



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
101 MARIETTA STREET, N.W., SUITE 2900  
ATLANTA, GEORGIA 30323-0199

Report Nos.: 50-395/93-27

Licensee: South Carolina Electric & Gas  
Columbia, SC 29218

Docket Nos.: 50-395

License No.: NFP-12

Facility Name: V. C. Summer

Inspection Conducted: December 6-10, 1993

Lead Inspector: E. H. Girard  
E. Girard

1/10/94  
Date Signed

Other Inspectors: M. Hunt  
M. Miller

Approved by: Charles A. Casto  
C. Casto, Chief  
Test Programs Section  
Engineering Branch  
Division of Reactor Safety

1/11/94  
Date Signed

SUMMARY

Scope:

This special, announced inspection examined the implementation of the licensee's motor-operated valve (MOV) program to meet commitments in response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance." The inspectors utilized the guidance provided in Temporary Instruction (TI) 2515/109 (Part 2), "Inspection Requirements for Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance." As delineated in Part 2 of TI 2515/109, this inspection was the initial review of the licensee's MOV program implementation in response to GL 89-10.

The inspectors reviewed the GL 89-10 design calculations, test packages, and diagnostic signature traces for a selected sample of eight MOVs. The inspectors also reviewed followup issues from the previous NRC inspection of the MOV program (TI 2515/109, Part 1) conducted in January 25-29, 1993, and documented in NRC Inspection Report No. 50-395/93-04.

Results:

In the areas inspected one violation and two inspector followup items (IFI) were identified:

(Open) Violation 50-395/93-27-01, Error in Calculation of Maximum Differential Pressure for Two MOVs. (Section 2.1)

(Open) IFI 50-395/93-27-02, Areas of Program that Require Further Evaluation. (Sections 2.1, 2.4, 2.5, and 2.7)

(Open) IFI 50-395/93-27-03, Investigation of MOV Failures. (Section 2.5)

A previously identified violation was closed.

(Closed) Violation 50-395/93-04-01, Inadequate Acceptance Criteria in MOV Procedures. (Section 2.10)

The IFI below remains open. It consisted of five concerns. Three concerns were resolved and are closed. Two remain open.

(Open) IFI 50-395/93-04-02, GL 89-10 Program Open Items. (Section 2.10)

(Open) Concern (1) - Additional testing is required to determine scope of MOV testing program.

(Closed) Concern (2) - Further engineering review of the MOV Design Basis Document (DBD) needs to be completed.

(Open) Concern (3) - The effects of high ambient temperature needs to be evaluated.

(Closed) Concern (4) - The engineering services procedure ES-424 needs to be updated and revised.

(Closed) Concern (5) - Inconsistencies were noted in the draft MOV DBD thrust calculations. The DBD needs to be completed.

Overall, the licensee had taken or was in the process of taking appropriate corrective action to address the previously identified NRC concerns. The MOV staff had been increased. The MOV staff had been trained. Procedures had been corrected and updated. The final MOV DBD had been issued, although it still needed additions of design temperature and flow data.

Strengths

There was a large, well trained, MOV staff. (Section 2.10)

MOV diagnostic stem sensors were being installed which provided direct measurement of thrust and torque. (Section 2.0)

## REPORT DETAILS

### 1. Persons Contacted

- \*J. Berly, Specialist, Nuclear Licensing
- \*M. Browne, Manager, Design Engineering
- \*C. Crowley, Technical Specialist, Nuclear Licensing
- L. Cunningham, Surveillance Specialist, Quality Systems
- \*A. Edmond, Engineer, Design Engineering
- \*M. Fowlkes, Manager, Licensing and Operations Experience
- \*M. Hazel, Engineer, Design Engineering
- \*S. Hunt, Manager, Quality Systems
- G. Meyer, Engineer, Design Engineering
- \*B. Norcutt, Specialist, Electrical Maintenance
- \*R. Osborne, Engineer, Design Engineering
- \*R. Price, Engineer, Component Engineering
- \*M. Quinton, General Manager, Engineering Services
- \*R. Rose, Engineer, Component Engineering
- J. Skolds, Vice President, Nuclear Operations Division
- \*W. Stuart, Mechanical Supervisor, Design Engineering

#### NRC Personnel

- R. Haag, Senior Resident Inspector
- \*T. Farnholtz, Resident Inspector

\*Denotes personnel that attended the exit meeting.

