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SUBJECT: Forwards final summary rept on MSIV. Requests that 12 scfh acceptance criteria for each MSIV when tested between seats be reflected in Tech Specs issued w/full power OL. MSIV completed to meet requirements of regulations for exemption.

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N M NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/301 PLAINFIELD ROAD, SYRACUSE, N.Y. 13212/TELEPHONE (315) 474-1511

January 23, 1987
(NMP2L 0977)

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

RE: Nine Mile Point Unit 2
Docket No. 50-410

Gentlemen:

As you are aware, Niagara Mohawk requested schedular exemptions to permit operation of Nine Mile Point Unit 2 prior to the completion of certain activities. For the schedular exemptions described in paragraphs 2.D iv), v), vi), vii), and viii) of our Facility Operating License No. NPF-54, Niagara Mohawk Power Corporation, is required to certify to the Nuclear Regulatory Commission, ten days prior to the expiration period specified in the exemption, that all systems, components and modifications have been completed to meet the requirements of the regulations for which the exemptions have been granted and provide summary descriptions of actions taken to assure the regulations have been met and the associated systems are complete and operable. This letter provides the required certification and summary description for the activities associated with the Main Steam Isolation Valves (MSIVs).

In a letter dated August 28, 1986, and amended by letters dated October 2 and October 10, 1986, Niagara Mohawk requested an exemption from the requirements of 10 CFR 50, Appendix A, GDC 54 and 55 in order to defer operability of the Main Steam Isolation Valves until initial criticality and prior to operation in modes 1, 2 or 3. The required exemption was granted by the Nuclear Regulatory Commission. The preoperational test of the Main Steam Isolation Valves has been completed, reviewed and approved. This preoperational test was performed in accordance with the approved Nine Mile Point 2 Preoperational Test Procedure (N2-POT-1-2 and N2-POT-1-3). The test results were reviewed and approved by the Site Operations Review Committee (SORC). The Site Operations Review Committee review and operational acceptance sign-off was completed on January 22, 1987 (N2-POT-1-2) and January 23, 1987 (N2-POT-1-3). The Station Superintendent's review and operational acceptance was completed on December 22, 1986 (N2-POT-1-2) and January 23, 1987 (N2-POT-1-3).

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Future main steam isolation valve, 10CFR50 Appendix J, Type C leak rate testing will meet Technical Specification Surveillance Requirements. Our analysis (submitted by letter NMP2L-0835, dated August 21, 1986) and testing have demonstrated that between-the-seat Type C testing provides conservative results. Through-the-valve test results will be a minimum of one-half the results obtained when testing between the seats. Therefore, we request that a 12 scfh acceptance criteria for each main steam isolation valve when tested between-the-seats be reflected in the NMP2 Technical Specifications issued with the full power operating license.

Based on the foregoing, on behalf of Niagara Mohawk Power Corporation, I certify to the best of my knowledge and belief that the Main Steam Isolation Valves have been completed to meet the requirements of the regulations for which the exemption has been granted. The operability of these valves is based on the information and conclusions described in our letter dated January 14, 1987 and in the attachment to this letter. As described in our letter dated January 15, 1987 (NMP2L 0973), the actuator design also meets the requirements of GDC 21. An affidavit relating to this certification accompanies this letter.

Very truly yours,

CVMangan

C. V. Mangan
Senior Vice President

TS/pns
0192C

xc: Regional Administrator, Region I
Ms. E. G. Adensam, Project Director
Mr. W. A. Cook, Resident Inspector
Project File (2)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	]	
	]	
Niagara Mohawk Power Corporation	]	Docket No. 50-410
	]	
(Nine Mile Point Unit 2)	]	

AFFIDAVIT

C. V. Mangan, being duly sworn, states that he is Senior Vice President of Niagara Mohawk Power Corporation; that he is authorized on the part of said Corporation to sign and file with the Nuclear Regulatory Commission the documents attached hereto; and that all such documents are true and correct to the best of his knowledge, information and belief.

CVMangan

Subscribed and sworn to before me, a Notary Public in and for the State of New York and County of Onondaga, this 23rd day of January, 1987.

Beth A. Menikheim
Notary Public in and for
Onondaga County, New York

My Commission expires:
BETH A. MENIKHEIM
Notary Public in the State of New York
Qualified in Onondaga County No. 4804074
My Commission Expires August 31, 1988

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MAIN STEAM ISOLATION VALVES

FINAL SUMMARY REPORT

FOR NINE MILE POINT UNIT 2

MAIN STEAM ISOLATION VALVES

FINAL SUMMARY REPORT

TABLE OF CONTENTS

I. INTRODUCTION AND SUMMARY

This report presents the current status of the Nine Mile Point Unit No. 2 Main Steam Isolation Valves, including an evaluation of potential contributors to valve delamination, an evaluation of lessons learned and their impact on prototype testing, and the acceptability of the ball type Main Steam Isolation Valve.

