOV Team, is performed by individuals qualified for the specific task.

5.5.7 Ensuring that the overall quality of mechanical MOV maintenance is maintained at high standards, both corrective and preventive.

5.5.8 Ensuring that mechanical MOV maintenance is performed in accordance with approved Station procedures.

5.5.9 Ensuring all technical PARs on any MOV procedure are reviewed and concurred with by the MOV Coordinator or MOV Engineer before implementation.

5.6 Supervisor - Electrical Maintenance

The Supervisor - Electrical Maintenance is responsible for the following:

5.6.1 Ensuring MOV PMs are accomplished, as scheduled.

5.6.2 Notifying the MOV Coordinator when unexpected MOV problems are encountered, which require engineering resolution.

5.6.3 Ensuring electrical personnel receive adequate training and are qualified to perform MOV maintenance.

5.6.4 Ensuring that qualified electricians are assigned to the MOV Team, as required.

5.6.5 Ensuring that qualified individuals are assigned to acquire/analyze MOV diagnostic signatures.

5.6.6 Ensuring that any MOV work (e.g., Minor Maintenance), not performed by the MOV Team, is performed by individuals qualified for the specific task.

5.6.7 Ensuring that the overall quality of electrical MOV maintenance is maintained at high standards, both corrective and preventive.

5.6.8 Ensuring that electrical MOV maintenance is performed in accordance with approved Station procedures.

5.6.9 Ensuring all technical PARs on any MOV procedure are reviewed and concurred with by the MOV Coordinator or MOV Engineer before implementation.

5.7 MOV Coordinator

The MOV Coordinator reports to the Supervisor - Maintenance Engineering and is responsible for the following:

5.7.1 Making programmatic and technical improvements to the MOV Program to optimize MOV performance and reliability.

5.7.2 Coordinating MOV Engineering and MOV Team efforts.

5.7.3 Establishing informal MOV technical communications with other Nuclear Stations and Corporate Maintenance Support Department personnel.

5.7.4 Ensuring that vendor technical manuals for the applicable vintage of MOVs installed at the Station are current and available on site.

5.7.5 Verifying the adequacy of post maintenance testing based on the maintenance activities performed on the MOV.

5.7.6 Approving final MOV test data and consulting with the MOV Engineer, MOV Team, vendor, and/or Corporate Maintenance Support Department personnel to assist, as necessary, with the review/acceptance of MOV diagnostic signature traces.

5.7.7 Identifying and resolving programmatic deficiencies relative to MOV installations, applications, and maintenance practices with assistance, as required, by the MOV Engineer, MOV Team, and Corporate Maintenance Support Department personnel.

5.7.8 Identifying MOVs to be scheduled for tear down under the requirements of the MOV Verification Inspection Program. This includes coordination of tear-down inspections and resolution of schedule difficulties.

5.7.9 Ensuring MOV maintenance procedures are current, correct, and that manufacturer's recommendations and industry experience are incorporated, as justified, into applicable electrical and mechanical PM and corrective maintenance procedures.

5.7.10 Recommending to the planning organization any outage related MOV work (based on the results of trending, Post Maintenance Testing, or Signature Analysis) and assisting in the identification of parts to support that work.

5.7.11 Identifying MOV spare parts and stocking requirements for both outage and non outage periods and ensuring that these stocking requirements are met.

5.7.12 Performing initial inspections of MOVs, with respect to actuator internal parts, evaluation, and determining when additional engineering support is required.

5.7.13 Participating in any MOV Failure Analysis/Root Cause Evaluation.

5.7.14 Trending motor operator signatures, identifying developing trends, and recommending corrective actions required to correct problems.

5.7.15 Generating and distributing the MOV Monthly Report.

5.7.16 Attending industry workshops/user groups on MOVs.

5.7.17 Supporting the MOV Engineer in maintaining the MOV data base by forwarding information on component changes resulting from maintenance activities.

5.7.18 Assisting as necessary in the review and concurrence of all technical PARs generated on any MOV procedure.

5.8 MOV Engineer

The MOV Engineer reports to the Supervisor - System Engineering and has overall design responsibility of the MOV Program. The MOV Engineer is responsible for the following:

5.8.1 Reviewing MOV test results, which require engineering evaluation, to ensure MOV operability and assisting in the resolution of discrepancies.

5.8.2 Reviewing data obtained from maintenance activities, as requested by the MOV Coordinator.

5.8.3 Reviewing operating and testing procedures and providing recommendations for any revisions to enhance MOV operability/reliability, as required.

5.8.4 Reviewing and tracking EWRs/DCPs to ensure that they do not invalidate the data or calculations previously analyzed.

5.8.5 Controlling MOV engineering data such as thrust requirements, maximum D/P's assumed, operator gear ratios, model numbers of spring packs, voltage requirements, stroke times, acceptable greases, Environmental Qualification requirements, thermal overload sizing, and any additional information not mentioned that directly affects sizing and operating requirements.

5.8.6 Reviewing, documenting, and approving any changes in torque or limit switch settings and any non original replacement parts.

5.8.7 Maintaining the MOV data base, and the distribution of controlled copies.

5.8.8 Recommending to the planning organization any outage related MOV work (based on pending EWRs, Part 21s, Signature Analysis) and assisting in the identification of parts/engineering documentation to support that work.

5.8.9 Ensuring that all design related information is controlled and that switch settings are maintained and controlled in the Set Point Document or Station drawings.

5.8.10 Responding to industry or regulatory notices and information.

5.8.11 Representing the Station in audits of the MOV Program.

5.8.12 Reviewing Station Deviation Reports concerning MOVs, preparing recommendations, and documenting corrective actions.

5.8.13 Ensuring, through communications with design groups, that Engineering Standard GN-0002 remains current and applicable with respect to Industry Design Standards.

5.8.14 Ensuring that System Engineers are appraised of MOV concerns in their systems.

5.8.15 Participating in any MOV Failure Analysis/Root Cause Evaluation.

5.8.16 Verifying that the configuration of safety related MOVs (e.g., cable splices on power supplies, cable sizing, actuator size application, thermal overload device sizing, motor sizing, etc.) satisfies design and performance requirements.

5.8.17 Assisting as necessary in the review and concurrence of all technical PARs generated on any MOV procedure.

5.9 MOV Team

MOV Team members report to their respective department Supervisors and are responsible for the following:

5.9.1 Performing corrective and preventive maintenance on Motor Operated Valves, including troubleshooting.

5.9.2 Complying with Station maintenance and administrative procedures.

5.9.3 Operating MOV diagnostic equipment and analyzing Signature Data, to identify operator or valve anomalies.

5.9.4 Identifying and reporting performance based concerns to the MOV Coordinator.

5.9.5 Identifying procedural deficiencies, providing recommendations for enhancement, and initiating procedure revisions.

5.9.6 Assisting the MOV Engineer and/or MOV Coordinator in the field verification of operator/control logic information.

5.9.7 Initiating work requests on conditions found that require additional evaluations by Maintenance and/or Engineering.

5.9.8 Verifying test equipment used for maintenance on MOVs is in calibration, and notifying the Technical Assistant of problems associated with MOV diagnostic equipment.

5.9.9 Assuming lead responsibility in directing work of others not fully qualified.

5.9.10 Performing maintenance evolutions to the highest quality standards achievable.

5.10 Electrical Foremen

Electrical Foremen are responsible for the following:

5.10.1 Verifying that all electrical personnel assigned to work on motor operated valves are trained in accordance with the requirements of this procedure.

5.10.2 Ensuring that the conduct of the job meets all requirements and standards as delineated in this procedure.

5.11 Mechanical Foremen

Mechanical Foremen are responsible for the following:

5.11.1 Verifying that all mechanical personnel assigned to work on motor operated valves are trained in accordance with the requirements of this procedure.

5.11.2 Ensuring that each aspect of the job meets all requirements and standards as delineated in the Work Package.

5.12 Technical Assistant

The Technical Assistant reports to the Supervisor - Maintenance Support and is responsible for the following:

5.12.1 Assisting the MOV Coordinator in processing Motor Operator Signature Data.

5.12.2 Extracting pre-determined Signature Data from the computer data base in preparation for the Monthly Report.

5.12.3 Drafting the Monthly Report for review by the MOV Coordinator.

5.12.4 Obtaining data base information on Station MOVs, as requested by the MOV Coordinator, MOV Engineer, or Corporate Maintenance support.

5.12.5 Maintaining department logs on MOV diagnostic equipment calibration dates, serial numbers, and assisting in resolving any equipment problems.

5.12.6 Maintaining the MOV Trending Program data base, and extracting the information as required.

5.12.7 Understanding the software used in the program, and complying with Station procedures.

5.13 Director Maintenance Support

The Director Maintenance Support or designee is responsible for the following:

5.13.1 Developing, assessing, and monitoring the effectiveness of the MOV Program at the North Anna and Surry Power Stations.

5.13.2 Assessing and reviewing MOV performance, maintenance trends between Stations, and ensuring compliance with regulatory, industry, and program requirements.

5.13.3 Reviewing MOV failure evaluations and providing recommendations to improve overall MOV reliability.

5.13.4 Assisting the Stations in piloting new technological practices on MOVs and performing equipment evaluations, as required.

5.13.5 Conducting interviews with the MOV Team members, MOV Coordinators, and MOV Engineers to identify and resolve MOV concerns.

5.13.6 Identifying programmatic improvements to the MOV Program as a result of reviews of industry events, experiences, or other applicable information.

5.13.7 Ensuring programmatic improvements are implemented and communicated to MOV Program members and the Training Departments at the Stations.

5.13.8 Performing an annual evaluation of the MOV Program, at each Station. This includes evaluating the overall effectiveness of each element of the MOV Program, identifying the need for corrective action and follow-up, and evaluating the progress of previous corrective actions.

5.13.9 Conducting periodic assessments of the MOV Training Program and identifying initial and continuing training requirement enhancements. This includes performing technical reviews and evaluations of the effect of training on current performance trends and identifying areas that show the need for MOV maintenance knowledge and skills improvement.

5.13.10 Keeping abreast of new maintenance techniques, test methodologies, modifications, enhancements, and new or modified requirements throughout the industry.

5.13.11 Interfacing with Nuclear Engineering concerning MOV calculation standards, future notices/bulletins, or other items that may effect the MOV Program.

6.0 INSTRUCTIONS

6.1 Methods

6.1.1 General

a. Objective of the Program

The objective of the Motor Operated Valve (MOV) Program is to ensure that motor operated valves are properly configured and maintained in optimum condition to enhance the reliability and operability of the Station.

b. Scope of the Program

The scope of the MOV Program includes all MOVs. MOVs will be prioritized such that safety related MOVs will be included before non-safety related MOVs.

c. MOV Component Boundaries

1. Electrical Component Boundaries

The electrical component boundaries of MOVs include:

- Thermal Overload Devices
- Motor Control Center Devices
- Actuator Motor
- Limit and Torque Switch
- Cable and Conduit

2. Mechanical Component Boundaries

The mechanical component boundaries of MOVs include:

- Packing
- Valve Stem, Seat, Disc, and Body
- Associated Supports
- Actuator Mechanical Drive Train and Housing
- Mechanical Indicators

d. **Elements of the Program**

The elements of the MOV Program include:

- MOV Program Administration
- MOV Corrective Maintenance Program
- MOV Preventive Maintenance Program
- MOV Trending Program
- MOV Inspection/Verification Program
- MOV Failure Analysis/Root Cause Program

6.1.2 **MOV Program Administration**

Attachment 1, MOV Organization Chart, depicts the MOV Program organization.

a. The Corporate Director Maintenance Support is responsible for the development and assessment of the MOV Program at the North Anna and Surry Stations.

b. The Superintendent - Maintenance is responsible for overall implementation of the MOV Program at the Station.

c. The MOV Coordinator is responsible for implementation of the MOV Program and coordination of MOV activities.

d. The MOV Engineer is responsible for all design aspects of the MOV Program.

e. The Technical Assistant is responsible for assisting the MOV Coordinator in generation of reports, trending information, and equipment calibrations.

f. **MOV Team**

An effective concept for controlling maintenance activities on MOVs is by establishing a dedicated group of well trained and qualified personnel into a MOV Team. The team, although not limited in size, ensures that individuals performing maintenance and engineering activities are not only qualified to that task, but also are sensitized to Station and industry concerns. This occurs during the annual retraining as identified in section 6.5.