Acronyms and initialisms used throughout this report are listed in the last paragraph.

### 2. GENERIC LETTER (GL) 89-10 "SAFETY-RELATED MOTOR-OPERATED VALVE [MOV] TESTING AND SURVEILLANCE" (2515/109)

On June 28, 1989, the NRC issued GL 89-10, which requested licensees and construction permit holders to establish a program to ensure that switch settings for safety-related MOVs were selected, set, and maintained properly. Subsequently, five supplements to the GL have been issued and one issued for comment. NRC inspections of licensee actions implementing commitments to GL 89-10 and its supplements have been conducted based on guidance provided in Temporary Instruction (TI) 2515/109, "Inspection Requirements for Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance." TI 2515/109 is divided into Part 1, "Program Review," and Part 2, "Verification of Program Implementation."

The TI 2515/109 Part 1 program review was conducted January 27-31, 1992, and was documented in NRC Inspection Report 50-395/92-02. A followup inspection of the Part 1 concerns was conducted January 25-29, 1993, and documented in NRC Inspection Report 50-395/93-04.

The purpose of the current inspection was to evaluate the following:

- (1) Corrective actions for the concerns and the violation identified in the NRC followup Inspection Report 50-395/93-04.
- (2) Design-basis and test documentation for selected safety related MOVs differential pressure (DP) tested in the GL 89-10 program.

The inspectors selected eight MOVs and examined the piping and instrumentation drawings; design-basis calculations of the expected DPs; the sizing and switch setting calculations; and diagnostic test data. These valves are listed below in Section 2.1. The selection was made from a list of valves that had received DP testing and included primarily gate valves with high design-basis DP operating requirements.

The licensee was utilizing strain gage stem sensors [Quick Stem Sensor (QSS)], that were being installed and calibrated by an outside vendor. The inspectors reviewed the documentation furnished by the vendor which certified the accuracy of the QSSs.

The inspectors examined the licensee's implementation of its GL 89-10 MOV program. They concluded that the licensee was in the process of upgrading and implementing a program in response to GL 89-10 that would ensure the design-basis capability of MOVs at the V. C. Summer facility. However, a violation and several other matters requiring followup were identified. Support for the above conclusion and descriptions of the violation and other findings are given in the following sections of this report.

## 2.1 Design-Basis Reviews

The inspectors reviewed the licensee's design-basis documentation to verify its adequacy in general and specifically for the eight sampled MOVs examined during this inspection. [The design-basis documentation included the MOV Design Basis Document (DBD), engineering calculations and records, procedures, and test data]. In addition, the recommended action "a" of GL 89-10 that requested the maximum differential pressure and flow expected for both normal and abnormal (accident) conditions was examined to verify maximum parameters were used. These follow-up reviews were performed to determine the changes implemented to correct deficiencies identified during the two previous GL 89-10 inspections. These inspections identified a violation and concerns related to DBD accuracies and procedural weaknesses.

The inspectors reviewed the licensee's design-basis documentation for both the selected MOVs and their systems. The MOV DBD included the DP calculations, the electrical degraded grid calculations, and the thrust calculations. The system operating description was also included in this information. The documents and calculations were reviewed to determine if the design-basis DP and flow conditions, design temperature, and other design parameters for each MOV selected met the recommendations of

GI. 89-10. The inspectors verified that degraded grid calculations were included to ensure that the lowest motor terminal voltage commensurate with design-basis conditions was factored into the determination of maximum thrust ratings. The design-basis documentation was reviewed for the selected MOVs identified below:

