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MSIV PHASE I TEST SPECIFICATION

NINE MILE POINT 2

Valve Locations: 2MSS*HYV6 (A,B,C,D)
2MSS*HYV7 (A,B,C,D)

Prepared For:

Niagara Mohawk Power Corporation
For Applicability To:
Nine Mile Point Nuclear Station, Unit 2.
Main Steam Isolation Valve Long Term
Program Task Force

NINE MILE POINT 2 MSIV LONG TERM PROGRAM

BALL TYPE MSIV

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MSIV PHASE-1 TEST PROGRAM

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MSIV PHASE I TEST SPECIFICATION

1. SCOPE

1.1 This specification identifies and defines those tests which shall be performed on a prototype unit of the Nine Mile Point-Unit 2 (NMP-2) Main Steam Isolation Valve (MSIV) design to demonstrate its acceptability for compliance with paragraphs C(14)(b) and C(14)(c) of Nine Mile Point-Unit 2 Facility Operating License No. NPF-54 and commitments identified in paragraphs 6.2.4 of Final Report, 10CFR50.55(e), MSIV Leakage, dated October 1986.

1.2 The tests identified are intended to simulate operational conditions expected during NMP-2 start-up testing and for one plant operating cycle under expected normal operational conditions.

1.3 The tests shall be performed on a full-size valve assembly that includes the hydraulic actuator assembly used.

1.4 The objectives of the tests are:

a. To confirm the mechanical integrity of the valve and actuator to sustain the expected duty cycles.

b. To demonstrate leak tightness of the valve for compliance with the safety analysis related to operation with the Nine Mile Point 2 Main Steam Isolation Ball Valves dated January 1987 submitted to NRC on January 14, 1987.

c. Demonstration of the ability to close the valve within the specified limits under normal operating pressure, temperature, and best achievable steam flow condition (minimum of 300,000 lb/hr).

d. Confirmation of the conservatism of the between-the-seat leak test method as an alternative to across-the-valve leak test.

e. To provide baseline data for the evaluation of the

(1) long-term suitability of the valve; and
(2) potential design and material improvements.

1.5 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.

1.6 This specification requires that a test procedure and test report be prepared and issued by the Contractor which demonstrates compliance with this specification.

1.7 This specification requires that the Contractor shall be solely responsible for compliance with this specification. Buyer review and approval action(s) shall in no way relieve, limit or affect the Contractor's responsibility for the inspection(s), testing and documentation required by this specification.

1.8 This specification requires that the Contractor agree to provide the Buyer with all technical data needed and pertinent to support verification of the test unit design. The Contractor shall also agree that the technical data provided may be transmitted by the Buyer to the NMP-2 MSIV Long Term Task Force participants, the Nuclear Regulatory Commission and other authorized entities as may be required to verify and document the acceptability of the MSIV for compliance with plant licensing requirements.

1.9 This specification requires that prototype unit be of the design configuration described in 3.1.1 and Appendix "A" and assembled in accordance with the events identified in Appendix "B" attached hereto. Prior to or during valve assembly, the critical features/dimensions are to be inspected/measured for informational and post-test disassembly purposes.

2. APPLICABLE DOCUMENTS

2.1 The following documents form a part of this specification.

2.1.1 Supporting Documents None

2.1.2 Supplemental Documents None

2.2 Codes and Standards. The following codes and standards (issue in effect at placement date of the purchase order or as otherwise specified in this specification form a part of this specification.

2.2.1 U.S. Nuclear Regulatory Commission (USNRC) Regulatory Guide - None

2.2.2 American National Standard Institute (ANSI)

a. N45.2-71, Quality Assurance Program Requirements for Nuclear Facilities

2.2.3 U.S. Federal Register Code of Federal Regulations

a. 10CFR50 - Title 10, Energy: Chapter 1, Nuclear Regulatory Commission; Part 50, Licensing of Production and Utilization Facilities. (1) Appendix B, Quality Assurance Criteria.