1. A designated group of trained craftsmen and engineers shall be assigned to the MOV Team to perform maintenance on Station MOVs.
2. Other maintenance personnel not assigned to the MOV Team may perform certain maintenance tasks on MOVs, provided they meet minimum training requirements delineated for craftsmen performing MOV maintenance in accordance with Subsection 6.5. Tasks that may be performed by non members of the MOV Team include, but are not limited to, the following types of maintenance tasks performed on MOVs with an approved procedure:
   - Electrical disconnects/reconnects
   - Operator removal/reinstallation
   - Grease sampling
3. Electrical and Mechanical Maintenance Department Supervisors shall ensure that only qualified craftsmen perform MOV maintenance outside the MOV Team concept.

6.1.3 MOV Corrective Maintenance Program

Attachment 2, MOV Corrective Maintenance Failure Flowchart, identifies the sequence of work activities to be performed on MOVs when an in-service failure occurs.

a. All MOV failures during plant operation, Periodic Testing, or Preventive Maintenance activities shall be identified on a Work Request in accordance with VPAP-2002, Work Requests and Work Orders.

b. The MOV Coordinator should be notified promptly of the failure to initiate the investigative process in accordance with Step 6.1.7. If possible, the MOV should be left in the "As - Is" condition the MOV failed, so that an accurate assessment of the failure can be made by the MOV Team.

c. The Operations Shift Supervisor and Station Technical Advisor (STA) shall complete Attachment 3, Operations MOV Review Sheet, documenting the initial evaluation of the MOV failure. The review shall consider operational observations and conditions known prior to failure of the MOV.

d. By troubleshooting, the MOV Team shall determine the appropriate corrective maintenance to be performed on the MOV, perform the corrective maintenance, and document the results of the corrective maintenance activity for history purposes in accordance with VPAP-2002, Work Requests and Work Orders.

e. The MOV Coordinator shall ensure that all post maintenance testing (e.g., signature analysis) and documentation associated with the corrective maintenance activity is reviewed for adequacy prior to the MOV being placed in service. Problems encountered during corrective maintenance activities on MOVs shall be resolved with the MOV Engineer, as necessary.

f. Corrective maintenance test data shall be forwarded to the MOV Engineer for review, as determined necessary by the MOV Coordinator.

g. The MOV Coordinator shall ensure that testing results and associated trending documentation are maintained for maintenance history purposes.

6.1.4 MOV Preventive Maintenance Program

A Preventive Maintenance (PM) Program shall be established for MOVs included in the MOV Program, in accordance with VPAP-0803, Preventive Maintenance Program.

a. PM evaluations on MOVs shall consider the following items:

- Manufacturers recommendations
- Equipment operating history
- Engineering analysis
- Industry findings and recommendations
- Lessons learned and Station Experience

b. PM tasks on MOVs shall include, but are not limited to, the following types of PM activities:

- Grease inspections for the main gear box, motor pinion gear box, limit switch gear boxes, and limit switch cartridge assembly
- Stem lubrication
- Electrical termination inspection
- Contact cleanliness check
- Contact wipe check
- Actuator to valve bolt tightness
- Motor inspection
- Spring pack cavity inspection for hardened grease
- Packing inspection for leakage
- Component inspection for damage or corrosion
- Equipment qualification inspection
- Motor control center inspections
- Cable and wire inspection

c. MOV diagnostic testing data, as described in Step 6.1.8, shall be obtained during the performance of Electrical PMs to support the MOV Trending Program and verify valve/operator condition. Testing normally will include data obtained from the Motor Control Center (i.e., current trace), however, the MOV Coordinator may specify additional tests as deemed necessary.

d. Post maintenance test data obtained during PMs shall be reviewed by the MOV Team and MOV Coordinator prior to returning the valve to service. Any abnormal MOV signatures shall be forwarded to the MOV Engineer for prompt review, justification, or resolution as determined by the MOV Coordinator.

e. PM test data shall be reviewed by the the MOV Coordinator for the MOV Trending Program.

f. MOV Lubrication

MOV grease inspections shall be performed at the same frequencies as the Electrical and Mechanical PMs. The following guidelines shall apply:

1. The frequency of sampling, replenishing, or analyzing the actuator main gear case, limit switch, and valve stem lubricant shall be in accordance with the established periodicities derived from the manufacturers recommendations, engineering analysis, and trended machinery history results.
2. Three main areas of lubrication concern (main gear case, limit switch, and valve stem) will be evaluated for replacement, as required, to establish a standardized lubricant for each area (i.e., MOV main gear cases should contain the same lubricant, limit gear frames and cartridges should contain the same type of lubricant, and MOV valve stems should be lubricated with the same lubricant contained within the main gear case). Standardizing the lubricant used in each area will reduce the probability of human error for mixing greases requiring subsequent rework to prevent internal component degradation.
3. Acceptance criteria will determine whether grease is acceptable for continued usage. The acceptance criteria shall be developed using industry data, manufacturer and engineering recommendations, and Station experience.
4. Qualitative acceptance criteria for the acceptable greases shall be included in the PM and maintenance procedures. Color, uniformity (non-hardened globules), consistency, and contamination (e.g., water, foreign material) may provide visual indication of lubricant degradation. Other acceptable grease examination methods involve grease penetration testing, moisture go-no-go splatter testing, and visual smear examination. Lubricant inspections shall be analyzed by qualified individuals. Examinations providing finite results shall be trended for condition directed lubrication replacement determination. Samples results obtained during PM activities shall be forwarded to the MOV.
5. Individuals involved in the inspection/analysis and determination of a grease sample for continued usage shall be specifically trained for that purpose.

6.1.5 MOV Trending Program

The purpose of the MOV Trending Program is to identify equipment degradations before they become significant. This will allow for parts identification, ordering, and scheduling before the valve is removed for servicing. The MOV Coordinator shall be responsible for the MOV Trending Program. The MOV Coordinator will notify the MOV Engineer for any assistance required to aid in the identification of suspected degrading conditions. The MOV Engineer will assist, as necessary, in determining the probable cause and in any maintenance recommendations to correct the problem.

a. A MOV Trending Program shall be established to review and trend MOV data. Specific information to be trended shall include, as a minimum, the following information:

- Limit switch settings (i.e., % open, closed, torque switch bypass)
- Torque switch settings (in appropriate direction) at torque switch trip and total thrust
- Motor current (Inrush, running, seating, unseating)
- Bus voltages
- Running loads
- Stroke times
- Hammer blow time
- Unseating time
- Contactor drop out times
- Threshold

b. The following MOV degraded conditions are expected to be identified as a result of the MOV Trending Program:

- Torque switch bypass incorrectly set
- Inadvertent back seating
- Loose stem nut locknut
- Loose worm shaft locknut
- Excessive inertia
- Bent valve stem

- Full spring pack compression
- High motor current
- Torque switch mechanical problem
- Limit switch mechanical problem
- Motor problem
- Spring pack gap
- Operator gear wear
- Stem/stem nut wear
- Valve seating concerns
- Valve unseating concerns
- Valve guide wear
- Operator design thrust exceeded
- Inadequate thrust
- Excessive thrust
- High running load
- Excessive preload
- Torque switch unbalance
- Misalignment of worm/worm gear

c. The MOV Trending Program shall ensure that MOV failure indicators (i.e. high thrust requirements, high running loads, indications in the signatures, etc.) are closely tracked.

d. When predetermined values are exceeded, or when abnormal signature indications start occurring, the MOV Engineer shall be advised. The MOV Engineer shall, as required, assist in determining the probable cause of the developing problem and shall assist in recommending the required maintenance actions to be taken.

e. The MOV Trending Program shall be reviewed periodically, and prior to outages when work schedules are being identified.

6.1.6 MOV Inspection/Verification Program

The MOV Inspection/Verification Program shall ensure, on a periodic basis, that the MOV Trending Program and Signature Review process is effective.

a. On a refueling cycle basis, the teardown and inspection of selected MOVs shall be performed. MOVs shall be selected that indicate acceptable performance (such as those requiring a grease change out) and MOVs suspected of degradations. The teardown process shall validate the mechanical condition of the MOV that the MOV Trending Program and Signature Review process predict. The number of MOVs torn down will be based on plant specific experience and industry operating experience.

b. Prior to disassembly and visual inspection of the MOV actuator internals, a review of the trend information and signature indicators of the MOV shall be performed. The mechanical condition shall be compared with the predicted findings. This inspection shall be documented and used for future reference. An actuator may be disassembled for any of the following reasons:

   - Grease change out
   - Known mechanical problems (Scheduled Maintenance)
   - To quantify signature anomalies with actual mechanical condition (e.g. cyclic loading)

c. The MOV Coordinator, or the MOV Engineer, may recommend valves to be disassembled and inspected based on MOV signatures, review of WPTS history, or proposed outage work scope. The MOV inspections (predicted vs findings) shall be documented and maintained by the MOV Coordinator. Any enhancements or changes to the MOV Inspection Verification Program, based on actual findings, shall be recommended to the Corporate Maintenance Support group for notification to the other Station, and possible revision to the MOV Program. This will ensure actual field experience is being utilized in program enhancements.

6.1.7 MOV Failure Evaluations

The purpose of the MOV Failure Evaluation is to determine the root cause of MOV failures, to aid in identifying the appropriate corrective maintenance to be performed on the affected MOV, and to improve the MOV Program . Attachment 4, MOV Failure Evaluation Process, identifies the general sequence of logically performing the evaluation. Guidelines to the program are as follows:

a. The MOV Coordinator shall notify the MOV Engineer when a MOV failure has occurred, as deemed necessary by the MOV Coordinator.

b. The MOV Coordinator has the lead role in performing the failure evaluation, and all remedial actions (e.g., NDE for over thrust of valve internals).

c. Station Management may initiate a formal Root Cause Evaluation in accordance with VPAP-1601, Corrective Action. The MOV Coordinator/Engineer will assist, as required.

d. Instances may occur in which the MOV will need to be cycled with diagnostic equipment installed to confirm suspected problems. This will be coordinated and scheduled in accordance with the normal work process.

6.1.8 MOV Diagnostics

The purpose of this section is to identify the types of diagnostic equipment used for testing MOVs and the requirements associated with performing diagnostic testing on MOVs.

a. MOV Diagnostics will be performed using VOTES or MOVATS equipment and software. There are basically four different types of diagnostic equipment to be utilized in the MOV Program.

1. **MOVATS 2150 Test Equipment**

   This test equipment is used to perform comprehensive testing which can identify key operating parameters, evaluate overall operator performance, and obtain initial baseline data on rising stem valves.

2. **MOVATS "BARTS" Test Equipment**

   This test equipment is used to perform comprehensive testing which will identify key operating parameters, evaluate overall operator performance, and obtain initial baseline data on quarter-turn Butterfly Valves. The MOVATS "BARTS" system will be utilized to control the torque applied to Butterfly Valves.

3. **Motor Current Analysis Test Equipment**

   This equipment is used to obtain signatures normally taken at the Motor Control Center during troubleshooting or PM activities.