<u>Valve No.</u>	<u>Function, Size, and Type</u>
XVG08106-CS	Charging pump Mini-flow isolation valve, 3 inch, gate
XVG08107-CS	Normal charging isolation valve inboard, 3 inch, gate
XVG08132A-CS	Charging pump discharge isolation valve, 4 inch, gate
XVG08133A-CS	Charging pump discharge isolation valve, 4 inch, gate
XVG08887A-SI	Low head recirculation train isolation valve (RHR cross connect), 10 inch, gate
XVG08888B-SI	Low head cold leg recirculation isolation valve (RHR cold leg header), 10 inch, gate
XVT02813-MS	Main steam to emergency feed pump turbine drain valve, 1.5 inch, globe
XVT08109A-CS	Charging Pump A mini-flow isolation valve, 2 inch, globe

All eight valves were controlled by limit switch in the opening position and by torque switch in the closing position with two exceptions. Valves XVG08106 and XVG08107 were controlled by limit switch in the closing position.

The design-basis system documentation, calculations, and drawings were reviewed for the systems in which the selected MOVs were installed. The DBD scope, grouping, and project instructions were contained in a series of documents entitled Design Basis Document (DBD). These are described as follows:

- (1) Design Basis Document, Volume 1, MOV Scope, Grouping, and Project Instructions, Revision 0, dated March 1993. This included:
  - Calculation No. 0980-077-SC-001 (Scope)
  - Calculation No. 0980-077-GR-001 (Grouping)
  - Calculation No. 0980-077-PI-001 (Instructions)
- (2) Design Basis Document, Volume 2, Maximum Differential Pressures For MOV Operation, Revision 0, dated March 1993. This included:
  - Calculation 0980-077-DP-001 (Safety Injection)
  - Calculation 0980-077-DP-002 (Charging System)
  - Calculation 080-077-DP-005 (Residual Heat Removal)

## Calculation 0980-077-DP-009 (Main Steam)

- (3) Design Basis Document, Volume 3, Minimum Required Motor Operated Valve Thrusts, Revision 3, dated March 1993. This included Calculation 0980-077-TH-001 to 009 (Thrust).
- (4) Design Basis Document, Volume 4, Motor Operated Valve Design Review and Capability, Revision 0, dated March 1993. This included Calculation 0980-077-DB-001 to 4 (Design).
- (5) Design Basis Document, Volume 5, MOV Thermal Overload Relay Evaluation, Revision 0, dated March 1993.
- (6) Design Basis Document, Volume 6, Minimum MOV Terminal Voltages, Revision 0, dated March 1993. This included - Electrical Calculation, Gilbert Associates, DCO 8200-003, Class 1E 460V MOV Starting Terminal Voltages at Degraded Voltage Conditions, Revision 2 dated April 6, 1993. (See Section 2.2 for further discussion).

The system flow diagrams were used to verify the location of the MOVs in the piping systems and the design safety function.

The licensee had completed and issued the above MOV DBD. The inspectors observed that the list of valves excluded from testing, and the justification for not testing, was not included in the MOV DBD. The licensee had the documentation for the excluded valves and agreed that it should be in the MOV DBD. The inspectors verified that the licensee initiated DBD Change Notice No. MOV-1, File: 17.5251 dated December 10, 1993, to correct this finding. Change Notice No. MOV-1, specified that the "list of excluded valves for MOV testing" and the justification for excluding them be included in MOV DBD Volume 1, Calculation 0980-077-GR-001. The addition of this list and the adequacy of the justifications it contains will be verified in a subsequent inspection. This matter was identified for followup as part of Inspector Followup Item 50-390/93-27-02, Areas of Program that Require Further Evaluation.

In MOV DBD Volume 2, Maximum Differential Pressure For MOV Operations, design flow and temperature were not included in the Calculations 0980-077-DP-001 to 009. The licensee had recognized this finding and was in the process of implementing corrective action. The inspectors reviewed and verified that flow and temperature were included in several updated DP calculations. These updated DP calculations were 0980-077-DP-007 (Component Cooling Water System) and 0980-077-DP-011 (Service Water System) both Revision 1, dated December 1, 1993. The licensee was in the process of updating the remaining DP calculations to include temperature and flow. Completion of this addition will be verified in a subsequent inspection. This matter was identified for followup as part of Inspector Followup Item 50-390/93-27-02, Areas of Program that Require Further Evaluation.