The decision to utilize the ball valve for Nine Mile Point Unit No. 2 was as a result of the problems relating to Main Steam Isolation Valves which have been a generic concern for a number of years. The ball type valve has inherent design features which we believe will ultimately enhance leak tightness. At the minimum, the ball type valve has characteristics comparable to those of the wye pattern globe valves. We are confident that these valves will perform their isolation function in case of a main steam line break or other event requiring primary system isolation. We have demonstrated that these valves can be brought into conformance with the Technical Specification leak tightness requirements. We have also analytically and experimentally shown that the maximum expected leakage from these valves is bounded and is generally comparable to or below the industry experience for the wye pattern globe valves. We have also demonstrated that any reasonably expected level of leak tight degradation will not have a significant radiological impact upon the public health and safety. Finally, we expect that additional knowledge about these valves gained through prototype testing and operational experience will enable us to better understand and, perhaps, improve their operational performance.

II. BACKGROUND AND HISTORY

This section presents the background and history of the Nine Mile Point Unit No. 2 Main Steam Isolation Ball Valves.

A. MSIV Valve Leakage

During March 1986, the eight NMP2 Main Steam Isolation Valves (MSIV) passed their formal "Type C" Local Leak Rate Tests (LLRT) conducted in accordance with the requirements of Appendix J of 10CFR50. During 1986, each valve was operated an estimated 100 times. This was an attempt to correct problems with the actuator. On September 2, 1986 NMPC conducted additional LLRT's on the MSIV's to provide data supporting the acceptability of the LLRT method used at NMP2 for this type of ball valve. During this testing it was discovered that all eight MSIV's had exceeded allowable leakage. Following this discovery, an extensive series of inspections, analyses and tests were performed.

In October 1986, several reports addressing the acceptability of the Main Steam Isolation Valves were prepared and submitted to the NRC. Our October 20, 1986 letter reported that the cause was wearing stress (excessive contact stress combined with friction) causing localized delamination of the tungsten carbide ball coating. The removed material scratched the stellite seats, causing excessive leakage.

Actions were taken to restore the valves to an acceptable condition and to reduce the wearing stress to an acceptable level.

The balls were removed from all eight valves and shipped to the manufacturer for evaluation and repair. The tungsten carbide coating was removed and the underlying Haynes overlay repaired as required in accordance with ASME Section III. Four (4) balls did not need weld repair to the Haynes overlay and were recoated at the Union Carbide facility, restoring them to the original specified condition. One (1) ball had the Haynes overlay repaired by welding and was also recoated at the Union Carbide facility. For three (3) balls, which would have required extensive repair it was considered more expedient to use spare castings. The spare balls were recoated with tungsten carbide in accordance with original specifications.

All the seats were removed from the MSIV's and returned to the manufacturer for repair. Scratches on the seats were removed by machining or lapping. Where possible, the seats were restored to the as-specified condition. This involved weld repairs to some seats. Seats which required extensive repair were scrapped and replacement seats meeting specifications were manufactured.

Upon re-assembly of the MSIV's the springs were reconfigured such that the seats were eccentrically loaded on the ball. This re-configuration is shown in Figure 4-8 of the Final 50.55(e) Report dated October 20, 1986.

The spool bore packing (John Crane 187I) originally specified is no longer available. Replacement packing (Chesterton 1000C), recommended by the valve manufacturer, has been installed in MSIV's 6A and 6C.

Subsequent supplies of this packing were undersized. An alternate packing Lattytex 117 was recommended by the valve vendor and has been installed in MSIV's 6B, 6D, 7A, 7B, 7C and 7D.

Pre-operational testing of the valves was performed in December 1986, followed by Type "C" leak tests between the valve seats. Results indicated that all valves had acceptable leak rates with the exception of valve 6B which had a leak rate of 8.9 scfh.

Disassembly of valve 6B revealed considerable damage to the carbide coating on the ball and to the mating seat surfaces. The bonnets of valves 6C, 6D and 7D were also removed to observe and note the ball conditions. The ball and seats were not removed. Slight damage to the coating of these balls was evident. A remote closed circuit television inspection of the top of the ball of the remaining valves (7A, 7B, 7C and 6A) revealed no apparent damage.

NMPC reviewed the damage observed on valves 6B, 6C, 6D and 7D and considered a number of potential causes for this type damage (see Evaluation and Analysis). Two additional tests were conducted in valve 7D to evaluate a) the durability of the Haynes 25 undercoating without tungsten carbide coating and, b) the spring forces applied. The results of these tests demonstrated that the Haynes 25 material was not durable as a wearing surface and that the present spring load is required for the proper seat to ball interface.

As a result of these tests and the condition of the four ball valves, Niagara Mohawk evaluated the use of wye pattern globe valves. The results of preoperational tests also identified the need for evaluation of the potential maximum leakage of the ball valves in their present condition. After this evaluation, Niagara Mohawk decided that the ball valve has the potential for less total leakage than wye pattern globe valves. This matter was discussed with the NRC on January 5, 1987. Niagara Mohawk subsequently determined that further field tests should be conducted to substantiate the maximum leakage expected during the first refueling cycle.

To quantify potential increases in valve leakage as a function of progressive coating damage, a test program was initiated in January 1987. The test utilized the damaged ball and seats from valve 6B in the body of valve 7D. The ball from 6B was selected because it had sustained the most coating damage and, as such, was likely to produce the most conservative condition of leakage.