4. **VOTES System 100**

   This equipment employs strain gauge technology coupled with standard control switch monitoring to evaluate thrust delivered to the valve stem during the entire stroke of the valve. Like the MOVATS 2150 system, VOTES is used to perform comprehensive testing and baseline analysis.

b. **Selection of Test Equipment**

The type of maintenance performed on the motor operator or valve will determine what type of test equipment is used. Comprehensive testing will be performed to establish a new baseline as required, based on the following:

- Inclusion of new MOVs in the program
- Following corrective maintenance on MOVs
- Troubleshooting as determined by the MOV Coordinator or MOV Engineer
- As trend data indicates

c. **Control of Test Equipment**

Test equipment shall be included and controlled in accordance with VPAP-1201, Measuring and Test Equipment (M&TE) Program, and shall be verified in calibration prior to usage.

d. **MOV Diagnostic Performance**

1. Motor Operated Valve diagnostic test instructions and test acceptance shall be specified in applicable Maintenance Department procedures.
2. Thrust settings and thermal overload settings shall be controlled and maintained in accordance with the Station Set Point Document. Limit Switch settings (open, close, and bypass) shall be identified on Station drawings (Electrical) and shall be maintained and controlled under the Drawing Control Program.
3. MOV stroke time criteria is specified in applicable Periodic Test (PTs) and may also be referenced on Station electrical drawings.
4. The MOV Coordinator shall independently verify the MOV diagnostic signatures for proper settings and mechanical condition.

e. **Diagnostic Training**

Select MOV Team members will be trained in the use of diagnostic test equipment. MOV Team members shall receive appropriate training relative to their assigned task and classification such as the following:

NOTE: MOV Diagnostic test equipment shall only be operated by personnel who have been trained and qualified in the use of that equipment.

1. **Electrical MOV Team Members**

Electrical members of the MOV Team shall receive awareness training to allow obtaining signatures using diagnostic test equipment. In addition, members shall receive training to perform "Basic Signature Analysis" to determine if the signature indicates a healthy operator or if the MOV Engineer needs to be contacted. Members shall be capable of verifying correct thrust, limit switch and bypass settings, along with ensuring the entire actuator/valve assembly is reviewed properly.

2. **Mechanical MOV Team Members**

Mechanical members of the MOV Team shall receive awareness training on diagnostic equipment and signature analysis. Specific training for using diagnostic equipment to perform Post Maintenance Testing shall also be given.

3. **MOV Coordinator and MOV Engineer**

The MOV Coordinator and MOV Engineer shall be trained in advanced levels of signature analysis. In addition they shall be trained in proper maintenance practices, troubleshooting techniques, and Root Cause Analysis.

6.1.9 Post Maintenance Testing

Post maintenance testing shall be performed to assure that maintenance performed on MOVs was implemented correctly and that the operator/valve assembly is properly set, adjusted, and ready to be returned to service.

NOTE: Post maintenance testing requirements specified for ASME Section XI components shall be performed as delineated in VPAP-0307, Repair and Replacement Program For ASME Section XI Components.

a. Post maintenance testing shall occur before returning the MOV and/or MCC to Operations for service. The type and extent of testing shall be determined by the MOV Coordinator utilizing Attachment 5, Post Maintenance Testing Guidelines For Motor Operated Valves. Additional or modified testing may be recommended by the MOV Engineer or department Supervisor based on the specific component or operating conditions. The work control package shall document all post maintenance testing performed on a MOV, including cross references to other work control packages or test procedures that satisfy the original test requirements.

b. **Types of Post Maintenance Tests**

1. **Comprehensive Test**

This test is normally utilized to establish a baseline for program implementation, following major maintenance activities, or as an aid in troubleshooting. This test indicates the thrust being delivered to the valve, control switch actuations, and records motor current amplitude over the entire stroke of the valve. Comprehensive Tests are identified on Attachment 5 as **COMP**. Portions of the Comprehensive Test may be performed where maintenance activities dictate at the discretion of the MOV Coordinator. These tests should be designated as SW (Switch Actuation), THR (Thrust Reading), and CT (Current Amplitude Trace).

2. **MCC Test**

   These tests are performed at the Motor Control Center (MCC) and are primarily used to monitor combinations of either motor current, control switch settings, or bus voltage. Secondarily, these tests are utilized to collect trending information on a PM frequency after a baseline has been established. MCC testing can also include motor power circuit meggars, control circuit ground checks, or continuity checks of circuits or components that affect valve operation. MCC Tests are identified on Attachment 5 as **MCC**.

3. **Interlock Test**

   This test is a verification that ensures limit switch contacts interlocked to other components have not been affected by limit switch adjustments or replacements. Interlock Tests are identified on Attachment 5 as **INT**.

4. **Thrust Verification Test**

   This test includes a measurement of delivered thrust (normally obtained at the valve) to ensure that the maintenance activity has not resulted in a thrust value outside of calculated tolerances. Thrust Verification Tests are identified on Attachment 5 as **TVT**.

5. **Visual Verification**

   A visual verification is normally required following maintenance when settings have not been altered. Stroke time is normally recorded at the same time. Visual Verifications are identified on Attachment 5 as **VIS**.

c. Upon completion of the maintenance activity, the MOV Coordinator shall re-confirm that the post maintenance test selected was appropriate for the actual work performed.

d. The MOV Coordinator shall also review post maintenance test results taken by the MOV Team. The MOV Engineer shall be notified if additional assistance is required in analyzing the signatures.

6.1.10 Switch Setting Policies

MOV control switches (torque and limit switches) shall be set consistently between Stations. Engineering Standard "STD-GN-0002 - Motor Operated Valve Sizing and Calculations Standard" shall be controlled by Power Engineering Services (Nuclear). The standard specifically addresses the following:

- The methodology for the baseline calculations required for sizing valve motor operators to design basis conditions
- Verification sizing for new MOVs
- Determining valve torque and thrust requirements
- Calculating motor operator capability
- Evaluating vendor supplied data
- Establishing thrust bands
- Specifying control switch settings
- Applicable tolerances and adjustments such as for GDC-17 requirements, in order to render a conservative approach for sizing valve motor operators
- Methodology for sizing thermal overload devices

NOTE: Any area not specifically addressed with respect to Company policy or methodology in this standard will be stated in this program.

6.2 Frequency

6.2.1 The frequency for performing MOV Preventive Maintenance and operability testing shall be established, based on the following:

- Regulatory or Technical Specification requirements
- Manufacturer's recommendations
- Number of cycles per period
- In-plant and industry experience with similar equipment
- Acceptance criteria limits established for the equipment
- Engineering analysis of the equipment performance
- Importance to Station/system operations

6.2.2 The frequency of the data collection process will be governed by the MOV Preventive Maintenance and Corrective Maintenance programs, unless determined otherwise by the MOV Coordinator or MOV Engineer.

6.2.3 The PM Coordinator shall ensure that MOV preventive maintenance is scheduled and tracked in accordance with VPAP-0803, Preventive Maintenance Program.

6.2.4 Electrical and Mechanical PMs shall be performed on an 18 month (refueling) cycle or as determined by step 6.2.1.

6.2.5 The Outage and Planning Department shall plan and schedule maintenance on MOVs in accordance with VPAP-2002, Work requests and Work Orders, and VPAP-2001, Station Planning and Scheduling.

a. The MOV Coordinator may recommend to the Outage and Planning Department specific parts required to perform proposed maintenance evolutions.

b. After parts, procedures, engineering (e.g., EWRs) are available, the MOV will be scheduled for work.

c. There may be cases where the valve must be returned to service (e.g., locked open or closed) as determined by the Operation Department, before the required parts are available. This will be tracked by the Outage and Planning Department and rescheduled when all parts or materials are available.

6.3 Functional Criteria

6.3.1 Maintenance on MOVs shall be performed only by qualified personnel thoroughly familiar with MOV operation, its design, and the maintenance activity to be performed.

6.3.2 MOV Data sheets shall be developed and accurately maintained. Specific data sheets shall be designed for the different types, sizes, and models of motor operators.

6.3.3 MOV inspection results shall be documented, reviewed, and filed in appropriate equipment history [illegible] Coordinator.

6.3.4 Each Station shall develop and conduct routine maintenance activities (preventive, predictive, [illegible] corrective) for each type of MOV. Overhaul and extensive [illegible] by the manufacture or other qualified overhaul facilities.

6.3.5 Maintenance and type of lubrication shall not differ from the manufacturer's recommendations whether the MOV is safety related or non safety related, unless proper engineering justification is obtained and documented.

6.3.6 Maintenance technical problems such as inability to obtain required opening/closing times and electrical or mechanical adjustments shall be referred to the MOV Coordinator. The MOV Coordinator shall ensure technical problems are resolved in accordance with good engineering judgement and manufacturer's instructions and/or guidance and shall contact the MOV Engineer for assistance, as required.

6.3.7 **MOV Monthly Reports**

a. A monthly report shall be developed and distributed by the MOV Coordinator. The report shall include the following, as a minimum:

- MOVs worked on that month (corrective and preventive maintenance)
- Types of problems found
- Status of MOVs in the MOV Program
- Advancements in the MOV Program
- Trend information
- Failure rate
- Status of on going programmatic improvement measures

b. This report shall be sent to the following personnel, at a minimum:

- Station Manager
- Assistant Manager (O&M)
- Superintendent - Maintenance
- Supervisor - Maintenance Engineering
- Supervisor - Electrical Maintenance
- Supervisor - Mechanical Maintenance
- MOV Engineer
- Supervisor - System Engineering
- Corporate Director Maintenance Support

c. The report shall contain applicable performance indicators (in addition to those in 6.3.7.a) to aid in identifying any program enhancements necessary on a continuous basis.

d. Selected trend data will be included in the MOV Monthly Report and will provide indicators with respect to program effectiveness.

e. The MOV Coordinator shall ensure that the report is distributed in a timely manner.

6.4 Effectiveness Review

The purpose of this review is to ensure that the MOV Program is effective in maintaining MOV reliability and identifying any weakness in the program that may exist. The MOV Trending Program, MOV Inspection Verification Program, and MOV Monthly Reports will aid in identifying key indicators that measure program effectiveness on an ongoing basis. Other indicators to measure program effectiveness include, but are not limited to, the following:

- Repetitive work performed on MOVs
- Station Deviation Reports written on MOVs
- LERs submitted on MOVs
- Comparison within the industry on MOV failures (e.g., NPRDS)

6.4.1 The Corporate Maintenance Support group will review the MOV Monthly Reports generated from the Stations to identify similarities and potential problems associated with MOVs. Applicable information will be shared between Stations.

6.4.2 An annual review of the MOV Program will be performed by Corporate Maintenance Support and a report showing the results of the review, and recommendations for program enhancement, will be forwarded to the Superintendent - Maintenance for consideration. As a minimum, the following information shall be included in the review for each Station:

- Total MOVs in program
- Number of MOV failures while in service
- Number of MOVs tested/inspected
- Enhancements to the program
- Training issues
- Data base advancements
- Spare parts
- Recommendations

6.5 Training Requirements

Proper training is the key to a successful MOV Program. This section will describe the minimum training requirements for the following individuals associated with the MOV Program:

- MOV Coordinator
- MOV Engineer
- MOV Team Members (Electrical and Mechanical)
- Contractors
- Corporate Maintenance Support Group
- Training Departments - Station Supervisors, Foremen, Operators, and Other Employees

6.5.1 MOV Coordinator

The MOV Coordinator shall, as a minimum, complete the following:

- MOV Coordinator required reading (Document the completion of the training requirements on Attachment 6)
- Technical Staff Training: BTST-3 Lesson Plan 2 (Engineering Mechanics: Valves) **or** Electrician Development Training: PSEDP(N)-4.1 (Mechanics of MOVs)
- Technical Staff Training: BTST-16 (Problem Solving and Communications) **or** Virginia Power Task Team Training
- Virginia Power Root Cause Analysis Evaluator Training (4 hour course or 3 day course)
- Diagnostics Training

6.5.2 MOV Engineer

The MOV Engineer shall, as a minimum, complete the following:

- MOV Engineer Required Reading (Document the completion of the training requirements on Attachment 7)
- Technical Staff Training: BTST-12 (Engineering Administration)
- Diagnostics Training

6.5.3 **MOV Team Members**

MOV Team members shall successfully complete initial and annual retraining of the following subjects to qualify as a MOV Team member:

a. **General Training**

NOTE: Additional re-training may be specified as identified by Station and industry experience, effectiveness reviews, or other assessments performed on the MOV Program.