During the design-basis review of DP Calculation No. 098000-077-DP-002, an error in the maximum closing DP was identified. The maximum closing

DP for the normal inboard charging isolation valves XVG08107-CS and XVG08108-CS was listed as 1130 psid for "Abnormal/Accident Conditions". For "Normal Conditions" the closing DP was listed as 1530 psid. These DPs were based on closing the valves with one charging pump running. However, the inspectors noted that during accident conditions two charging pumps would be in operation before the valves could close. The inspectors informed the licensee of this condition. Consequently, the licensee recalculated the worst case closing DP for the two valves. The recalculated worst case DP was documented in Engineers Technical Work Record, Serial Number 13867, "SI Pump Vs XVG8107 & 8108 DP/Pressures", dated December 9, 1993. The worst case recalculated closing DP was 1925 psid. The valve was found to be capable of operation at the higher DP. The Engineers Work Record also stated that Calculation No. 0980-077-DP-002 "failed to identify the worst case DP for the MOVs with both pumps operating". The failure of the licensee to include the flow from both charging pumps and calculate the worst case DP for MOVs XVG08107-CS and XVG08108-CS was identified as Violation 50-395/93-27-01, Error in Calculation of Maximum Differential Pressure for Two MOVs.

The inspectors found that the licensee had generally developed a satisfactory design-basis document. However, a violation and two other matters (IFIs) were identified that require followup. The violation, described in the previous paragraph, involved an error in a determination of design-basis DP. The other matters, described earlier in this section, involved intended additions to the DBD of design-basis flows and temperatures, and the list of valve DP test exclusions.

## 2.2 MOV Sizing and Switch Setting

The inspectors reviewed the calculations which computed the minimum required thrusts for the selected safety related rising stem MOVs. The various thrust values were determined and grouped in calculations for the system in which the MOVs were installed.

The inspectors observed that the calculations used the standard industry equations and applications factors. The licensee's gate valve thrust equation typically incorporated a valve factor of 0.60 for Westinghouse gate valves and a valve factor of 0.55 for the remainder of the MOVs. The licensee assumed a stem friction coefficient of 0.20 instead of 0.15 as an effort to provide a margin for load sensitive behavior (also known as "rate of loading") and to compensate for stem lubrication degradation that might increase the stem friction coefficient over the lubrication interval. Diagnostic equipment inaccuracies were not included in the determination of the thrust bands. Instead, they were accounted for in the evaluation of diagnostic test results.

The licensee used the test results to determine a factor for load sensitive behavior for those valves tested during refueling outage (RF) 7, while the valves tested during RF 6 had only the thrust data collected from the Thrust Measuring Device which incorporated the open-closed data that has now been determined to be of questionable accuracy. The licensee informed the inspectors that the valves tested during RF 6 will

be retested during RF 8. In the meantime, an evaluation was made to verify that these MOVs were operable.

The inspectors noted that the licensee had a draft calculation that addressed Limitorque's potential 10 CFR 21 condition, "Reliance 3 Phase L. C. Actuator Motors (Starting Torque at Elevated Temperatures)," dated May 13, 1993, which dealt with the effect of elevated temperature on the output of AC motors. The licensee presented this draft, of calculation DC-820-003, which reflected the following changes:

- (1) Steam Generator Replacement/Unit Uprate Accident Temperature Profiles.
- (2) Refined Circuits Routing/Conductor Temperature Evaluation for Selected MOVs.
- (3) Incorporation of the May 13, 1993, Limitorque Potential 10 CFR Part 21 Regarding Elevated Temperature Effects on AC Motors.
- (4) Refined Thermal Overload (OL) Resistance Values Based on OL Size Specific Material Properties Corrected to 50° C.

These changes did not appear to impact the capability of the MOVs that were reviewed by the inspectors and no conclusions were drawn by the inspectors since the information was still in the draft condition.