A combination of full and partial closures was used in the test program to envelope valve stroking requirements up to the first refueling outage. Full fast closure of the valve represents planned strokes during Heatup and up to the first refueling outage. Partial closure represents the Technical Specification Surveillance for the Reactor Protection System trip test performed monthly. A conservative estimate of anticipated valve operations for the first plant operating cycle is shown on Table 1. Valve stroking during the leak test program enveloped these requirements. Figure 1 shows the test results. Each "set" of strokes consisted of two full (90°) fast closures plus two partial (6° from full open) closures followed by a Type "C" test performed through the valve (across the seats).

The testing performed demonstrates that the leakage rate does not substantially increase when the valve is stroked with the ball wet or dry even after some ball coating damage has occurred.

It is anticipated that during normal plant operation, some amount of moisture due to steam condensation will be present on the outer surface of the ball. This film of condensate could assist in reducing wear to the ball, similar to the wet stroke tests described above. The effectiveness of this condensation will be demonstrated during prototype testing.

On January 14, 1987, a safety analysis of Main Steam Isolation Valve leakage was submitted to the NRC. This submittal provided information on the acceptability of the ball valves. Further, an analysis to assess the maximum leakage, and an analysis in accordance with NUREG 1169 were prepared. All valves disassembled for evaluation have been reassembled and tested to meet Technical Specification limits (see Section B type "C" leakage).

B. TYPE "C" LEAKAGE TEST RESULTS

All eight MSIV's have been successfully Type "C" tested as described in Appendix 9.3 of the Final 10CFR50.55(e) MSIV Leakage Report. The leakage test results and closure time are shown on Table 2:

The test method used was between the seats which has proven to be conservative because both seats are tested in parallel rather than series. This will be further verified as part of the prototype testing program.

C. Actuator Modification

1. Mechanical Portion

During August 1986, the eight NMP2 Main Steam Isolation Valve (MSIV) actuators underwent testing to verify conformance to Technical Specification Sections 3/4.4.7 and 3/4.6.3 which require that the MSIVs be capable of closing within 3 to 5 seconds. During this time, several deficiencies were identified, including cracking of the mechanical latching roller on one of the actuators, closure durations in excess of the 5 second limit, and on occasion, failure of the actuator to trip and allow the valve to move from its open position. An extensive investigation into the cause of the problems was initiated which included evaluation and testing of various potential actuator design modifications to implement as corrective action. The problems were reported to the NRC on August 8, 1986, by Report 55(e)-86-18 and on August 15, 1986, by Report 55(e)-86-19, and addressed in our letter of October 21, 1986.

In October, the MSIV actuator was modified to ensure positive, repeatable fast closures commensurate with the 3 to 5 seconds required by Technical Specifications. A schematic diagram of the modified actuator is shown in Figure 4-1 of the Final 50.55(e) Report dated October 21, 1986. The mechanical latching mechanism, which includes trip solenoids, pivot

plate, and blocking lever pivot assembly, was removed. Added to the actuator was a jockey pump and an accumulator which are used to maintain hydraulic pressure in the cylinder. The jockey pump has a capacity of 0.48 gpm and will maintain the system pressure between 1100 and 1300 psig. The accumulator is a steel cylinder and a piston with a nitrogen precharge of 825 psig. This pressure has been adjusted for ambient temperature conditions inside the primary containment and steam tunnel. A flow control valve is utilized between the accumulator and hydraulic header to permit accumulator recharging with a slow controlled flow release into the system. This flow into the system does not compromise the fast closure of the MSIV. A check valve has been installed on the discharge of the jockey pump.

The revised design of the actuator requires that the Target Rock solenoid valves be continuously energized in the closed position. Since tight shut off and fast repeatable valve opening is essential, a new disc o-ring and graphite impregnated teflon backup ring and spring spacer were installed in the SOV's. A new hydraulic cylinder is provided with an enhanced piston lip seal to minimize fluid leakage. Other new features of the cylinder include a mechanical adjustable stop on the low pressure side of the cylinder to establish the full open position. An orifice was inserted in the high pressure outlet of the cylinder to maintain fast closing time between 3 to 5 seconds. Additionally, two pressure switches were added to start and stop the jockey pump at the low and high pressure system setpoints. (Actuator testing is described below in Section D.)

2. Electrical Portion

The final actuation logic for the revised MSIV actuator was described in our January 15, 1987 letter and reflects the new mode of operation. The major modifications include:

a. Maintaining the Target Rock S.O.V's energized while the MSIV is open.

b. Addition of hydraulic pressure control to the new jockey pump.

c. Addition of back-up pressure control to the main pump in the event of pressure switch or jockey pump failure.

d. Suitable alarms monitoring low hydraulic pressure and excessive jockey pump cycling.

e. Addition of RPS test monitoring circuit to detect failure of the test reset circuit.

f. Addition of a new logic control scheme as shown on the attached Figure 2, and discussed in our letter dated January 15, 1987.

g. Addition of a UPS source of power to the 3/8" diameter test solenoid operated valve.

h. Revision to the surveillance test reset circuitry to improve operator interaction.

All the above changes were implemented to enhance MSIV availability without affecting the valve's ability to perform its safety related function of closing upon receipt of an emergency trip signal.