Electrical

1. Mechanics of MOVs

   PSEDP (N) - 4.1 LP-1 MOV Awareness Training*
   LP-2 Valve Actuators

2. MOV Circuits and Prints

   PSEDP(N) - 6.1 LP-1 MOV Geared Limit Switches
   LP-2 Torque Switches
   LP-3 MOV Control Circuits

3. MOV Failures

   NPSECT - 13 MOV Failures*

Mechanical

Advanced Valve Motor Operator Maintenance

PSMDP (N) - 6.4 LP-1 MOV Awareness Training*
LP-2 Valve Motor Operator Fundamentals
LP-3 HBC Fundamentals
LP-4 Nuclear Industry Areas of Concern*

* Indicates subjects requiring annual re-training

b. **Specific Training**

In addition to General Training requirements, the following applicable JPMs (or specialty JPMs) are required to be completed, as initial training, prior to assigning an individual to the MOV Team to work on a specific MOV component:

NOTE: Prerequisites for the following JPMs are identified within the individual JPM listed, or can be obtained through the Training Department.

1. **Electrical MOV Team Members**

JPM 7.09 - Perform Maintenance on Motor Operated Valves (Troubleshoot, Replace parts as required, Inspect, Adjust, and Test)

JPM 7.10 - Clean and Lubricate Motor Operated Valves

Diagnostic / Signature Analysis

The following is required for any electrical team member (select individuals) who is being qualified for data acquisition and data analysis of Motor Operated Valve signatures. These requirements are in addition to those identified above:

JPM-002 - Perform MOV Diagnostics.

2. **Mechanical MOV Team Members**

JPM 9.12 - Perform Maintenance on Limitorque Motor Operators SMB-000, SMB-00, and SB-00 (Disassemble, Inspect, Repair, Reassemble, Test)

JPM 9.13 - Perform Maintenance on Limitorque Motor Operators SMB-0 thru SMB-4, and SB-0 thru SB-4 (Disassemble, Inspect, Repair, Reassemble, Test)

JPM 9.14 - Perform Maintenance on Limitorque Motor Operators (HBCs - Size 0 thru 3)

JPM 9.15 - Perform Maintenance on Limitorque Motor Operators (HBCs - Size 4 thru 7)

Specialty JPMs

SPTE - 50 - Limitorque SMB 5 and 5XTs
SPTE - 51 - Limitorque SMC-04 (Surry Station)
SPTE - 52 - Crane Teledyne Actuators (North Anna Station)
SPTE - 53 - Rotorque Actuators (North Anna Station)

3. **Contractors**

Contractors performing MOV maintenance shall meet the requirements delineated in Reference 3.1.10.

6.5.4 **Corporate O&M Support**

The Corporate Maintenance Support Group involved in the MOV Program shall be trained in the following areas:

- Corporate polices and standards
- Station administrative procedures and practices
- Reviewing industry experiences, good practices, and trip reports
- Same training described for the MOV Engineer and MOV Coordinator

6.5.5 **Training Topics**

The Training Program on MOVs for craftsmen, planners, engineers, supervisors, and other cognizant personnel shall include:

- MOV theory of operation
- Common MOV failures
- Industry operating experience (i.e., SOERs, SERs, O&MRs, NRC IE Notices, NRC IE Bulletins, NRC AEOD reports, Industry User Group information)
- Disassembly and reassembly of MOVs using plant specific procedures
- Torque and Limit Switch adjustments
- Preventive Maintenance Inspections
- Lubrication
- Maintaining equipment qualification
- Testing

- Troubleshooting Techniques
- Use of diagnostic test equipment and associated signature analysis
- Lessons learned from plant inspections and experience
- Spare parts

6.5.6 Operations Personnel

The Training Program for Operations personnel shall include the following:

- Operator construction and theory of valve operation including functions of torque and limit switches
- Operational valve design limitations such as pressure, temperature, and maximum differential pressure
- Valve operation including precautions to prevent damage from use of excessive force during manual operation
- Valve position indication problems associated with two rotor limit switch designs
- Effect on valve operability from manually seating or back seating MOVs to prevent leakage
- Potential damage to an MOV when electrically backseating the MOV
- Potential opening of manually closed MOVs that contain non-locking gears, when under system pressure
- Duty cycle of AC motors and the corresponding number of cycles an MOV can be operated

6.6 Documentation and Maintenance History Requirements

This section defines the documentation requirements to comply with the MOV Program.

6.6.1 MOV Data Base

A controlled data base of all Motor Operated Valves shall be developed and maintained by the MOV Engineer. This data base shall contain MCC, operator, valve and motor information. Information to update the data base will be obtained by review of completed Preventive and Corrective Maintenance procedures. Minimum controlled distribution of the MOV data base shall be to the MOV Engineer, MOV Coordinator, and Corporate Maintenance Support.

6.6.2 MOV History

Motor Operated Valve history entries shall contain pertinent data such as the following:

- Serial number of the MOV
- Type of service or maintenance performed
- Appearance of gear case lubricant
- Types of lubricant and where applied (gear case, stem or other)
- Dates and names of personnel performing maintenance, adjustments or rework
- Timing of MOV, opening and closing (if applicable)

6.6.3 Torque and Thrust requirements

The following items are addressed in Mechanical Engineering Standard, STD-GN-0002, MOV Sizing and Calibration Standard:

- Motor Operator Sizing Requirements
- Policy and methodology of setting motor operators
- Controls
- Design Criteria

6.6.4 Motor Operator Control Switch Settings

The following motor operator control switch settings are maintained in Station Set Point Documents:

- Torque Switch Settings
- Thrust Band
- Torque Band
- Thermal Overload Relay Settings

6.6.5 Control logic

Limit switch settings are maintained on the Station Electrical (ESK) Drawings.

6.6.6 Software Control

The MOV Coordinator will ensure that diagnostic software being utilized is being updated as required and obsolete software is replaced.

7.0 RECORDS

7.1 The following individually packaged documents and copies of any related correspondence completed as a result of the implementation or performance of this procedure are records. They shall be transmitted to Records Management in accordance with VPAP-1701, Records Management. Prior to transmittal to Records Management, the sender shall assure that:

- Each record is packaged, when applicable
- QA program requirements have been fulfilled for Quality Assurance records
- Each record is legible, completely filled out, and adequately identifiable to the item or activity involved
- Each record is stamped, initialed, or otherwise authenticated and dated, as required by this procedure

7.1.1 Individual Records

a. Operations MOV Review Sheet

b. MOV Coordinator Training Requirements

c. MOV Engineer Training Requirements

7.1.2 Record Packages

None

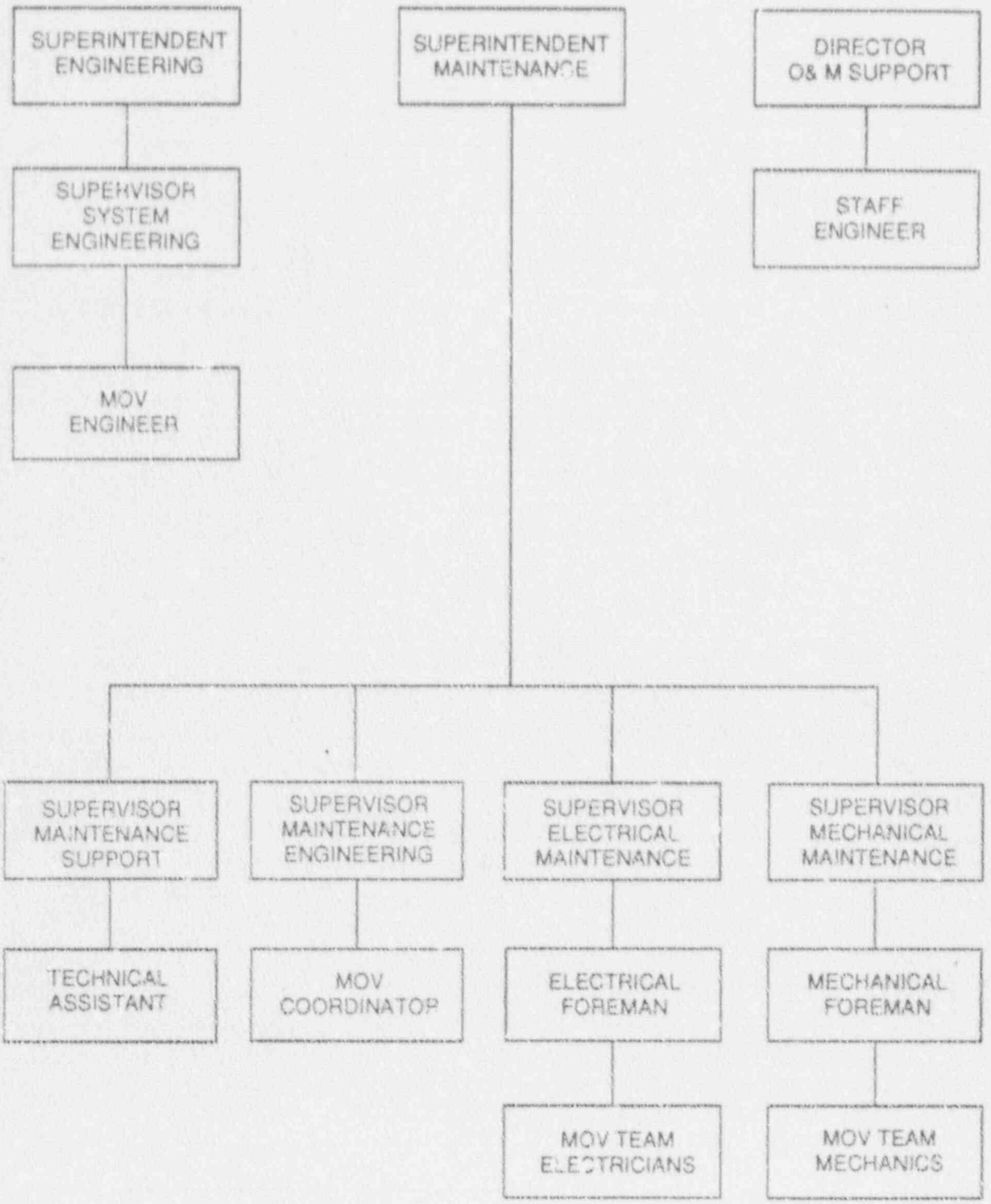
7.2 The following documents completed as a result of the implementation of this procedure **are not records** and are not required to be transmitted to Records Management:

None

ATTACHMENT 1

(Page 1 of 1)