### 2.3 Design-Basis Capability

The inspectors reviewed a series of Preventive Test Procedures for the MOVs they had selected for examination. These procedures were written to control the design-basis differential pressure (DP) testing and the test results verification. Electrical Maintenance Procedure, EMP-445.011, Baseline Testing of Limitorque Valves with MOVATS 3000 System, was reviewed since it was the controlling document for the testing activities. This procedure provided instruction for use of the MOVATS 3000 System for analysis of the mechanical and electrical setup of MOVs. It incorporated the test equipment accuracies and the torque switch repeatability factors for evaluations of the test data. Also included in the procedure were the formulas to be used by the technician for setup of the test equipment.

Engineering Services Procedure ES-424, MOV Program Implementation, defined the responsibilities of the engineering services organization for the MOV program. This procedure contained tables which listed the MOV number and system, test procedure, the expected DP for each direction of valve travel, and the design DP values. The MOV coordinator uses the guidance and forms contained in ES-424 to verify and evaluate the test results to determine margins and operability of each tested MOV. This task is accomplished as soon as possible after each MOV is tested.

The latest test results for the selected valves were reviewed by the inspectors and compared to the calculated data. For the valves selected

the lowest test DP was 73 percent of design-basis. The licensee tested each valve at or as near as possible to design DP. The licensee used a one point extrapolation to compare the DP test results with the design DP. This is an acceptable interim method. The licensee will be expected to justify its extrapolation method at the end of its GL 89-10 program.

#### 2.4 Periodic Verification of MOV Capability

Recommended action "d" of the generic letter requests the preparation or revision of procedures to ensure that adequate MOV switch settings are determined and maintained throughout the life of the plant. Section "j" of the generic letter recommends surveillance to confirm the adequacy of the settings. The interval of the surveillance was to be based on the safety importance of the MOV as well as its maintenance and performance history, but was recommended not to exceed five years or three refueling outages. Further, GL 89-10 recommended that the capability of the MOV be verified if the MOV was replaced, modified, or overhauled to an extent that the existing test results are not representative of the MOV.

For their selected sample of eight MOVs, the inspectors reviewed the licensee's task database and verified that it specified periodic testing at a five year frequency. The database documented that the periodic testing would be performed as preventive maintenance in accordance with procedure EMP-445.007. This procedure referenced several other procedures as alternatives. Based on differences in the procedures, the inspectors found that it was unclear how the periodic verifications would be performed and whether design DP would be employed. Licensee personnel stated that static diagnostic testing would be used. The licensee's basis for using static testing and its implementation of appropriate procedures and equipment for performing periodic tests of MOVs (and for post maintenance and post modification tests) are of concern and will be examined further in a subsequent inspection. The inspectors noted that the licensee had scheduled the development of justification for use of static testing for verifications as activity MVO210, to be completed October 12, 1994 (schedule entitled Early Resource for MOVATS Project). This matter was identified for followup as part of Inspector Followup Item 50-390/93-27-02, Areas of Program that Require Further Evaluation.

#### 2.5 MOV Failures, Corrective Actions, and Trending

Recommended action "h" of the generic letter requests that licensees analyze and justify each MOV failure and corrective action. The documentation should include the results and history of each as-found deteriorated condition, malfunction, test, inspection, analysis, repair, or alteration. All documentation should be retained and reported in accordance with plant requirements. It is also suggested that the material be periodically examined (every two years or after each refueling outage after program implementation) as part of the monitoring and feedback effort to establish trends of MOV operability.

Licensee personnel stated that a trending database was to be established by the second quarter of 1994. They also stated that, currently, MOV failures were documented and dispositioned on Nonconformance Notices (NCNs), per procedure SAP-1141, Rev. 1.

The inspectors reviewed the Work Request records, NCNs, and diagnostic test records for the following GL 89-10 MOVs that experienced significant failures during the last refueling outage (Refuel 7):

XVG08887A-SI

This is a low head recirculation train isolation valve. It is located in the cross-connect line between the low head injection valves and is normally open. It closes to provide separation of flowpaths during cold leg recirculation. Reopening may be required for hot leg recirculation. In DP testing this valve failed to fully close.