D. ACTUATOR TEST RESULTS

A test actuator located at the manufacturer's facility was utilized to verify acceptable operability of the final hydraulic latch actuator design. This same actuator had previously undergone seismic/dynamic qualification shake table testing at Wyle Labs. Operability testing of this test actuator fitted with the modified hydraulic system began on August 29, 1986, with over 70 actuator trip tests performed. On September 23, 1986, the solenoid operated valves on the test actuator were equipped with the final EP rubber o-ring/graphite filled teflon (TFE) backing ring combination, and twelve actuator trips were performed. Each of the twelve trip tests using this combination of SOV ring material verified that the actuator closes within the required 3 to 5 seconds ; there were no unsuccessful trips. The latest trip test was successfully performed on December 4, 1986 after the actuator had been held in the open position by the hydraulic system for a period of thirty-eight days. The jockey pump had cycled only four times during this last test period. The test results are shown on Table 3.

E. NORMAL MSIV SURVEILLANCE TESTING

In accordance with plant technical specifications the MSIV's are closed to approximately 6° from full open position once per month to test the reactor protection system trip signal.

Full fast closure testing is performed during cold shutdown condition in compliance with the NMP2 Inservice Testing Plan. Fast closure during operation at power could challenge the plant safety systems due to the possibility of a scram.

F. MSIV TESTING BETWEEN PRE-OPERATIONAL AND 100 HOUR WARRANTY RUN

At various Startup Test Plateaus, all MSIV's will be tested to verify fast stroking closure and 6° close and open inservice test. Current schedules for the various tests at different test conditions and power levels are summarized in Table 4.

III. EVALUATION AND ANALYSIS

This section describes the evaluation and analysis of the problems identified on the ball valves. Specifically, this section addresses potential contributors to delamination, and actuator acceptability, and provides an analysis of valve use.

A. Potential Contributors

Previously, Niagara Mohawk reported in its October 20, 1986 letter that all eight balls showed consistent damage patterns of tungsten carbide delamination at the top and bottom of the flow holes approximately 12 degrees from the full open position. This damage occurred from contact pressure, friction and a considerable number of operating cycles. Further, an analysis of the mechanical interaction of the seat and ball was provided, with a stress analysis, and metallurgical evaluation of the damage. These analyses are still applicable since the damage is caused by high contact stress between the seat and ball. After the Type "C" failures in December 1986, additional areas were investigated for root cause.

Niagara Mohawk is evaluating the following possible contributors:

1. Relationship of the horizontal centerline of ball with relation to horizontal centerline of valve body (centerline of seal ring).
2. Relationship of the vertical centerline of the ball trunnions with respect to upper and lower body bearings, (i.e. close tolerance are required such that the actuator does not impart lateral motion on the ball trunnions).

3. Friction between ball and seat. Low friction is desirable to minimize seal ring rocking.
4. Packing design: packing material, packing load.
5. Ball coating: alternate materials and applications.
6. Seat design: material, spring design, and lateral stability.

Based upon the extensive test and evaluation program to date, we have not identified a potential root cause for the delamination which would preclude safe plant operation. This includes the possibility that the root cause may be a combination of the above factors. The prototype testing as discussed in Section IV will be utilized to determine the specific root cause.

B. <u>Actuator Acceptability</u>

The design modifications which have been made to the actuating mechanism have been evaluated and tested to ensure the operability and reliability of the MSIVs. The modified actuating mechanism has been put through an operability testing program at the manufacturer's facility. The design has been evaluated to assure that the seismic qualification has not been degraded.

The mechanical components in the hydraulic system have been tested and evaluated to assure they are qualified for the revised service conditions. The failure mechanism of the new and modified components have been evaluated to assure that the safety function of the MSIVs has not been diminished.

Niagara Mohawk is committed to continued testing of these valves and actuators. The testing program provides further assurance that the cause of previous failures will be determined and confirmed.

In conclusion, the closure problems associated with the MSIVs have been resolved, and the valves, including their actuators, are appropriate for normal and emergency plant operation. Based upon the testing and analysis performed, the MSIVs will provide rapid isolation of the main steam lines at the primary containment in the event of a break in a main steam line outside containment, a design basis loss of coolant accident (LOCA), or other events requiring main steam line or containment isolation. In the case of a main steam line break, the isolation valves will terminate reactor coolant blowdown by closing within 3 to 5 seconds, thereby preventing an uncontrolled release of radioactivity from the reactor vessel to the environment.

C. Analysis of Valve Use

As discussed below, Niagara Mohawk has concluded that the main steam isolation ball type valves are capable of performing their intended function and are acceptable from a safety standpoint.

In reaching the decision to continue to use these valves, Niagara Mohawk has examined the current pattern of leak test results experienced at Nine Mile Point Unit No. 2 compared to the historical experience with the wye pattern globe valves which are used by other BWRs as Main Steam Isolation Valves. In general, while both types of valves can be brought to a condition which will

pass Technical Specification leak test requirements, there is some probability that the leak tightness may degrade over time and the valve may not pass a subsequent leak rate test unless maintenance and refurbishment is performed. As discussed below, and in our January 14, 1987 letter, despite such possible increases in leakage over time, the safety function of the valves is not affected, and the valves meet their licensing bases.