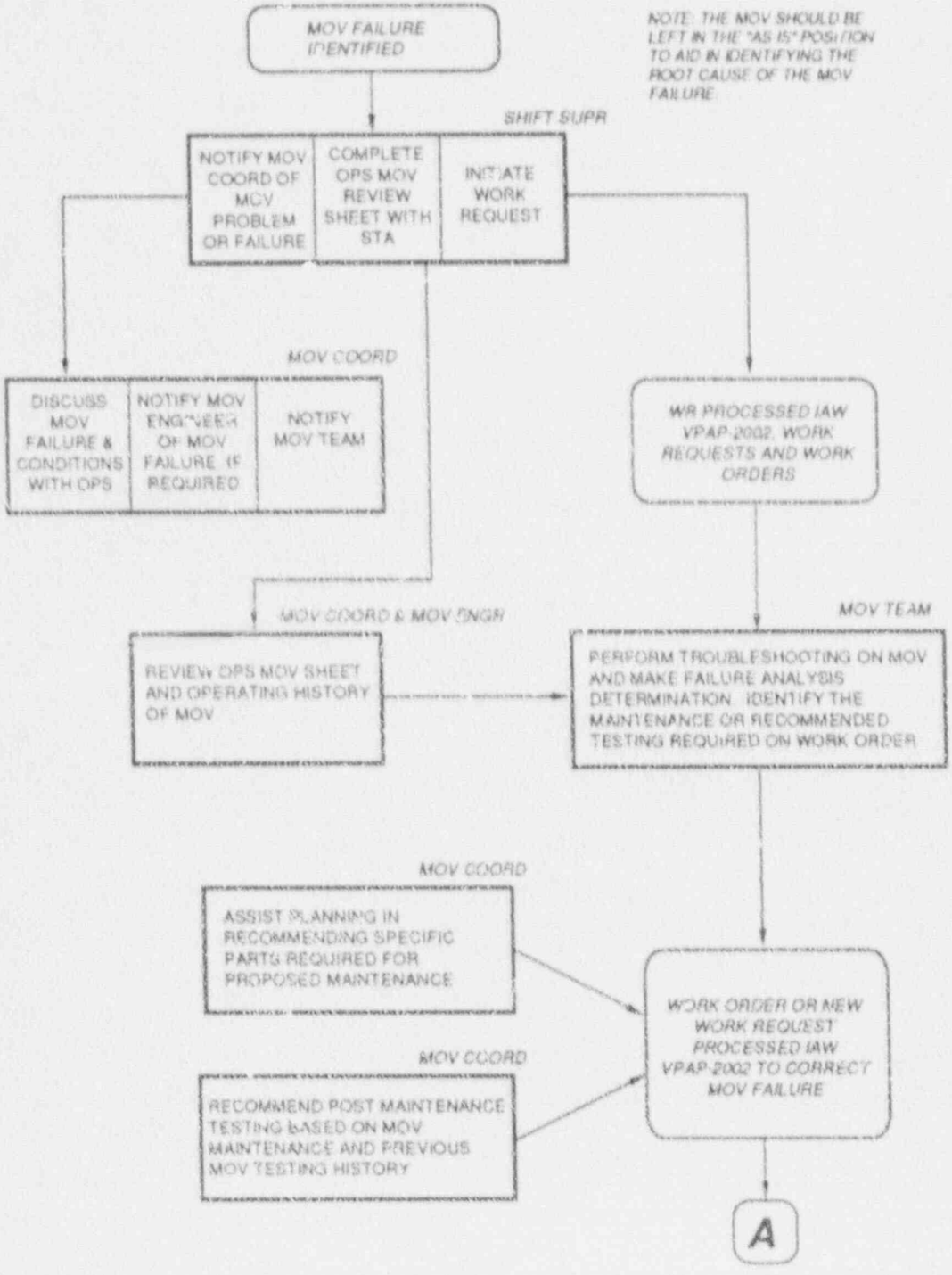
MOV ORGANIZATION CHART



ATTACHMENT 2

(Page 1 of 2)

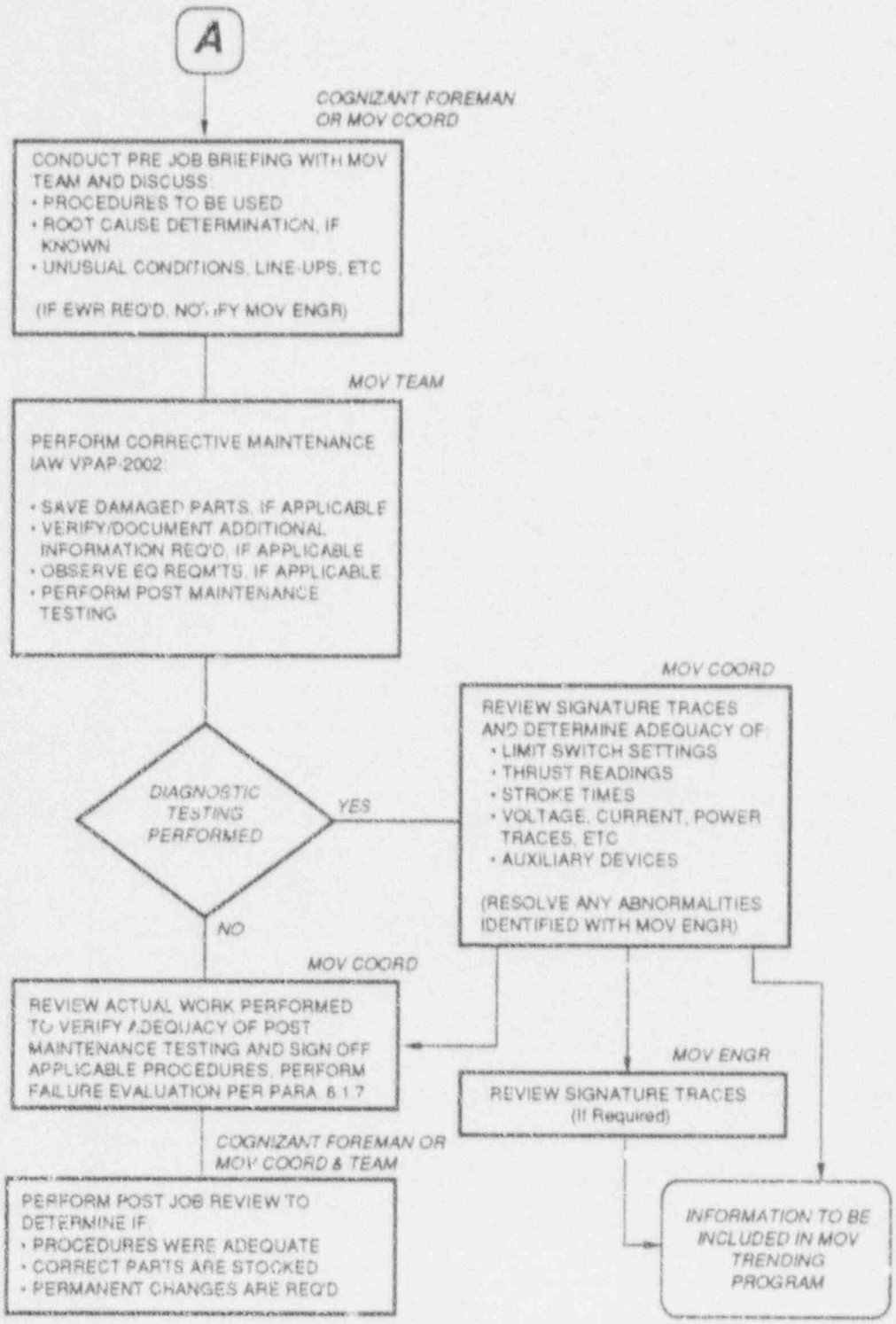
MOV CORRECTIVE MAINTENANCE FAILURE FLOWCHART



ATTACHMENT 2

(Page 2 of 2)

MOV CORRECTIVE MAINTENANCE FAILURE FLOWCHART



ATTACHMENT 3

(Page 1 of 2)

OPERATIONS MOV REVIEW SHEET - 726263(SEP 90)

Operations MOV Review Sheet

POW 26

Unit Number	Time	Date
System	Mark Number	

1. Verify that the failed or malfunctioning MOV (or component) is not disturbed, and is quarantined, unless plant operation or safety is jeopardized. List any actions taken.

2. Promptly notify the System Engineer, Maintenance Department, and/or the MOV Engineer of the failure. List personnel notified.

3. If visual discrepancies are noted, then require that photographs of the discrepancy be taken and provide a brief description.

4. Briefly describe the procedure, test, or lineup which was being performed when the failure occurred. Include specific step and procedure numbers.

5. Document what actions were completed just prior to the test, procedure, or lineup which was in progress.

6. What was the electrical system status and alignment at the time of the failure, if known?

7. List any alarms, indications, or fault indicators which were observed.

8. List any alarms, indications, or fault indicators which were expected, but not received.

9. Were the thermal overloads tripped at the MCC or intact? Specify which ones and how many.

10. Describe any abnormal breaker operations.

Key: MOV-Motor Operated Valve
MCC-Motor Control Center

ATTACHMENT 3

(Page 2 of 2)

OPERATIONS MOV REVIEW SHEET - 726263(SEP 90) (BACK)

Operations MOV Review Sheet

11. Is there any other known problems or history of problems with this component?

12. Provide a detailed summary of the exact sequence of events leading to the failure. Each individual involved with the failure should provide a separate report. The reports are to include all actions with times, dates, and reasons for such actions. Attach additional sheets, as required.

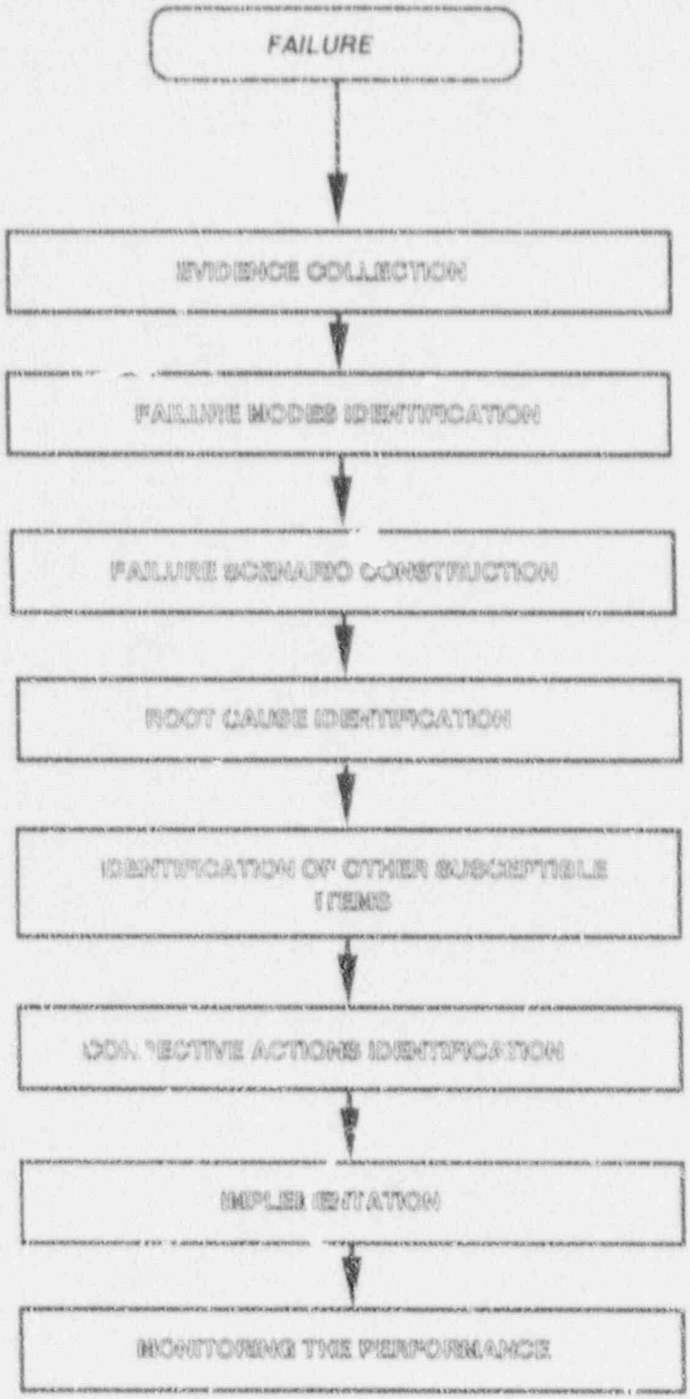
Completed By	
Shift Supervisor (Signature)	Date
Station Technical Advisor (Signature)	Date

Form No. 726263(Sep 90)
(Back)

ATTACHMENT 4

(Page 1 of 1)

MOV FAILURE EVALUATION PROCESS



ATTACHMENT 5

(Page 1 of 1)