XVG08108-CS

This is the normal charging outboard isolation valve. It lies in the charging path to the Reactor Coolant System, is normally open, and must close on a safety injection signal to ensure adequate injection flow. It failed to open against charging pump flow while the system was being returned to operation.

As documented in NCN 4744, MOV XVG08887A-SI failed to fully seat during DP testing. Subsequently, it was dynamically tested eight times to verify that it was capable of performing its intended function. During the first test the MOV did not completely close due to the torque switch opening before the valve was fully seated. During the first retest (test 2) data was lost. The test was repeated and the valve closed. No changes had been made to the valve or test set up. Due to the concern for the operation of the valve and the fact that the thrust was not exceeding any of the design limits, the decision was made to modify the control scheme to close the valve on limit rather than torque switch. The MOV was again tested and verified to close at 96 to 98 percent of design DP 5 times. The thrust values measured were consistent within 500 lbf each time and in each direction. The inspectors reviewed the evaluation for reportability. In it the licensee stated that the valve factor used in calculating the required torque switch settings had been too small. This resulted in the valve failing to perform during the testing at or near full DP. The inspectors confirmed that the licensee had scheduled an examination of the valve condition to investigate the cause of the higher valve factor during RF 8. The repeatability of the post failure valve test results were considered to assure continued operability pending further investigation. A determination that the valve failure was not reportable was based on (1) manual actions that could have been taken to close the valve, and (2) that the "B" train would have been sufficient even without closing valve XVG08887A-SI. The inspectors agreed with the decision and concluded the corrective action being undertaken was appropriate.

Nonconformance Notice 4732 described the failure of MOV XVG08108-CS to open against maximum charging pump pressure. Unlike the failure described in the previous paragraph, this failure did not occur during testing. Opening this valve was required for operation but not for a safety function. It closes on a safety injection signal. The licensee's corrective action was to bypass the torque switch to 95 percent open. The inspectors verified satisfactory test results following the corrective action. Also, they confirmed that the licensee had scheduled DP testing and an examination of the internal valve conditions during RF 8. The inspectors concluded the corrective action being undertaken was appropriate.

The inspectors verified that the licensee documented adequate operability and 10 CFR 50.72/73 evaluations for the above valve failures. Additionally, as noted above, they concluded that appropriate corrective actions were being instituted. However, the inspectors considered the causes of the failures inadequately explained pending licensee investigations planned during RF 8. The results of licensee's examination and testing of the valves in RF 8 will be reviewed to determine if cause is satisfactorily determined and corrected. This is identified as Inspector Followup Item 50-395/93-27-03, Investigation of MOV Failures.

The licensee's corrective actions for the MOV failures examined were satisfactory. Additional MOV failure investigation followup is planned as described in the previous paragraph. The licensee's establishment and implementation of a trending database and periodic review of failure data will be examined further in a subsequent inspection. This matter was identified for followup as part of Inspector Followup Item 50-390/93-27-02, Areas of Program that Require Further Evaluation.

## 2.6 Schedule

In GL 89-10, the NRC staff requested that licensees complete all design-basis reviews, analyses, verifications, tests, and inspections that were initiated in order to satisfy the generic letter recommendations by June 28, 1994, or three refueling outages after December 28, 1989, whichever is later. In a letter dated December 22, 1989, the licensee requested an extension through their fourth refueling outage after December 28, 1989. The extension, until the licensee's outage RF 8, was granted in a letter from the NRC dated October 29, 1990.

As of the current inspection the licensee had performed GL 89-10 differential pressure (DP) testing on just 27 valves during outages RF 6 and 7. The inspectors verified that the remaining valves not on the licensee's exclusion list were scheduled for testing during this next refueling outage, RF 8, which would meet the licensee's commitment. The testing planned included 46 valves not previously DP tested plus retests on 11 others. The schedule reviewed by the inspectors was entitled "Refuel 8 Outage Schedule, Report Date 9Dec93". The inspectors observed that the licensee's plan for the outage appeared ambitious as compared to the tests completed in the previous two outages. They were informed that

the next outage was scheduled to be 90 days long, longer than either of the previous outages. The licensee's conformance with the schedule will be determined in a subsequent inspection.