3. VALVE DESCRIPTION/APPLICATION(S)/DUTY CYCLES

3.1 General.

3.1.1 The Main Steam Isolation Valve applicable to Nine Mile Point 2 is a basic Gulf and Western 24-inch, 900#, ball type valve design with an EFCO 600 type actuator which has been modified to the design configuration described in Appendix "A".

3.1.2 The prototype MSIV to be used in this test program is to be equivalent to the design of the installed units described in 3.1.1. Any differences shall be documented and approved by the buyer prior to commencing testing.

3.1.3 Definitions

3.1.3.1 Contractor. The entity who completes or substantially completes the services required and who certifies that the tests performed complies with this specification. Where more than one contractor is involved, the contractor who is required to perform the work effort shall comply with the applicable sections of this specification.

3.1.3.2 Buyer. Niagara Mohawk Power Corporation or its authorized designee.

3.1.4 MSIV Assembly/Disassembly Instructions

3.1.4.1 Assembly/Re-Assembly of the test unit is to be in accordance with Appendix "B".

3.2 Valve/Application

3.2.1 The main steam isolation valves perform containment isolation safety functions when installed. The MSIV safety functions are to close within and meet leak tightness requirements specified by the plant technical specification.

3.3 Anticipated Duty Cycles

The anticipated duty cycles which may be applied to a typical NMP-2 MSIV were established to be as a result of the following plant phases noted below as identified in a NMP-2 Safety Analysis Report related to Operation with the NMP-2 main steam isolation ball valves:

Plant Phase	Number/Type Cycle (Full)	(RPS)
a. Pre-Operational (Prior to initial nuclear power ascension)	12(Avg)	7(Avg)
b. Valve Check-Out (Prior to nuclear heat-up)	1	
c. Initial nuclear power ascension (up to 100 hr. warranty run)	16	8
d. Nuclear plant operation (18 month cycle)	16	18

Notes:

1. The pre-operational cycles were based upon the average of all the cycles applied to the MSIVs installed at NMP-2. The cycles were applied under non-steam conditions with some of the cycles performed dry and some under wetted conditions. Approximately 1/2 were performed dry and 1/2 wet on each of the MSIVs. This test phase will therefore simulate the dry and wetted condition during cyclic operation.

2. Valve check-out will be performed prior to initial plant nuclear heat-up and under non-steam conditions. This valve operation will be performed to simulate the planned operation.

3. Initial nuclear power ascension and plant operation include cycles due to planned trips, unanticipated trips and MSIV surveillance tests.

4. REQUIREMENTS

4.1 General Test Facility. The general test facility configuration shall be capable of performing the specific tests specified herein. A basic test loop configuration to be finalized by the Seller is depicted on Figure 1.

4.1.1 Steam Supply System. The steam supply system and loop configuration shall be capable of creating a differential pressure of 200 to 300 psid across the MSIV during MSIV closure and with an upstream pressure at 1020 ±100 psig at the inlet to the valve at closure with an initial flow through rate of approximately 300,000 lbs/hr.

The steam supply shall be saturated steam. Prior to commencing the test the Seller should verify that the above test conditions can be established.

4.1.2 Pneumatic Leakage Test System. The pneumatic leakage test arrangement shall permit the testing described in Attachment "E". The pneumatic supply source is characterized as air that is clean and dry, with particle sizes no greater than 50 microns, has a dew point equal to or less than -24°F at zero psig, and is oil free. The pneumatic system shall provide 40 psig at the test unit for MSIV leak testing. The pneumatic leak test equipment used shall be the same as that used at the NMP-2 site on the installed MSIVs or its approved equivalent.

4.1.3 Ambient Environment. The test unit shall be in an enclosed building area such that the indoor environmental temperature is a result of the steam system piping and not affected by external weather conditions.