POST MAINTENANCE TESTING GUIDELINES FOR MOTOR OPERATED VALVES

MAINTENANCE ACTIVITY	PMT
Actuator Maintenance	
Remove / Replace Actuator	COMP, INT
Refurbish Actuator (Disassembly)	COMP, INT
Declutch Mechanism Adjustment	VIS
Declutch Shaft Replacement	COMP
Replace / Tighten Stem Nut	COMP
Disassemble Spring Compensator	COMP
Replace / Remove / Adjust Spring Pack	COMP
Gearing and Bearing Replacement	COMP
Remove / Replace Torque Switch	COMP
Adjust Limit Switch	COMP or TVT
Remove / Replace Limit Switch	COMP and INT
Adjust Limit Switch	COMP and INT
Remove / Replace Motor	VIS
Replace Motor	COMP
Electrical Disconnect / Reconnect	COMP
Replace Wiring / Lift Leads	VIS
Valve Maintenance	
Adjust / Replace Packing	COMP or TVT
Bonnet Removal	COMP
Valve Refurbishment	COMP
Valve Replacement	COMP
Removal / Replacement of Stem / Disk	COMP
Clean and Lubricate Stem	MCC or TVT
Lapping Seats	COMP
Reach Rod Repairs	
Replace Reach Rod Bearings	COMP
Straighten or Replace Reach Rod	COMP
Replace Universal Joints	COMP
Removal or Installation	COMP
Procedures	
Electrical PM	MCC or TVT
Mechanical PM	*VOTES*

COMP = Comprehensive Test **MCC** = MCC Test **INT** = Interlock Test

TVT = Thrust Verification Test **VIS** - Visual Verification

ATTACHMENT 6

(Page 1 of 1)

MOV COORDINATOR TRAINING REQUIREMENTS - 726264(SEP 90)

VIRGINIA POWER

MOV Coordinator Training Requirements

PER 22

VPAP-0805

Instruction: This attachment, when completed, should be filed in the individual's training records.

Name	Department	
Required Reading		
1. VPAP-0805, Motor Operated Valve Program	Signature	Date
2. STD-GN-0002, Motor Operated Valve Sizing and Calculation Standard	Signature	Date
3. Limitorque Selection Procedures	Signature	Date
4. IEB 85-03, Motor Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings	Signature	Date
IEB 85-03 Supplement 1, Motor Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings	Signature	Date
GL Generic Letter 89-10, Safety Related Motor Operated Valve Testing and Surveillance	Signature	Date
7. NUREG 1289, Thermal Overload Protection For Electric Motors on Safety Related Motor Operated Valves Generic Issue 6(1) B-61	Signature	Date
8. MEMP-C-MOV-1, Inspection and Repair of Safety Related Limitorque Valve Control Type SMB-000, SMB-00, and SB-00	Signature	Date
9. Inservice Testing Plan for Pumps and Valves	Signature	Date
10. M-10-MOVR-5, Limitorque Motor Operated Valve Gear Case Lubricant Inspection	Signature	Date
11. Limitorque Critical Components List	Signature	Date
12. Environmental Qualification Test Report Basis	Signature	Date
13. Motor Overload Protection for Motor Operated Valves by A. W. Richards and C. D. Formica	Signature	Date
14. Draft Criteria for Sizing Thermal Overload Devices for Motor Operated Valves Dated 9-F-89	Signature	Date
15. Manual: Raymond Control Systems Type AR Electropower Actuator	Signature	Date
16. Jamesbury EL-20 Electric Actuator Installation Maintenance and Operating Instructions	Signature	Date
17. Crane Teledyne Model T1G, T4G, T10G, T40G Instructions	Signature	Date
18. Additional Plant Specific Training as Deemed Necessary by the Superintendent-Maintenance	Signature	Date

Key: MOV-Motor Operated Valve

Form No. 726264(Sep 90)

ATTACHMENT 7

(Page 1 of 1)

MOV ENGINEER TRAINING REQUIREMENTS - 726265(SEP 90)

VIRGINIA POWER

MOV Engineer Training Requirements

PER 22

VPAP-0805

Instruction: This attachment, when completed, should be filed in the individual's training records.

Name	Department	
Required Reading		
1. VPAP-0805, Motor Operated Valve Program	Signature	Date
2. STD-GN-0002, Motor Operated Valve Sizing and Calculation Standard	Signature	Date
3. Limitorque Selection Procedures	Signature	Date
4. IEB 85-03, Motor Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings	Signature	Date
5. IEB 85-03 Supplement 1, Motor Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings	Signature	Date
6. NRC Generic Letter 89-10, Safety Related Motor Operated Valve Testing and Surveillance	Signature	Date
7. NUREG 1296, Thermal Overload Protection For Electric Motors on Safety Related Motor Operated Valves Generic Issue 070 Ref 1	Signature	Date
8. MEMP-C-MOV-1, Inspection and Repair of Safety Related Limitorque Valve Control Type SMB-000, SMB-00, and SB-00	Signature	Date
9. Inservice Testing Plan for Pumps and Valves	Signature	Date
10. M-10-MOVR-5, Limitorque Motor Operated Valve Gear Case Lubricant Inspection	Signature	Date
11. Limitorque Critical Components List	Signature	Date
12. Environmental Qualification Test Report B0058	Signature	Date
13. Motor Overload Protection for Motor Operated Valves by A. W. Richards and C. D. Formica	Signature	Date
14. Draft Criteria for Sizing Thermal Overload Devices for Motor Operated Valves dated 9-5-89.	Signature	Date
15. Manual: Raymond Control Systems Type AR Electripower Actuator	Signature	Date
16. Jamesbury EL-20 Electric Actuator Installation, Maintenance and Operating Instructions	Signature	Date
17. Crane Teledyne Model T1G, T4G, T10G, T40G Instructions	Signature	Date
18. Applicable MOV Test Procedures	Signature	Date

Key: MOV-Motor Operated Valve

Form No. 726265(Sep 90)

ATTACHMENT 2

VALVE LISTING

SURRY MOV STATUS MATRIX KEY

SMATKEY

ACRONYM	MEANING	ACRONYM	MEANING
QT	QUARTER TURN MOV	DT *	COMPREHENSIVE TEST PERFORMED
SR	SAFETY RELATED MOV	LO	BREAKER LOCKED OUT DURING OPERATION
GL	GENERIC LETTER 89-10	OOS	OUT OF SERVICE
DBR *	DESIGN BASIS REVIEW PERFORMED	NPI	NAMEPLATE INFORMATION RECORDED
CAL *	CALCULATION (THRUST OR TORQUE)	IN	INCLUDED IN MOV PROGRAM
DP	DIFFERENTIAL PRESSURE TEST	4TL *	INDEPENDANT TORQUE SWITCH BYPASS

* REQUIRED FOR PROGRAM MOV'S.

SURRY POWER STATION UNIT ONE

REV100691
PAGE 1 OF 6

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
1	AS-100	CONDENSER VACUUM BREAKER					X							
2	AS-101	AUX STEAM TO FLASH EVAPORATOR										X	X	
3	BR-100A	BORON FEED TO EVAPORATOR		V									X	
4	BR-100B	BORON FEED TO EVAPORATOR		V									X	
5	BR-101A	BORON EVAPORATOR PUMP SUCTION		V									X	
6	BR-101B	BORON EVAPORATOR PUMP SUCTION		V									X	
7	CH-1115B	CHARGING SUPPLY FROM RWST		X	X	X	X		X	X			X	X
8	CH-1115C	CHARGING SUPPLY FROM VCT		X	X	X	X		X	X			X	X
9	CH-1115D	CHARGING SUPPLY FROM RWST		X	X	X	X		X	X			X	X
10	CH-1115E	CHARGING SUPPLY FROM VCT		X	X	X	X		X	X			X	X
11	CH-1267A	"A" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
12	CH-1267B	"A" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
13	CH-1269A	"B" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
14	CH-1269B	"B" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
15	CH-1270A	"C" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
16	CH-1270B	"C" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
17	CH-1275A	CHARGING PUMP RECIRCULATION		X	X	X	X	X	X	X			X	X
18	CH-1275B	CHARGING PUMP RECIRCULATION		X	X	X	X	X	X	X			X	X
19	CH-1275C	CHARGING PUMP RECIRCULATION		X	X	X	X	X	X	X			X	X
20	CH-1286A	NORMAL CHARGING PUMP DISCHARGE		X	X	X	X	X	X	X			X	X
21	CH-1286B	NORMAL CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
22	CH-1286C	NORMAL CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
23	CH-1287A	ALTERNATE CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
24	CH-1287B	ALTERNATE CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
25	CH-1287C	ALTERNATE CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
26	CH-1289A	CHARGING ISOLATION		X	X	X	X		X	X			X	X
27	CH-1289B	CHARGING ISOLATION		X	X	X	X		X	X			X	X
28	CH-1350	EMERGENCY BORATE		X	X	X	X		X	X			X	X
29	CH-1370	RCP SEAL INJECTION		X	X	X	X		X	1			X	X
30	CH-1373	CHARGING PUMP COMBINED RECIRC		X	X	X	X	X	X	X			X	X
31	CH-1381	RCP SEAL WATER RETURN		X	X	X	X		X	X			X	X

NOTE: 1. OPEN TORQUE SWITCH REMOVED FROM CIRCUIT. (SEE ESK 6BL SH2)

SURRY POWER STATION UNIT ONE

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
32	CP-100	CONDENSATE POLISHING BYPASS			3		X						X	
33	CS-100A	CONTAINMENT SPRAY PUMP SUCTION		X	X	X	X		X	X			X	X
34	CS-100B	CONTAINMENT SPRAY PUMP SUCTION		X	X	X	X		X	X			X	X
35	CS-101A	"A" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
36	CS-101B	"A" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
37	CS-101C	"B" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
38	CS-101D	"B" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
39	CS-102A	RWST CHEMICAL ADDITION ISOLATION		X	X	X	X		X	X			X	X
40	CS-102B	RWST CHEMICAL ADDITION ISOLATION		X	X	X	X		X	X			X	X
41	CS-103A	"B" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
42	CS-103B	"A" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
43	CS-103C	"B" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
44	CS-103D	"A" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
45	CW-100A	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
46	CW-100B	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
47	CW-100C	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
48	CW-100D	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
49	CW-106A	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
50	CW-106B	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
51	CW-106C	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
52	CW-106D	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
53	ES-100	FIRST POINT EXTRACTION STEAM											X	
54	ES-22	EXTRACTION STEAM										X		
55	ES-58	EXTRACTION STEAM										X		
56	ES-67	EXTRACTION STEAM										X		
57	ES-86	EXTRACTION STEAM										X		
58	ES-93	EXTRACTION STEAM										X		

NOTE: 2. QUARTER TURN MOV WITH TORQUE SWITCH SET TO MAXIMUM SETTING.
3. UNDER CONSIDERATION. (50% LOAD REJECT)
6. MOV ROUTINELY CYCLED UNDER DP CONDITIONS.