Over the years, there has been considerable effort throughout the industry to resolve generic concerns related to BWR Main Steam Isolation Valves. While there has been a general improvement in the performance of these valves, not all the problems have yet been solved. Recently, NUREG 1169 which provides the latest regulatory evaluation regarding this issue was published. Based upon our evaluation, it can be concluded that some degradation in leak tightness beyond the value associated with Surveillance testing contained in the Technical Specification would not result in a health and safety impact when the mitigating effect of other plant features are realistically considered and modeled.

Niagara Mohawk has reviewed the Nine Mile Point Unit No. 2 design against NUREG 1169. As discussed in the attachment to our January 14, 1987 letter, we have concluded that Unit No. 2 compares very favorably with respect to design features which have a significant effect in reducing the radiological impact of leakage in the Main Steam Line Isolation Valves. Furthermore, because the valves utilized for Unit No. 2 are of different design, Niagara Mohawk has taken additional measures to further assure public health and safety. Niagara Mohawk has assessed the significance of the potential for degradation which

reasonably could be expected over a comparatively long period of time, i.e., for a number of cycles greater than that expected to be experienced by the valves during the first refueling cycle.

This testing indicates that the maximum observed leakage per valve of 17 standard cubic feet per hour occurred after 54 full fast closure and 54 partial closure valve cycles of operation (see Figure 1). It is expected that for the first refueling cycle, the valves will be subjected to 33 full cycles and 26 partial cycles. Using a comparison of Unit No. 2 design features to the factors discussed in NUREG 1169, we have evaluated the level of valve leakage which might have a significant radiological impact both in the control room and to members of the public following a radiological accident. We have conservatively determined that a total leakage up to 150 standard cubic feet per hour through all four main steam lines would not result in doses exceeding the limits. This compares to the predicted leakage of 53 standard cubic feet per hour based upon the test data. The evaluation results indicate that the controlling limit is the beta radiation exposure of the plant operators. With appropriate beta radiation protection, leakage up to 500 standard cubic feet per hour would not result in exceeding dose limits. Considerably higher leakages can be tolerated before exceeding the dose limit for the public.

Niagara Mohawk is pursuing an extensive prototype testing program for these valves. This program is described in our letter dated October 20, 1986, and Section IV of this report. We expect that the information gained from this testing will confirm the design basis for these valves and will be helpful in identifying measures which may be implemented to further improve the performance of these valves.

IV. FUTURE ACTIVITIES:

A. Effect of Lessons Learned on Prototype Testing

Niagara Mohawk is committed to additional testing as described in our October 20, 1986 letter. This testing includes prototype testing scheduled for the spring of 1987. The prototype testing provides confirmation of the following attributes:

- Verification of the mechanical integrity of the valve and the actuator for the expected operating and test cycles.

- Demonstration of valve leak tightness for the expected valve duty cycles.

- Demonstration of the ability to close the valve within the Technical Specification limits under normal operating pressure, temperature and steam conditions.

- Verification of the conservatism of the between-the-seat leak test method as an alternative to across-the-valve seat leakage tests.

- Provision of baseline data for the evaluation of (1) the long-term suitability of the valve and (2) potential design and material improvements.

The prototype test report, which will address the confirmation of the valves' acceptability for the first operating cycle, is to be provided to the Nuclear Regulatory Commission by May 15, 1987.

Based upon the testing performed to date, the following additional areas will be investigated as part of the long-term MSIV program:

1. Further evaluation of the effects of valve ball to seat interface and orientation.
2. Further evaluation of friction effects between the ball and seat.
3. Further evaluation of packing design, alternate coatings, alternate spring loads, and seat rocking.

B. <u>Prototype Testing Schedule</u>

The program for the initial prototype testing of a Main Steam Isolation Valve and Actuator has been initiated. This testing will simulate the normal valve operating conditions and cycles expected during startup testing and one plant operating cycle. This testing will be performed at normal operating pressure and temperature. The initial prototype testing will be performed at Crosby Valve and Gage Company's high flow test facility in Wrentham, Mass. The following is a summary of the major activities and their associated schedule for the initial prototype testing program:

Activity	Schedule	Status
Valve body manufacture	10/15/86 - 12/15/86	complete
Valve ball manufacture	11/01/86 - 12/23/86	complete
Valve assembly	12/16/86 - 01/23/87	underway
Actuator rework	12/16/86 - 01/23/87	underway
Prepare test specification	11/01/86 - 01/23/87	underway
Prepare test procedures	12/01/86 - 01/31/87	underway
Fabricate test loop	01/01/87 - 01/31/87	underway
Initial system checkout	02/01/87 - 02/15/87	scheduled
* Perform valve testing	02/16/87 - 03/15/87	scheduled
Inspect valve and actuator	03/16/87 - 03/31/87	scheduled
Submit final report to NRC	05/15/87	scheduled

The above dates represent the schedule for initial prototype testing to meet the commitment for a final report by 5/15/87. However, the testing is being expedited to assure completion as soon as possible. If, during the performance of this prototype testing there are any occurrences which may compromise acceptability of the installed MSIVs, the Nuclear Regulatory Commission will be notified promptly.