4.2 Instrumentation

4.2.1 General

4.2.1.1 Accelerometers (If Used)

a. Variable measured: Acceleration G's
b. Accuracy: ±5%
c. Frequency: 2-200 Hz
d. Expected Environment(s): Air-600°F

4.2.1.2 Pressure Sensors

Steam

a. Variable Measured: Pressure
b. Accuracy/Range: 0-1250 psig ±0.25% F.S.
c. Expected Environment(s): Steam
Temperature: 0-600°F
Pressure: 0-1250 psig
Flow Velocity: 2000 ft/sec
d. Frequency: 0-200 Hz
e. Types: Differential, Direct, Transducers, etc.

Air/Nitrogen

a. Similar to that for steam except expected temperature is 0-125°F, pressure 0-60 psig and flow velocity expected not exceed 200 ft/-second.

4.2.1.3 Temperature Sensors

a. Type(s): Flush mounted, weldable "J" or "K"-type or approved. equivalent
b. Accuracy/Range: 0-600°F °5°F
c. Expected environments: Air, Steam
Temperature: 0-500°F
Pressure: Atmospheric

4.2.1.4 Valve Rotation

a. Type: Lanyard Potentiometer or LVDT or approved equivalent.
b. Accuracy/Range: 0-100° in; 3-5 seconds;
c. Expected Environment: Air
Temperature: 0-500°F
Pressure: Atmospheric

4.2.1.5 Trunnion Movement (Axial)

a. Type: LVDT (Linear Voltage Differential Transformer)
b. Accuracy: < 0.0005 inches
c. Range: 0 to .060 inches
d. Frequency: 0-200 Hz
e. Resolution: Full Lift/0-5 seconds
f. Motion Sensed: Axial movement during valve closure and during valve heat-up.
g. Expected environment: Air at 500°F and 100% relative humidity

4.2.1.6 Strain Gages

a. Type: Weldable
b. Material to which applied: Carbon Steel
c. Variable measured: Strain, inches per inch
d. Range/accuracy: ±1000 microstrain (MS)/±3% F.S.

4.2.1.7 Acoustic

Acoustic measuring devices may be used to measure or detect relative motion or noise for informational purposes as selected by the Buyer.

4.2.2 MSIV Instrumentation

4.2.2.1 The valve shall be instrumented as noted in Appendix "D"

4.2.2.2 The hydraulic pressure of the alinator shall be instrumented by use of the as designed pressure switch. The initiating signal to the actuator solenoids shall be instrumented for obtaining time history data.

4.2.3 Test Loop Instrumentation

4.2.3.1 The basic test loop and facility instrumentation is as noted in Figure 1. The Contractor may recommend any additional instrumentation which the Contractor feels is necessary to perform the tests.

4.3 DATA ACQUISITION AND REDUCTION

4.3.1 Data Acquisition. All data including strain gages, accelerometers, pressures, temperatures, differential pressures, electrical signals to initiate test and valve closure shall be simultaneously and continuously recorded with respect to time for each of the respective steam tests. All data shall be recorded in such a manner that "Quick Look" capability is readily available for review and evaluation prior to the next run. Should data be recorded on magnetic tape, it shall be done in such a manner that "Quick Look" data is readily available. If data is recorded on magnetic tape it shall be recorded at > 500 Hz in order to pre-sample filter at 200 Hz. All tapes shall be verified and properly identified prior to delivery to the Buyer.

4.3.2 Data Reduction. All test data shall be recorded in engineering units, as follows:

a. Strain: micro-inches/inch
b. Acceleration: G's
c. Pressure: psig/psid as appropriate
d. Temperature: °F
e. Velocity: inches/second
f. Movement: inches
g. Angular Rotation: degrees

4.3.3 "Quick Look" Data Output Capability

The Contractor shall have the capability to supply permanent copies of time histories of parameters recorded so that they may be reviewed to determine if the test was performed satisfactorily without delaying the continuation of the testing and for real time determination of test valve performance to the expected results.

4.4 QUALITY ASSURANCE REQUIREMENTS

4.4.1 The test program shall be performed, controlled and documented in accordance with the requirements specified in 2.2.2.a and 2.2.3.a.