SURRY POWER STATION UNIT ONE

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
59	FW-150A	FEED WATER PUMP DISCHARGE											X	
60	FW-150B	FEED WATER PUMP DISCHARGE											X	
61	FW-151A	AUX FEED WATER TO "C" STEAM GEN.		X	X	X	X		X	X			X	X
62	FW-151B	AUX FEED WATER TO "C" STEAM GEN.		X	X	X	X		X	X			X	X
63	FW-151C	AUX FEED WATER TO "B" STEAM GEN.		X	X	X	X		X	X			X	X
64	FW-151D	AUX FEED WATER TO "B" STEAM GEN.		X	X	X	X		X	X			X	X
65	FW-151E	AUX FEED WATER TO "A" STEAM GEN.		X	X	X	X		X	X			X	X
66	FW-151F	AUX FEED WATER TO "A" STEAM GEN.		X	X	X	X	X	X	X			X	X
67	FW-154A	STEAM GEN. FEED WATER ISOLATION				X	X		X	X			X	X
68	FW-154B	STEAM GEN. FEED WATER ISOLATION				X	X		X	X			X	X
69	FW-154C	STEAM GEN. FEED WATER ISOLATION				X	X		X	X			X	X
70	FW-160A	AUXILIARY FEED WATER CROSS TIE		X	X	X	X		4	X			X	X
71	FW-160B	AUXILIARY FEED WATER CROSS TIE		X	X	X	X		4	X			X	X
72	MS-100A	SUPPLY TO REHEAT MOISTURE SEP.				X	X		X	X			X	X
73	MS-100B	SUPPLY TO REHEAT MOISTURE SEP.				X	X		X	X			X	X
74	MS-100C	SUPPLY TO REHEAT MOISTURE SEP.				X	X		X	X			X	X
75	MS-100D	SUPPLY TO REHEAT MOISTURE SEP.				X	X		X	X			X	X
76	MS-101A	MAIN STEAM NON-RETURN VALVE		V		X	X			X			X	
77	MS-101B	MAIN STEAM NON-RETURN VALVE		V		X	X		X	X			X	
78	MS-101C	MAIN STEAM NON-RETURN VALVE		V		X	X			X			X	
79	MS-103A	GLAND STEAM SUPPLY TO TURBINE					X		X				X	
80	MS-103B	GLAND STEAM SUPPLY TO TURBINE					X		X				X	
81	MS-104A	GLAND STEAM SPILL OVER SHUT-OFF					X		X				X	
82	MS-104B	GLAND STEAM SPILL OVER BYPASS					X		X				X	
83	NS-100A	NEUTRON SHIELD TANK DISCHARGE		V									X	
84	NS-100B	NEUTRON SHIELD TANK DISCHARGE		V									X	
85	NS-101A	NEUTRON SHIELD TANK INLET		V									X	
86	NS-101B	NEUTRON SHIELD TANK INLET		V									X	
87	PG-107A	CHILLED WATER OUTLET		X		X	X		3	3			X	X
88	PG-107B	CHILLED WATER OUTLET		X		X	X		3	3			X	X
89	PG-107C	CHILLED WATER OUTLET		X		X	X		3	3			X	X

NOTE: 3. CLOSE CONTROL WIRING REMOVED FROM CIRCUIT. (SEE ESK 6BS-SH2 AND 6FC2-SH1)

SURRY POWER STATION UNIT ONE

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
90	RC-1535	PORV BLOCK VALVE		X	X	X	X		X	X			X	X
91	RC-1536	PORV BLOCK VALVE		X	X	X	X		X	X			X	X
92	RC-1585	LOOP STOP BYPASS VALVE		V		X	X				X		X	
93	RC-1586	LOOP STOP BYPASS VALVE		V		X	X				X		X	
94	RC-1587	LOOP STOP BYPASS VALVE		V		X	X				X		X	
95	RC-1590	RCP INLET LOOP STOP VALVE		V		X	X				X			
96	RC-1591	RCP INLET LOOP STOP VALVE		V		X	X				X			
97	RC-1592	RCP INLET LOOP STOP VALVE		V		X	X				X			
98	RC-1593	RCP OUTLET LOOP STOP VALVE		V		X	X				X			
99	RC-1594	RCP OUTLET LOOP STOP VALVE		V		X	X				X			
100	RC-1595	RCP OUTLET LOOP STOP VALVE		V		X	X				X			
101	RH-100	RHR ISOLATION FROM RWST		V		X	X					X	X	
102	RH-1700	RHR PUMP INLET ISOLATION		X		X	X		X	X	X		X	X
103	RH-1701	RHR PUMP INLET ISOLATION		X		X	X		X		X		X	
104	RH-1720A	RHR PUMP DISCHARGE ISOLATION		X		X	X		X		X		X	
105	RH-1720B	RHR PUMP DISCHARGE ISOLATION		X		X	X		X		X		X	
106	RS-155A	OUTSIDE RECIRC SPRAY PUMP SUCTION	X	X	X	X	2		X	X			X	X
107	RS-155B	OUTSIDE RECIRC SPRAY PUMP SUCTION	X	X	X	X	2		X	X			X	X
108	RS-156A	RECIRC SPRAY PUMP DISCHARGE	X	X	X	X	2		X	X			X	X
109	RS-156B	RECIRC SPRAY PUMP DISCHARGE	X	X	X	X	2		X	X			X	X
110	SD-100A	HP TURBINE DRAIN							X				X	X
111	SD-100B	HP TURBINE DRAIN											X	
112	SD-100C	HP TURBINE DRAIN							X				X	X
113	SD-100D	HP TURBINE DRAIN											X	
114	SD-101	HP TURBINE 1ST DRAIN											X	
115	SD-102A	TURBINE CROSS UNDER DRAIN											X	
116	SD-102B	TURBINE CROSS UNDER DRAIN											X	

NOTE: 2. QUARTER TURN MOV WITH TORQUE SWITCH AT MAXIMUM SETTING.

SURRY POWER STATION UNIT ONE

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
117	SI-1842	BORON INJECTION TANK BYPASS		X	X	X	X	X	4	X			X	X
118	SI-1860A	LOW HEAD SI SUCTION FROM CONT SUMP		X	X	X	X		X	X			X	X
119	SI-1860B	LOW HEAD SI SUCTION FROM CONT SUMP		X	X	X	X		X	X			X	X
120	SI-1862A	LOW HEAD SI SUCTION FROM RWST	X	X	X	X	2		X	X			X	X
121	SI-1862B	LOW HEAD SI SUCTION FROM RWST	X	X	X	X	2		X	X			X	X
122	SI-1863A	LOW HEAD SI TO CHARGING PUMP SUCT		X	X	X	X		X	X			X	X
123	SI-1863B	LOW HEAD SI TO CHARGING PUMP SUCT		X	X	X	X		X	X			X	X
124	SI-1864A	LOW HEAD SI DISCHARGE		X	X	X	X		X	X			X	X
125	SI-1864B	LOW HEAD SI DISCHARGE		X	X	X	X		X	X			X	X
126	SI-1865A	ACCUMULATOR DISCHARGE		X		X	X		X	X	X		X	X
127	SI-1865B	ACCUMULATOR DISCHARGE		X		X	X		X	X	X		X	X
128	SI-1865C	ACCUMULATOR DISCHARGE		X		X	X		X	X	X		X	X
129	SI-1867C	SI LOOP INJECTION ISOLATION		X	X	X	X	X	X	X			X	X
130	SI-1867D	SI LOOP INJECTION ISOLATION		X	X	X	X	X	X	X			X	X
131	SI-1869A	CHARGING PUMP SI STOP		X	X	X	X		X	X			X	X
132	SI-1869B	CHARGING PUMP SI STOP		X	X	X	X		4	X			X	X
133	SI-1885A	"A" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
134	SI-1885B	"A" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
135	SI-1885C	"B" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
136	SI-1885D	"B" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
137	SI-1890A	LO HEAD SI TO HOT LEG		X	X	X	X		X	X			X	X
138	SI-1890B	LO HEAD SI TO HOT LEG		X	X	X	X		X	X			X	X
139	SI-1890C	LO HEAD SI TO COLD LEG		X	X	X	X		X	X			X	X

NOTE: 2. QUARTER TURN MOV WITH TORQUE SWITCH SET TO MAXIMUM SETTING.
4. MINIMUM THRUST NOT ACHIEVED. EOP MODIFIED AND LIMIT CLOSE.

SURRY POWER STATION UNIT ONE

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
140	SW-101A	BEARING COOLING SUPPLY	X	X	X	X	2		X	X			X	X
141	SW-101B	BEARING COOLING SUPPLY	X	X	X	X	2		X	X			X	X
142	SW-102A	COMPONENT COOLING SUPPLY	X	X	X	X	2		X	X			X	X
143	SW-102B	COMPONENT COOLING SUPPLY	X	X	X	X	2		X	X			X	X
144	SW-103A	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
145	SW-103B	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
146	SW-103C	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
147	SW-103D	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
148	SW-104A	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
149	SW-104B	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
150	SW-104C	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
151	SW-104D	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
152	SW-105A	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
153	SW-105B	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
154	SW-105C	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
155	SW-105D	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
156	SW-106A	RECIRC SPRAY HX CROSS TIE	X	X		X						X		
157	SW-106B	RECIRC SPRAY HX CROSS TIE	X	X		X						X		
158	VSP-100A	PURGE AIR SUPPLY (INSIDE CONT)	X	V		X	2		X		X		X	X
159	VSP-100B	PURGE AIR SUPPLY	X	V		X	2				X		X	
160	VSP-100C	PURGE AIR EXHAUST (INSIDE CONT)	X	V		X	2		X		X		X	X
161	VSP-100D	PURGE AIR EXHAUST	X	V		X	2				X		X	
162	VSP-101	PURGE AIR EXHAUST BYPASS	X	V		X	2		X		X		X	X
163	VSP-102	PURGE AIR SUPPLY BYPASS	X	V		X	2		X		X		X	X

NOTE: 2. QUARTER TURN MOV WITH TORQUE SWITCH SET AT MAXIMUM.
5. STROKED DURING RS HX FLOW TESTING.

SURRY POWER STATION UNIT TWO

REV100891

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
1	AS-200	CONDENSER VACUUM BREAKER				X	X		X	X			X	X
2	AS-201	AUX STEAM TO FLASH EVAPORATOR										X	X	
3	CH-2115B	CHARGING SUPPLY FROM RWST		X	X	X	X		X	X			X	X
4	CH-2115C	CHARGING SUPPLY FROM VCT		X	X	X	X		X	X			X	X
5	CH-2115D	CHARGING SUPPLY FROM RWST		X	X	X	X		X	X			X	X
6	CH-2115E	CHARGING SUPPLY FROM VCT		X	X	X	X		X	X			X	X
7	CH-2267A	"A" CHARGING PUMP SUCTION		X	X	X	X	X	X	X			X	X
8	CH-2267B	"A" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
9	CH-2269A	"B" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
10	CH-2269B	"B" CHARGING PUMP SUCTION		X	X	X	X	X	X	X			X	X
11	CH-2270A	"C" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
12	CH-2270B	"C" CHARGING PUMP SUCTION		X	X	X	X		X	X			X	X
13	CH-2275A	CHARGING PUMP RECIRCULATION		X	X	X	X		X	X			X	X
14	CH-2275B	CHARGING PUMP RECIRCULATION		X	X	X	X		X	X			X	X
15	CH-2275C	CHARGING PUMP RECIRCULATION		X	X	X	X		X	X			X	X
16	CH-2286A	NORMAL CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
17	CH-2286B	NORMAL CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
18	CH-2286C	NORMAL CHARGING PUMP DISCHARGE		X	X	X	X	X	X	X			X	X
19	CH-2287A	ALTERNATE CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
20	CH-2287B	ALTERNATE CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
21	CH-2287C	ALTERNATE CHARGING PUMP DISCHARGE		X	X	X	X		X	X			X	X
22	CH-2289A	CHARGING ISOLATION		X	X	X	X	X	X	X			X	X
23	CH-2289B	CHARGING ISOLATION		X	X	X	X		X	X			X	X
24	CH-2350	EMERGENCY BORATE		X	X	X	X		X	X			X	X
25	CH-2370	RCP SEAL INJECTION		X	X	X	X		X	X			X	X
26	CH-2373	CHARGING PUMP COMBINED RECIRC		X	X	X	X	X	X	X			X	X
27	CH-2381	RCP SEAL WATER RETURN		X	X	X	X		X	X			X	X

SURRY POWER STATION UNIT TWO

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
28	CP-200	CONDENSATE POLISHING BYPASS			3		X						X	
29	CS-200A	CONTAINMENT SPRAY PUMP SUCTION		X	X	X	X		X	X			X	X
30	CS-200B	CONTAINMENT SPRAY PUMP SUCTION		X	X	X	X		X	X			X	X
31	CS-201A	"A" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
32	CS-201B	"A" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
33	CS-201C	"B" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
34	CS-201D	"B" CS PUMP DISCHARGE/ISOLATION	X	X	X	X	2		X	X			X	X
35	CS-202A	RWST CHEMICAL ADDITION ISOLATION		X	X	X	X		X	X			X	X
36	CS-202B	RWST CHEMICAL ADDITION ISOLATION		X	X	X	X		X	X			X	X
37	CS-203A	"B" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
38	CS-203B	"A" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
39	CS-203C	"B" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
40	CS-203D	"A" CS PUMP CAT ISOLATION		X		X	X		X	X		X	X	
41	CW-200A	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
42	CW-200B	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
43	CW-200C	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
44	CW-200D	WATERBOX CIRC WATER DISCHARGE	X	X	X	X	2	6	X	X			X	X
45	CW-206A	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
46	CW-206B	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
47	CW-206C	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
48	CW-206D	WATERBOX CIRC WATER INLET	X	X	X	X	2	6	X	X			X	X
49	ES-200	FIRST POINT EXTRACTION STEAM											X	
50	ES-22	EXTRACTION STEAM										X		
51	ES-58	EXTRACTION STEAM										X		
52	ES-67	EXTRACTION STEAM										X		
53	ES-86	EXTRACTION STEAM										X		
54	ES-93	EXTRACTION STEAM										X		

NOTE: 2. QUARTER TURN MOV WITH TORQUE SWITCH SET AT MAXIMUM VALUE.
3. UNDER CONSIDERATION - 50% LOAD REJECT.
6. ROUTINELY STROKED UNDER DP CONDITIONS.