## 2.7 Pressure Locking and Thermal Binding

The Office for Analysis and Evaluation of Operational Data (AEOD) has completed a study of pressure locking and thermal binding of gate valves. AEOD concluded in its report that licensees have not taken sufficient action to provide assurance that pressure locking and thermal binding will not prevent a gate valve from performing its safety function.

The licensee provided documentation of its past evaluation of the potential for pressure locking and thermal binding of gate valves. The inspectors found the evaluations to be out-of-date in light of recent studies and industry experience. Industry experience evaluated did not include AEOD Report 1275, Volume 9. The inspectors noted that additional NRC guidance was expected in a supplement to GL 89-10 and informed the licensee that a further review of its response to pressure locking and thermal binding would be conducted in a subsequent inspection. This matter was identified for followup as part of Inspector Followup Item 50-390/93-27-02, Areas of Program that Require Further Evaluation.

## 2.8 Walkdown

A walkdown inspection of selected MOVs was conducted by the inspectors to observe the installed stem sensors (strain gages) and the condition of the valve stems. For all the MOVs examined, the valve stems were in good condition and lubricated. The MOVs were also examined to verify that stem sensors were installed on selected valves. The stem sensors were examined to determine their general condition including the installed location and wiring connections. The stem sensors were in good condition and properly installed.

## 2.9 Quality Assurance (QA) Involvement

The inspectors were informed that the QA organization had participated in assuring the adequacy of the GL 89-10 program. The inspectors verified this through discussions with the Surveillance Specialist principally involved and through review of the following QA surveillances:

<u>Surveillance No.</u>	<u>Date</u>
06-LPC-91-G	April 5, 1991
18-LPC-91-0	October 7, 1991
19-LPC-91-0	October 8, 1991
24-LPC-91-0	December 3, 1991
01-LPC-93-0	March 10, 1993
02-LPC-93-0	March 11, 1993
04-LPC-93-0	March 19, 1993
05-LPC-93-0	March 19, 1993
06-LPC-93-0	March 19, 1993

10-LPC-93-0	March 24, 1993
11-LPC-93-0	April 1, 1993
16-LPC-93-0	April 15, 1993
QA-SUR-93002-0	April 21, 1993
QA-SUR-93008-0	April 22, 1993
QA-SUR-93049-0	July 6, 1993

All of the above listed surveillances were performed by the same individual. The inspectors verified certifications from ITI MOVATS Incorporated, that he had completed one week of training in diagnostic data acquisition in February 1993. The extent of QA involvement was considered adequate.

## 2.10 Followup of Concerns Enumerated in the Part I Followup Report

The inspectors reviewed the violation and the concerns identified in the previous GL 89-10, Part I inspections to evaluate the licensee's corrective actions.

- a. (Closed) Violation 50-395/93-04-01, Inadequate Acceptance Criteria in Mov Procedures.

The licensee has now revised all the procedures in the MOV program to identify what is required and acceptable in each activity involved in the testing of MOVs. This is evidenced by the data, furnished to the testing personnel and the activities required by the engineering personnel. This item is closed.

- b. (Open) Inspector Followup Item 50-395/93-04-02, GL 89-10 Program Open Items.

This item identified five concerns for followup. The inspectors assessed the status of these concerns as described below:

(Open) Concern (1) - Additional testing is required to determine scope of MOV testing program.

This was an expression of concern as to whether design-basis differential pressure and flow testing would be performed on all GL 89-10 MOVs, where practicable. In the current inspection, the inspectors examined the licensee's testing schedule and their informal list of MOVs excluded from design-basis testing. The inspectors determined that the licensee's planned differential pressure testing appeared to agree with GL 89-10 MOVs where practicable. Because the licensee had extensive testing remaining and had not formalized the exclusion list this concern will remain open.

(Closed) Concern (2) - Further engineering review of the MOV Design Basis Document (DBD) needs to be completed.

This was a concern regarding inconsistencies between the licensee's design-basis review documents. In the current inspection the inspectors examined the present design-basis documents and did not observe any remaining inconsistencies. This concern is closed.