4.4.2 The Contractor shall provide a detail test procedure to the Buyer for review and obtain Buyer approval prior to the performance of the testing.

4.4.3 The Contractor shall set-up and maintain a Test Record File for this test program. All test related information shall be made part of this record file.

4.4.4 All instrumentation shall be in calibration and the calibrations shall be traceable to the U.S. National Bureau of Standards.

4.4.5 Test Procedure Change/Revision Control

4.4.5.1 Only one copy of the Buyer approved test procedure that is clearly marked "Control Copy" in red (on the title page) shall be used while the test(s) is being conducted.

4.4.5.2 The "Control Copy" shall be replaced for each new revision and the old "Control Copy" retained in the Test Record File.

4.4.5.3 If a change is a result of a test anomaly, the Buyer's technical test representative and the Contractor's responsible project test engineer must indicate their written approval on the deviation document. The deviation document shall then become part of the "Control Copy" procedure.

4.4.5.4 Red line changes may be made to the procedure providing it does not affect the test results and the Buyer's technical representative is informed of the change and the basis for the change. The Buyer's technical test representative however must be informed before any change(s) is made which may affect the test results. Red line changes shall be documented in a deviation document at a convenient time not to exceed 5 working days.

4.4.5.5 All deviation documents shall be submitted to the Buyer (or his designee) for approval.

4.4.5.6 Telephonic approval by the Buyer (or his designee) is acceptable but must be noted in the red-lined change as "Buyer (name) Telecon Approved", dated and initialed by the person who is making the change and indicating who obtained the Buyer's telephonic approval.

4.4.5.7 Where numerous changes have been made to the "Control Copy" so that it is illegible and of poor microfilm quality, a revision shall be made.

4.4.5.8 Document and revision control shall be a joint Contractor's QA and Engineering Test Responsibility. Adequate checkpoints shall be made to verify that the test is being performed in compliance with the approved test procedure and Buyer's test specification.

4.4.6 A test checklist, defining the operations required before, during and after each test or test sequence shall be prepared and used. A copy of the test checklist shall be made a part of the test procedure submitted for Buyer approval.

4.5 TESTS

4.5.1 Events and Sequence
The test events and sequence shall be performed as noted on Table 1. Table 2 summarizes the test cycle conditions for general information.

4.5.2 MSIV Performance Criteria

4.5.2.1 The MSIV design which is to be tested is expected to meet the following criteria or expectations throughout the Table 1 identified test program:

a. Closing Time (full closure) : 3 seconds minimum
5 seconds maximum

b. Leak Rate (across the valve) : 6 SCFH maximum (air medium, 40 psig) prior to in-service hot operational conditions. Following any of the hot operational cycles in Table 1, the leak rate shall not exceed 17 SCFH.

c. RPS Test:

1) Ball shall rotate and not exceed a maximum position of 87.7° (open).

2) Actuator shall not fail to move ball the required distance.

d. RPS Test Abort:

1) Ball shall rotate and not exceed a maximum position of 70° (open).

2) Actuator shall not fail to move ball the required distance.

4.5.2.2 Should the MSIV fail to function as expected in 4.5.2.1 during any phase of the test program, the Contractor shall immediately inform the Buyer within 24 hours and provide him with a written deviation notice within 5 calendar days from the date of the non-conformance. The Contractor shall identify the non-conformance, the event cycle of occurrence, and provide a recommended disposition and technical basis for resolution of the non-conformance. Testing shall not resume until authorized by the Buyer or his authorized representative.

4.5.3 Pre-Test Inspections

4.5.3.1 The valve assembly shall be inspected to ascertain its condition for future evaluation/comparison (See Appendix "C"). Photographs shall be taken of the valve in its test fixture and of specific areas considered prudent by either the Contractor or Buyer. Instrumentation shall be inspected to assure acceptability and photographs taken to document location and arrangement.

4.5.3.2 The actuator assembly shall be inspected to ascertain its condition for future comparison. Photographs shall be taken of the actuator assembly and of specific areas considered prudent by either the Contractor or the Buyer. Instrumentation shall be inspected to assure acceptability and photographs taken to document location and arrangement. The actuator cover shall not be installed during this test program in order to permit ease of inspection and observations.