C. Contingency Planning

The contingency plan in place involves the procurement of fully qualified wye-pattern globe valves for installation in place of the ball valves. The globe valves could also be provided with a leakage control system. Preliminary schedule information indicates that the globe valves and, if required, a leakage control system could be installed and operable to support operation

* If the first prototype test results are favorable, a second prototype test will be performed to demonstrate repeatability.

after the Unit 2 refuel outage. However, if a problem arises during plant startup testing or the prototype testing schedule, changes could be made.

V. CONCLUSION

In conclusion, the decision to utilize the ball valve for Nine Mile Point Unit No. 2 was as a result of the recognition of the problems relating to Main Steam Isolation Valves which have been a generic concern for a number of years. The ball type valve has inherent design features which we believe will ultimately enhance leak tightness. As a minimum, the ball type valve has characteristics comparable to those of the wye pattern globe valves. We are confident that these valves will perform their isolation function in case of a main steam line break or other event requiring primary system isolation. We have demonstrated that these valves can be brought into conformance with the Technical Specification leak tightness requirements. We have also analytically and experimentally shown that the maximum expected leakage from these valves is bounded and is generally comparable to or below the industry experience for the wye pattern globe valves. We have also demonstrated that any reasonably expected level of leak tight degradation will not have a significant radiological impact upon the public health and safety. Finally, we expect that additional knowledge about these valves gained through prototype testing and operational experience will enable us to better understand and, perhaps, improve their operational performance.

For these reasons, Niagara Mohawk has, at this time, determined to continue the startup testing and operation of Unit No. 2 in accordance with the Operating License and Technical Specifications. We will, as we have previously committed, notify the Commission promptly should any of our testing indicate a concern regarding the valves' ability to function.

TABLE 1

MSIV OPERATIONAL SEQUENCE USED

TO ESTABLISH VALVE TEST CYCLES

Testing period prior to 100 Warranty Run (about 8 months)

A. Valve checkout prior to 1 open/close (fast closure for 6A, Type "C" B, C, & 7D actuator function check)

B. Valve opening for plant heatup 1 full open

C. Unanticipated trips 10 close/open (fast closure)

D. Surveillance 8 cycle (partial closure 6°)

E. Planned trips 5 close/open (fast closure)

F. 100 Hour Warranty Run 1 closure (shutdown for Type "C" test)

SUBTOTAL FULL CYCLE-17 PARTIAL CYCLE-8

100-Hour Warranty Run to Mini-Outage (about 6 months)

G. Valve opening or plant heatup 1 full open

H. Unanticipated trips 5 close/open (fast closure)
(1st month)

I. Unanticipated trips 5 close/open (fast closure)
(2nd month)

J. Surveillance 6 cycles (partial closure, 6°)

K. Mini-Outage 1 closure (shutdown)

SUBTOTAL FULL CYCLE-11 PARTIAL CYCLE-6

Mid-Cycle Outage to 1st Refueling Outage (about 12 months)

L. Valve opening for plant heatup 1 full open

M. Unanticipated trips 1 cycle (fast closure)

N. Surveillance 3 cycles (partial closure 6°)
(6-8 months)

O. Unanticipated trips 1 cycle (fast closure)

P. Surveillance 3 cycle (partial closure 6°)
(9-11 month)

Q. Unanticipated trips 1 cycle (fast closure)

R. Surveillance 3 cycles (partial closure 6°)
(12-14 month)

S. Unanticipated trips 1 cycle (fast closure)

T. Surveillance 3 cycles (partial closure 6°)
(15-18 month)

U. Planned trip 1 closure (shutdown)

SUBTOTAL FULL CYCLE-5 PARTIAL CYCLE-12

TOTAL ESTIMATED CYCLES FULL CYCLES-33 PARTIAL CYCLES-26

TOTAL TEST CYCLES FULL CYCLES-54 PARTIAL CYCLES-54

TABLE 2

FINAL MSIV PRE-OP TEST RESULTS

MSIV	TYPE "C" SCFH*	CLOSURE TIME
6A	1.8	4.4
6B	5.5	4.42
6C	4.4	4.34
6D	2.9	4.12
7A	0.3	4.32
7B	0.6	4.44
7C	1.1	4.66
7D	5.7	4.56

* between seats

TABLE 3

SUMMARY OF RESULTS FOR ACTUATOR

SHOP TESTING USING FINAL SOV DISC SEAL

Test Results (Seconds)

DATE	TIME AT PRESSURE	SOV TRIP TIME	STROKE TIME	TOTAL TIME	REMARKS
09/23/86	30 min.	0.4	3.2	3.6	No Spring Spacer
09/24/86	15 hrs.	0.4	3.2	3.6	No Spring Spacer
09/24/86	30 min.	0.5	3.3	3.8	No Spring Spacer
09/29/86	30 min.	0.4	3.1	3.5	No Spring Spacer
09/30/86	16 hrs.	0.4	3.2	3.6	No Spring Spacer
10/08/86	3 days	0.3	3.2	3.5	No Spring Spacer
10/10/86	15 hrs.	0.5	3.2	3.7	No Spring Spacer
10/10/86	30 min.	0.4	3.3	3.7	No Spring Spacer
10/15/86	5 days	0.3	3.3	3.6	No Spring Spacer
10/27/86	12 days	0.4	3.3	3.7	No Spring Spacer
10/27/86	6.5 hrs.	0.2	3.1	3.3	Spring Spacer Installed
12/04/86	38 days	0.4	3.2	3.6	Spring Spacer Installed