(Open) Concern (3) - The effects of high ambient temperature needs to be evaluated.

This was a concern that the licensee had not evaluated the effects of high ambient temperature on developed motor torque. The licensee had not completed addressing this concern.

(Closed) Concern (4) - The engineering services procedure ES-424 needs to be updated and revised.

The concern was that requirements and criteria needed to be added to assure adequate margins. The inspectors determined that the procedure now contains adequate technical and engineering instructions and data to support the GL 89-10 MOV program.

(Closed) Concern (5) - Inconsistencies were noted in the draft MOV DBD thrust calculations. The DBD needs to be completed.

This concern was that the thrust calculation documents contained inconsistencies and torque switch settings had not been incorporated into the formal design-basis documentation. Based on their reviews during the current inspection, the inspectors concluded that the torque switch settings had been satisfactorily incorporated into issued design-basis documentation and that the previous inconsistencies in thrust calculation documents had been resolved.

c. Other Concerns

In a letter dated April 26, 1993, the licensee responded to three concerns that had been described by Inspection Report 50-395/93-04. These concerns, a summary of the licensee's responses, and the inspectors' findings in the current inspection are as follows:

Design-Basis Document (DBD) Not Issued - The concern was that the licensee's DBD remained an unissued draft. The licensee's response letter explained that DBD completion had still been in process when reviewed during Inspection 50-395/93-04 and that it was subsequently issued in March 1993. As indicated in Section 2.0 above, the inspectors found that the DBD had been issued as stated by the licensee. The concern was resolved.

Limited Staffing for the GL 89-10 Program - The concern was that only one engineer and one electrician had been assigned to the program. The licensee's response letter explained that the majority of the program work was completed during outages, with additional contract and licensee personnel assigned. In the current inspection an organization chart was provided to the inspectors that indicated the licensee had designated a team for the GL 89-10 program work that consisted of the seven Engineering, five Electrical Maintenance, three Mechanical Maintenance, two Test Unit, and two Operations Coordination personnel. The team was headed by two of the Engineering personnel - one the Team Leader and the other a Coordinator. Based on this staffing, and on a review of training provided to the team, the inspectors considered that adequate staffing had been provided.

Insufficient Personnel Had Received MOV Diagnostic Training - The concern was that only two electricians had received MOVATS diagnostic training. Even the MOV coordinator who performed reviews of the diagnostic data had not received the training. The licensee's response letter stated that they had subsequently provided diagnostic analysis training to four engineers (including the MOV coordinator), a QA specialist, and a training instructor. Further, MOV maintenance and testing training had been provided to seven other personnel (engineers and operations). This training was provided prior to RF 7. In the current inspection the inspectors verified that the stated training had been performed. Additionally, based on a review of certifications from ITI MOVATS Incorporated, the inspectors verified that 12 individuals assigned responsibilities in the GL 89-10 program had completed training in diagnostic testing during November 1993. Except for one individual this involved a week of training in data acquisition and another week in signature analysis. The one individual had only received data acquisition training. The inspectors concluded the concern regarding training had been resolved.

### 3. EXIT INTERVIEW

The inspection scope and findings were summarized on December 10, 1993, with those persons indicated in Section 1. The inspectors described the areas inspected and discussed in detail the inspection results. Proprietary information is not contained in this report. No dissenting comments were received from the licensee. One violation and two inspector followup items were identified. These items are listed in the summary at the beginning of this report.

### 4. ACRONYMS AND INITIALISMS

AEOD	Office for Analysis and Evaluation of Operational Data
CFR	Code of Federal Regulations
DBD	Design Basis Document
DP	Differential Pressure
GL	Generic Letter

IFI	Inspector Followup Item
lbf	Pounds of Force
MOV	Motor Operated Valve
NCN	Nonconformance Notice
NRC	Nuclear Regulatory Commission
OL	Thermal Overload
psid	Pounds Per Square Inch Differential
QA	Quality Assurance
QSS	Quick Stem Sensor
RF	Refueling Outage
RHR	Residual Heat Removal System
TI	Temporary Instruction
V	Volts