4.5.3.3 Visual results of the inspection shall be recorded on an inspection report form with reference to the applicable photograph taken. The Contractor shall identify the areas to be inspected on the inspection report form. The inspection report shall be made part of the test report.

4.5.4 Valve Assembly

4.5.4.1 The valve is to be assembled in accordance with Appendix B event number 1 through 18.

4.5.5 Hydrostatic Test

4.5.5.1 Perform a hydrostatic test on the assembled valve and test loop piping in accordance with Appendix B, event number 19. The hydrostatic test is to be simultaneously applied to the upstream, downstream and valve body with the valve in the closed position.

4.5.6 Actuator Installation and Check-Out

4.5.6.1 Actuator checkout and installation shall be performed in accordance with Appendix B, event number 21. Only the minimum of strokes needed shall be applied and should not exceed two cycles. The ball shall be wetted during each valve cycle operation.

4.5.7 Leakage Tests

4.5.7.1 Valve seat leakage tests shall be performed in accordance with the procedure specified in Appendix "E", which simulates the "Between-The-Seat" method of leak testing the valve when installed in the plant. Appendix "E" also requires "Across-the-Valve" leak testing to obtain a correlation between these two methods. In addition, Appendix "E" requires that a leak check be performed across the inlet seat to body drain for MSIV long term program task force informational purposes.

Leakage test sequence shall be as follows:

a. "Across-the Valve"
b. "Inlet Seat-to-Body Drain"
c. "Between-the-Seats"

4.5.7.2 Record the following information:

a. Valve body temperature
b. Total "Valve" leakage in SCFH.
c. Differential pressure (actual)
d. Locations of all noted leak paths thru the valve.

4.5.7.3 The maximum leakage expected for the "Across-the-Valve" is 29 SCFH as established in the Appendix "E" procedure during hot operational events. All other leakage test results are for informational purposes.

4.5.8 Pre-Operational Tests

4.5.8.1 This test set is intended to simulate the average of those valve cycles which were applied to the MSIVs installed at NMP-2 under non-steam conditions and prior to the power ascension phase of the NMP-2 plant start-up.

4.5.8.2 The average of the cycles applied to the installed NMP-2 MSIVs was established to be:

a. Full (Close/Open) - 12
b. RPS (Partial Cycles) - 6
c. RPS Abort Test (Partial Cycle)-1

4.5.8.3 This test set of cold cyclic operations applied shall consist of the following under normal room ambient conditions:

Type Stroke	Wetted	Dry	Total
a. Open Valve	Full Open		1/2
b. Full (Close/Open)	6	6	12
c. RPS (Partial)	3	3	6
d. RPS Abort (Partial)	1		1
3. Close Valve	Full Close		1/2

4.5.8.4 Prior to each valve closure test record:

a. Valve body temperature(s)
b. Actuator pressure
c. Actuator solenoid voltage and current

d. Trunnion LVDT zero point
e. Valve rotation instrumentation zero point
f. Pressure in loop segments
g. Ambient temperature within 12 ft of test valve.

4.5.8.5 During each actuation test, simultaneously and continuously record all instrumentation data including closure time (initiating signal to full closure).

4.5.8.6 During the RPS abort test cycle, the valve shall be slowly rotated beyond the 83.7 (open) degree position but not exceed the maximum position of 70 degrees (open). The valve shall be wetted for this cycle operation.

4.5.9 MSIV Heat-Up

4.5.9.1 With the valve in the closed position apply 5 psig saturated steam to the valve. Maintain in this condition for 2 hours, then open valve. Increase pressure to 1000 to 1020 psig. Heat valve up to its thermally stabilized conditions. Make sure that downstream recirculation line drain is open to circulate flow during valve heat-up. Valve is considered thermally stabilized after the body thermal readings have leveled-off within ±10°F for 30 minutes.