TABLE 4

PLANNED SCHEDULE FOR MSIV TESTING BETWEEN INITIAL CRITICALITY AND THE 100 HOUR WARRANTY RUN

	Days After 1st Criticality Schedule	(Float)*	Power Level	Steam Flow	DESCRIPTION
1.	5	(15)	≤ 5%	< 5%	Normal (slow) close all MSIV's following planned scram to permit feedwater piping to Heatup to rated (426° F) using reactor water cleanup return.
2.	10	(15)	≤ 5%	< 5%	Emergency (fast) close each MSIV individually for closure timing.
3.	47	(30)	10-20%	10-20%	Fast close MSIV's following initiation of shutdown from outside the control room.
4.	47	(30)	Shut-down	< 1%	Slow close MSIV's following depressuration to <128 psig to permit operation of residual heat removal shut-down cooling mode from remote shutdown panel.
5.	111	(60)	50-55%	50-55%	Fast closure of each MSIV individually for closure timing.
6.	111	(60)	60-65%	60-65%	Fast close fastest MSIV for closure timing/scram avoidance margin.

	Days After 1st Criticality Schedule	(Float)*	Power Level	Steam Flow	DESCRIPTION
7.	119	(90)	75-80%	75-80%	Fast close fastest MSIV for closure timing/scram avoidance margin.
8.	121	(90)	about 90%	about 90%	Fast close fastest MSIV for closure timing/scram avoidance margin.
9.	122	(90)	about 94%	about 94%	Fast close fastest MSIV for closure timing/scram avoidance margin.
10.	136	(90)	95-100%	95-100%	Initiate fast closure of all MSIV's to initiate reactor scram.

* Float is an additional increment of time to complete the activity. For example, Item 1 could occur between five days (early date) and 20 days (late date) after criticality.

(0192C)

MSIV TYPE "C" TEST RESULTS THROUGH THE VALVE

FIGURE 1

NOTE:(The ball and seat used for this test had 10 full and 11 partial cycles and had damage to the tungsten carbide coating prior to the start of this test.)