SURRY POWER STATION UNIT TWO

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
55	FW-250A	FEED WATER PUMP DISCHARGE											X	
56	FW-250B	FEED WATER PUMP DISCHARGE											X	
57	FW-251A	AUX FEED WATER TO "C" STEAM GEN		X	X	X	X	X	X	X			X	X
58	FW-251B	AUX FEED WATER TO "C" STEAM GEN		X	X	X	X		X	X			X	X
59	FW-251C	AUX FEED WATER TO "B" STEAM GEN		X	X	X	X		X	X			X	X
60	FW-251D	AUX FEED WATER TO "B" STEAM GEN		X	X	X	X	X	X	X			X	X
61	FW-251E	AUX FEED WATER TO "A" STEAM GEN		X	X	X	X		X	X			X	X
62	FW-251F	AUX FEED WATER TO "A" STEAM GEN		X	X	X	X	X	X	X			X	X
63	FW-254A	STEAM GEN. FEED WATER ISOLATION				X	X		X	X			X	X
64	FW-254B	STEAM GEN. FEED WATER ISOLATION				X	X		X	X			X	X
65	FW-254C	STEAM GEN. FEED WATER ISOLATION				X	X		X	X			X	X
66	FW-260A	AUXILIARY FEED WATER CROSS TIE		X	X	X	X	X	X	X			X	X
67	FW-260B	AUXILIARY FEED WATER CROSS TIE		X	X	X	X	X	X	X			X	X
68	MS-200A	SUPPLY TO REHEAT MOISTURE SEP				X	X		X	X			X	X
69	MS-200B	SUPPLY TO REHEAT MOISTURE SEP				X	X		X	X			X	X
70	MS-200C	SUPPLY TO REHEAT MOISTURE SEP				X	X		X	X			X	X
71	MS-200D	SUPPLY TO REHEAT MOISTURE SEP				X	X		X	X			X	X
72	MS-201A	MAIN STEAM NON-RETURN VALVE		V		X	X			X			X	
73	MS-201B	MAIN STEAM NON-RETURN VALVE		V		X	X			X			X	
74	MS-201C	MAIN STEAM NON-RETURN VALVE		V		X	X			X			X	
75	MS-203A	GLAND STEAM SUPPLY TO TURBINE					X		X				X	X
76	MS-203B	GLAND STEAM SUPPLY TO TURBINE					X		X				X	X
77	MS-204A	GLAND STEAM SPILL OVER SHUT-OFF					X		X				X	X
78	MS-204B	GLAND STEAM SPILL OVER BYPASS					X		X				X	X
79	NS-200A	NEUTRON SHIELD TANK DISCHARGE		V									X	
80	NS-200B	NEUTRON SHIELD TANK DISCHARGE		V									X	
81	NS-201A	NEUTRON SHIELD TANK INLET		V									X	
82	NS-201B	NEUTRON SHIELD TANK INLET		V									X	

SURRY POWER STATION UNIT TWO

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
83	RC-2535	PORV BLOCK VALVE		X	X	X	X		X	X			X	X
84	RC-2536	PORV BLOCK VALVE		X	X	X	X		X	X			X	X
85	RC-2585	LOOP STOP BYPASS VALVE		V		X	X				X		X	
86	RC-2586	LOOP STOP BYPASS VALVE		V		X	X				X		X	
87	RC-2587	LOOP STOP BYPASS VALVE		V		X	X				X		X	
88	RC-2590	RCP INLET LOOP STOP VALVE		V		X	X				X		X	
89	RC-2591	RCP INLET LOOP STOP VALVE		V		X	X				X		X	
90	RC-2592	RCP INLET LOOP STOP VALVE		V		X	X				X		X	
91	RC-2593	RCP OUTLET LOOP STOP VALVE		V		X	X				X		X	
92	RC-2594	RCP OUTLET LOOP STOP VALVE		V		X	X				X		X	
93	RC-2595	RCP OUTLET LOOP STOP VALVE		V		X	X				X		X	
94	RH-200	RHR ISOLATION FROM RWST		V		X	X					X	X	
95	RH-2700	RHR PUMP INLET ISOLATION		X		X	X				X		X	
96	RH-2701	RHR PUMP INLET ISOLATION		X		X	X		X	X	X		X	X
97	RH-2720A	RHR PUMP DISCHARGE ISOLATION		X		X	X				X		X	
98	RH-2720B	RHR PUMP DISCHARGE ISOLATION		X		X	X				X		X	
99	RS-255A	OUTSIDE RECIRC SPRAY PUMP SUCTION	X	X	X	X	2		X	X			X	X
100	RS-255B	OUTSIDE RECIRC SPRAY PUMP SUCTION	X	X	X	X	2		X	X			X	X
101	RS-256A	RECIRC SPRAY PUMP DISCHARGE	X	X	X	X	2		X	X			X	X
102	RS-256B	RECIRC SPRAY PUMP DISCHARGE	X	X	X	X	2		X	X			X	X
103	SD-200A	HP TURBINE DRAIN				X							X	
104	SD-200B	HP TURBINE DRAIN				X							X	
105	SD-200C	HP TURBINE DRAIN				X			X				X	X
106	SD-200D	HP TURBINE DRAIN				X							X	
107	SD-201	HP TURBINE 1ST DRAIN				X							X	
108	SD-202A	TURBINE CROSS UNDER DRAIN				X							X	
109	SD-202B	TURBINE CROSS UNDER DRAIN				X							X	

NOTE: 2. QUARTER TURN MOV WITH TORQUE SWITCH AT MAXIMUM SETTING.

SURRY POWER STATION UNIT TWO

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	COS	NPI	IN
110	SI-2842	BORON INJECTION TANK BYPASS		X	X	X	X	X	X	X			X	X
111	SI-2860A	LOW HEAD SI SUCTION FROM CONT SUMP		X	X	X	X		X	X			X	X
112	SI-2860B	LOW HEAD SI SUCTION FROM CONT SUMP		X	X	X	X		X	X			X	X
113	SI-2862A	LOW HEAD SI SUCTION FROM RWST	X	X	X	X	2		X	X			X	X
114	SI-2862B	LOW HEAD SI SUCTION FROM RWST	X	X	X	X	2		X	X			X	X
115	SI-2863A	LOW HEAD SI TO CHARGING PUMP SUCT		X	X	X	X	X	X	X			X	X
116	SI-2863B	LOW HEAD SI TO CHARGING PUMP SUCT		X	X	X	X		X	X			X	X
117	SI-2864A	LOW HEAD SI DISCHARGE		X	X	X	X	X	X	X			X	X
118	SI-2864B	LOW HEAD SI DISCHARGE		X	X	X	X	X	X	X			X	X
119	SI-2865A	ACCUMULATOR DISCHARGE		X		X	X		X	X	X		X	X
120	SI-2865B	ACCUMULATOR DISCHARGE		X		X	X		X	X	X		X	X
121	SI-2865C	ACCUMULATOR DISCHARGE		X		X	X		X	X	X		X	X
122	SI-2867C	SI LOOP INJECTION ISOLATION		X	X	X	X	X	X	X			X	X
123	SI-2867D	SI LOOP INJECTION ISOLATION		X	X	X	X	X	X	X			X	X
124	SI-2869A	CHARGING PUMP SI STOP		X	X	X	X	X	X	X			X	X
125	SI-2869B	CHARGING PUMP SI STOP		X	X	X	X	X	4	X			X	X
126	SI-2885A	"A" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
127	SI-2885B	"A" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
128	SI-2885C	"B" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
129	SI-2885D	"B" LO HEAD SI PUMP RECIRC		X	X	X	X		X	X			X	X
130	SI-2890A	LO HEAD SI TO HOT LEG		X	X	X	X	X	X	X			X	X
131	SI-2890B	LO HEAD SI TO HOT LEG		X	X	X	X		X	X			X	X
132	SI-2890C	LO HEAD SI TO COLD LEG		X	X	X	X	X	X	X			X	X

NOTE: QUARTER TURN MOV WITH TORQUE SWITCH SET AT MAXIMUM VALUE.

SURRY POWER STATION UNIT TWO

MOV STATUS MATRIX

NO.	MARK NO.	NAME	QT	SR	GL	DBR	CAL	DP	DT	4TL	LO	OOS	NPI	IN
133	SW-201A	BEARING COOLING SUPPLY	X	X	X	X	2		X	X			X	X
134	SW-201B	BEARING COOLING SUPPLY	X	X	X	X	2		X	X			X	X
135	SW-202A	COMPONENT COOLING SUPPLY	X	X	X	X	2		X	X			X	X
136	SW-202B	COMPONENT COOLING SUPPLY	X	X	X	X	2		X	X			X	X
137	SW-203A	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
138	SW-203B	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
139	SW-203C	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
140	SW-203D	RECIRC SPRAY SW HEADER ISOLATION	X	X	X	X	2	5	X	X			X	X
141	SW-204A	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
142	SW-204B	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
143	SW-204C	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
144	SW-204D	RECIRC SPRAY HEAT EXCHANGER INLET	X	X	X	X	2	5	X	X			X	X
145	SW-205A	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
146	SW-205B	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
147	SW-205C	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
148	SW-205D	RECIRC SPRAY HEAT EXCHANGER OUTLET	X	X	X	X	2	5	X	X			X	X
149	SW-206A	RECIRC SPRAY HX CROSS TIE	X	X		X						X		
150	SW-206B	RECIRC SPRAY HX CROSS TIE	X	X		X						X		
151	VSP-200A	PURGE AIR SUPPLY (INSIDE CONT)	X	V		X					X		X	
152	VSP-200B	PURGE AIR SUPPLY	X	V		X	2		X		X		X	X
153	VSP-200C	PURGE AIR EXHAUST (INSIDE CONT)	X	V		X					X		X	
154	VSP-200D	PURGE AIR EXHAUST	X	V		X	2		X		X		X	X
155	VSP-201	PURGE AIR EXHAUST BYPASS	X	V		X	2		X		X		X	X
156	VSP-202	PURGE AIR SUPPLY BYPASS	X	V		X	2		X		X		X	X

NOTE: 2. QUARTER TURN MOV WITH TORQUE SWITCH SET AT MAXIMUM VALUE.
5. STROKED UNDER DP CONDITIONS DURING RS HX FLOW TESTING.