4.5.9.2 During valve heat-up monitor the following data in a continuous and periodic fashion:

a. Steam temperature and pressure

b. MSIV body temperature(s)

c. Axial movement of ball valve trunnion relative to the body (upper/lower)

d. Valve trunnion packing leakage

4.5.10 Hot Operational Tests

4.5.10.1 All full closure stroke tests conditions shall be performed and data recorded as delineated below:

a. With the valve in its normally open position and under hot thermally stabilized conditions, cycle the valve with the actuator under approximately 300,000 lbs/hr. steam flow conditions, with at least a 900 psig upstream pressure at the inlet side of the valve during valve full closure and by creating a differential pressure of 200 to 300 psi across the valve during closure.

b. Prior to the valve cycle stroke test record the type of information identified in 4.5.8.4.

c. During each actuation cycle test, simultaneously and continuously record all instrumentation data, including upstream pressure, differential pressure across the valve during cyclic operation and closure time (initiating signal to full closure).

d. Equalize pressure across the valve before opening the valve between full stroke test runs.

e. Between test runs verify acceptability of previous data obtained and assure instrumentation adequacy prior to the next test run. Assure that the valve has been thermally re-stabilized.

4.5.10.2 Start-Up Tests

This cyclic test set is intended to simulate those valve cycles which may be applied during the power ascension phase of NMP-2 plant startup. The tests and test sequence shall consist of the following events under hot operational conditions:

Description	Type Stroke	Flow (Yes/No)
a. Unanticipated Trips	10 Full (Close/Open)	Yes
b. Surveillance	4 RPS (Partial Cycle)	No
c. Planned Trips	5 Full (Close/Open)	Yes
d. Surveillance	4 RPS (Partial Cycle)	No
e. Shutdown	1 Closure Only	No

Notes:

1. Total full (Close/Open) cycles applied is 16 (includes the MSIV heat-up open cycle and the above shutdown closure cycle).

2. Total RPS (partial cycles) is 8.

4.5.10.3 Operational Test (Phase-1)

This cyclic test set is intended to simulate those valve cycles which may be applied after the "100 hour warranty run" and to the scheduled NMP-2 mini-outage. The period of time postulated is 6 months. The tests and test sequence shall consists of the following events under hot operational conditions:

Description	Type Stroke	Flow (Yes/No)
a. Unanticipated Trips	10 Full (Close/Open)	Yes
b. Surveillance	6 RPS	No
c. Shutdown	1 Closure Only	No

Notes:

1. Total full (close/open) cycles applied is 11 (includes the MSIV heat-up open cycle and the above shutdown closure cycles).

2. Total RPS (Partial Cycles) is 6.

4.5.10.4 Operational Test (Phase-2)

This cyclic test set is intended to simulate those valve cycles which may be applied after the NMP-2 "mini-outage" until the first refueling outage. The period of time postulated is 12 months. This test set shall be sub-divided into two sub-sets representing 6 month intervals. The tests and test sequence of each sub-set shall consist of the following events under hot operational conditions:

4.5.10.4.1 Operational Test (Phase-2A)

Description	Type Stroke	Flow (Yes/No)
a. Unanticipated Trips	? Full (Close/Open)	Yes
b. Surveillance	6 RPS	No
c. Shutdown	1 Closure Only	No

Notes:

1. Total full (close/open) cycles applied is 3 (includes the MSIV heat-up open cycle and the above Shutdown Closure Cycle).

?. Total RPS (partial cycles) is 6.

4.5.10.4.2 Operational Test (Phase-2B)

Description	Type Stroke	Flow (Yes/No)
a. Unanticipated Trips	2 Full (Close/Open)	Yes
b. Surveillance	6 RPS	No
c. Shutdown	1 Closure Only	No

Notes:

1. Total full (close/open) cycles applied is 3 (includes the MSIV heat-up open cycle and the above shutdown closure cycle).
2. Total RPS (partial cycles) is 6.