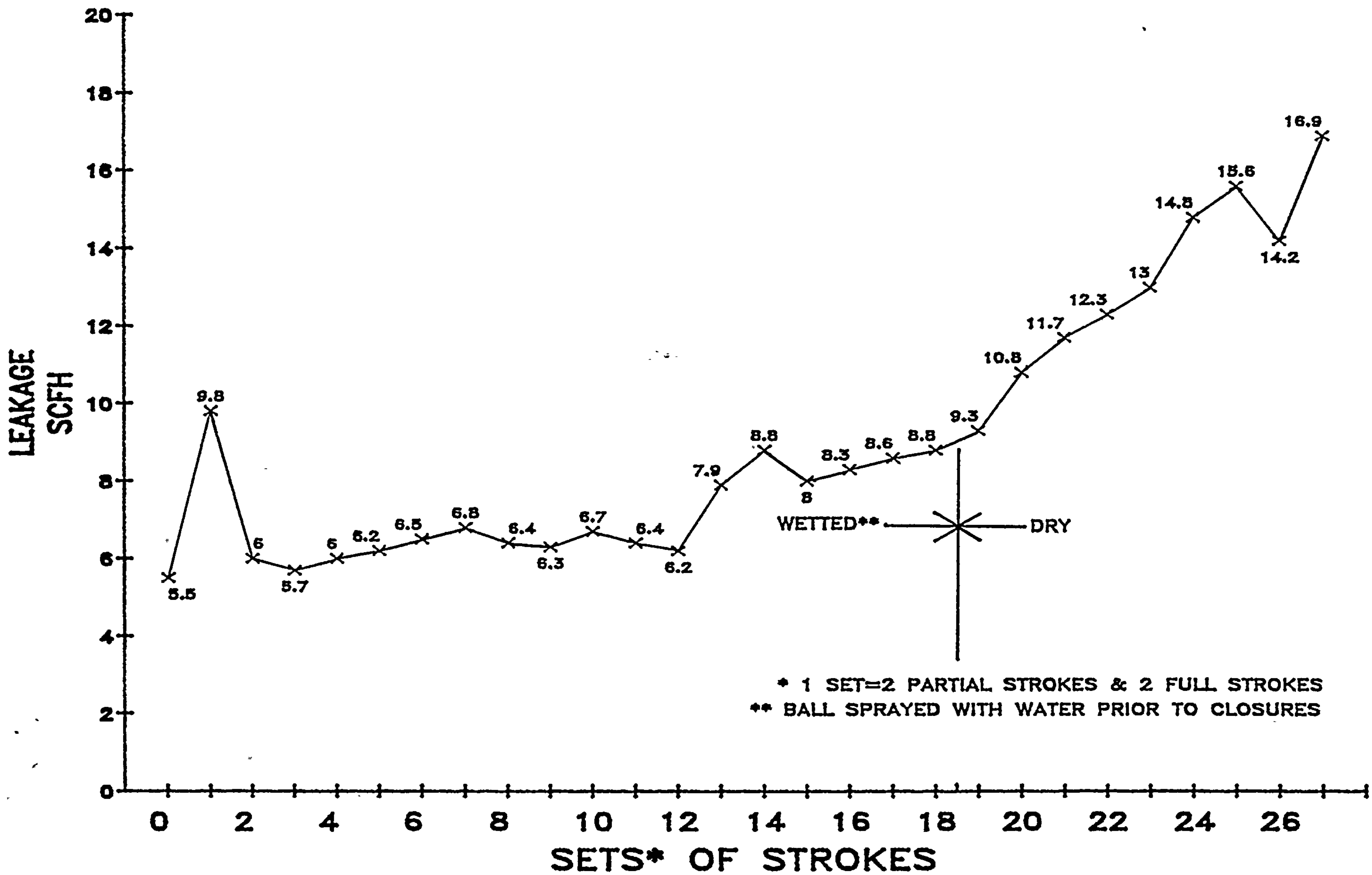
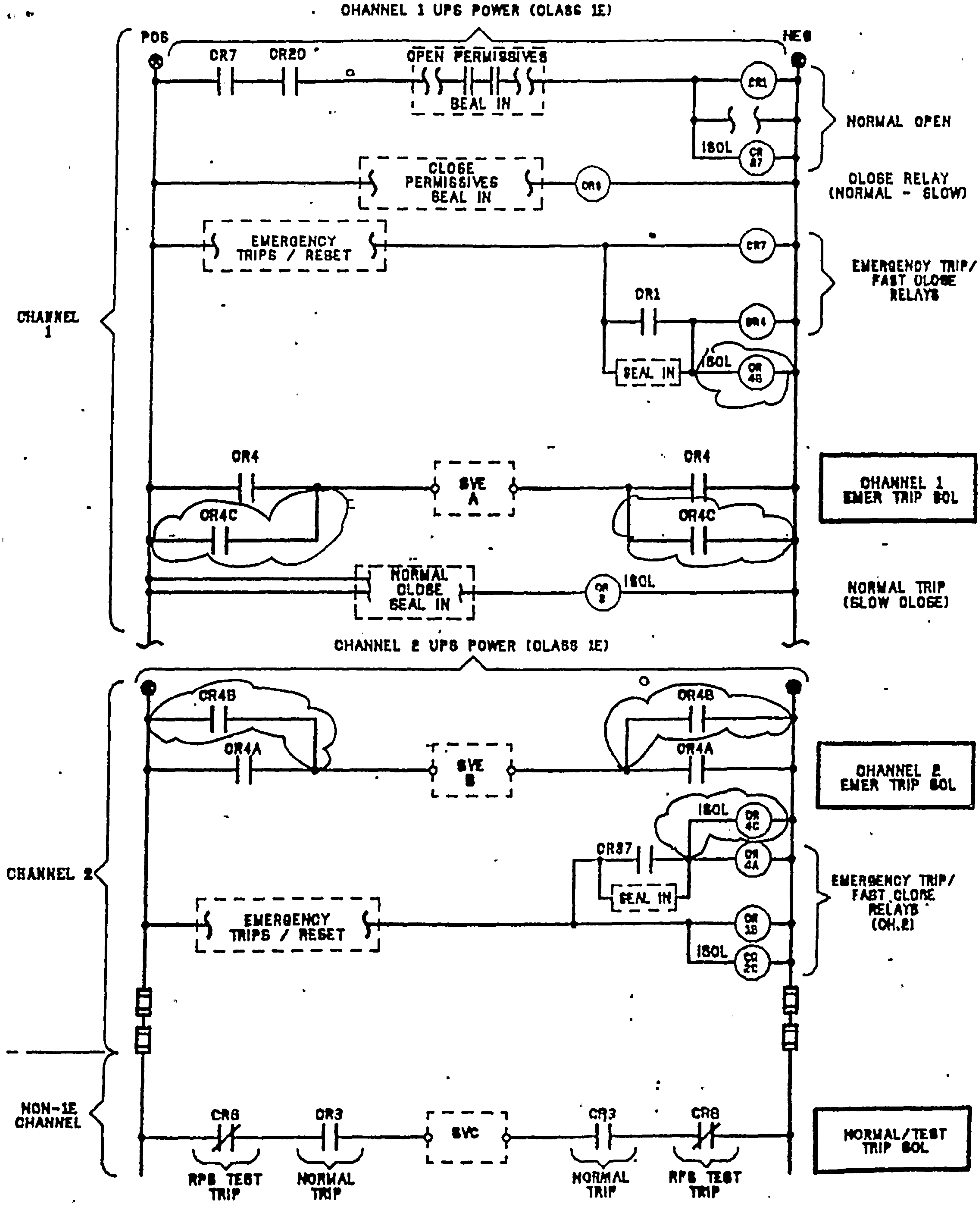


FIGURE 2

MSIV REVISED CIRCUITRY



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