4.5.10.3 The total Phase-2 hot operational cycles to be applied for this complete test set is:

Full (close/open) - 6
RPS (partial cycles) - 12

4.5.10.4 Each partial stroke test shall only be performed with the recirculating system loop open to provide steam circulation and minimize condensate build-up in the loop/valve.

4.5.10.5 Each RPS stroke test shall partially stroke the valve. The stroke position should not exceed the 83.7° position mark.

4.5.8.5.1 Simultaneously and continuously record the angular rotation achieved for each partial stroke test, the axial movement of the trunnion relative to the body, initial and post actuator cylinder pressures, solenoid signals and strain gage data.

4.5.10.6 After each operational test set, periodically monitor and record body temperature and trunnion axial position relative to the body during cooldown to ambient conditions.

4.5.10.7 Verify acceptability of data taken and thermally re-stabilize between runs.

4.5.10.8 After cooldown visually inspect actuator and valve (without disassembly) for any evidence of damage, wear or actuator fluid leakage.

4.5.10.9 Perform leak tests as delineated on Table 1 and Appendix "E".

4.5.11 Valve Disassembly/Inspection

4.5.11.1 After completing events 1-17 identified in Table 1, the valve shall be partially disassembled by removing the actuator and the ball from

the valve using the Reference 7.3 instruction manual. The spool seat shall also be removed for inspection.

4.5.11.2 The Buyer shall be informed of the scheduled disassembly of the valve in order to permit witnessing and inspection of the ball, spool seats and other internal parts.

4.5.11.3 Upon disassembly, the contractor shall inspect the ball, seat, thrust washer and other features subject to relative motion. The inspection shall note and document any wear, score and/or damage marks/indicators observed. The above items and features shall be photographed.

4.5.11.4 Valve disassembly may only be performed after event 22 (Table 1) if deemed necessary by the Buyer. The contractor shall not perform disassembly of the valve assembly after event 22 unless specifically instructed by the Buyer.

4.5.12 Valve Re-Assembly

4.5.12.1 Valve re-assembly after event number 18 shall be performed using replacement packings and bonnet seal. Re-assembly of the valve is to be in accordance with Reference 7.3 and Appendix B. A hydrotest to bolt up the bonnet is to be performed.

4.5.12.2 All items replaced shall be documented and made part of the test report.

4.5.12.3 If the valve is disassembled in event number 23, then 4.5.12 applies.

4.5.12.4 If the valve leakage test results is greater than 6.0 SCFH but less than 17.0 SCFH, the valve shall not be re-assembled. Buyer approval for re-assembly is required.

5. CONTRACTOR SUBMITTALS/TEST REPORT(S)

5.1 The Contractor shall submit a detail test procedure identifying the overall test arrangement, description of the test facility, details on how each test event is to be performed, inspection checklist for each test event, method to be used to document a non-conforming condition (including a sample non-conforming data sheet), typical data sheets, instrumentation to be used and their locations (including type and accuracy), and the data acquisition equipment to be used.

5.2 The Contractor shall prepare a test report which shall describe the test performed, results obtained and whether or not the tested MSIV met the closing time and leakage acceptance criteria. The report shall also identify and discuss the correlation (if any) between the "Across-the-Valve" and "Between-the-Seat" leak rate method used, any non-conformance and its affect on the validity of subsequent test results, and any damage, wear, actuator leakage, etc. noted on the test unit. The test report shall contain copies of all pertinent photographs agreed upon between Seller and Buyer. The test report shall be submitted to the Buyer for review and approval prior to issuance.

5.2.1 Forty copies of the approved test report shall be provided to the Buyer.

5.2.2 Copies of the report shall be provided to the Nine Mile Point 2 MSIV Long Term Program Task Force members as directed by the Buyer.

5.2.3 The test report shall be of good microfilmable quality.

5.2.4 The test report shall include a copy of the approved test procedure revision to which the test was performed.

5.2.5 The test report shall be signed by the Seller's responsible test engineer, authorized project/program manager and quality assurance engineering, as a minimum.

5.3 The Contractor shall provide the Buyer with a copy of all data, engineering and Q.A. log books, non-conformance reports and photographs which is contained in the Seller's test record file.

6. POST TEST INSPECTION(S)

6.1 The actuator shall be removed from the valve and visually inspected for damage/wear. Photograph areas of interest.

6.2 Disassemble valve and dimensionally and visually inspect all those features identified in Appendix "C". Photograph surface conditions(s) wherever possible. Record and describe observations.

6.3. Visually inspect ball and seats. Photograph all seating surfaces and areas of wear, gallin, etc. Record and describe observations.

6.4 If required, disassemble the actuator only to the extent specified by the Buyer. Inspect and record observations noted.

6.5 The MSIV test unit shall be dispositioned as specified by the Buyer under separate correspondence.

7. REFERENCE SOURCE DOCUMENTS

7.1 United States Nuclear Regulatory Docket No. 50-410-Nine Mile Point Nuclear Station, Unit 2 Facility Operating License No. NPF-54.

7.2 Stone and Webster Corporation E&DCRs:

a. C94753B
b. 10523
c. 10524
d. C947068
e. C94748
f. C94743
g. M10030C
h. M10032

7.3 Crosby Valve Division Installation, operation and maintenance manual for 24 inch, 900 class main steal isolation valve with 600 series actuator and relay logic cabinet (SWEC Spec.. No. P303D).

7.4 NMP-2 Instrument Surveillance Procedure No. N2-ISP-CNT-R002, Revision 1.

7.5 NMP-2 Reactor Protection System Instrumentation Setpoints-Table 2.2.1-1.

7.6 NMP-2 Reactor Protection System Instrumentation Surveillance Requirements - Table 4.3.1.1-1.

7.7. NMP-2 Pre-Operational Procedure N2-POT01, Revision 1.

TABLE 1

TEST EVENTS AND SEQUENCE

Event	Description	Ref. Para.	Remarks
1.	Valve Assembly	4.5.4	
2.	Hydrostatic Test	4.5.5	
3.	Actuator Installation	4.5.6	
4.	Valve/Actuator Check-Out	4.5.6	Cold and Wetted
5.	Leakage Tests	4.5.7	6.0 SCFH criteria "Across-the-Valve" applies
6.	MSIV Heat-Up	4.5.9	See Note 1
7.	Start-Up Tests	4.5.10.2	See Note 2
8.	Leakage Tests	4.5.7	17 SCFH criteria "Across-the-Valve" applies
9.	MSIV Heat-Up	4.5.9	
10.	Operational Test (Phase-1)	4.5.10.3	1st 6 months of operation
11.	Leakage Tests	4.5.7	17 SCFH criteria "Across-the-Valve" applies
12.	MSIV Heat-Up	4.5.9	
13.	Operational Test (Phase-2A)	4.5.10.4.1	6-12 months of operation

Notes:

1. During heat-up verify acceptability of instrumentation and data acquisition equipment.

2. The first two full cycles applied to the valve can be used to verify proper full flow sequencing/timing of the test arrangement and controls to verify attainment of the required flow rate and differential pressure across the valve during closure. System adjustment to achieve these parameters is permitted during the first two cycles applied.

TABLE 1

TEST EVENTS AND SEQUENCE
(Continued)

Event	Description	Ref. Para.	Remarks
14.	Leakage Tests	4.5.7	17 SCFH criteria "Across-the-Valve" applies
15.	MSIV Heat-Up	4.5.9	
16.	Operational Test (Phase-2B)		12-18 months of operation
17.	Leakage Tests	4.5.7	17 SCFH criteria "Across-the-Valve" applies
18.	Valve Disassembly Inspection	4.5.11	
19.	Valve Re-Assembly	4.5.12	See 4.5.12.4 instructions
20.	Leakage Tests	4.5.7	6.0 SCFH criteria "Across-the-Valve" applies
21.	Pre-Operational Test	4.5.8	Cold Operational Tests
22.	Leakage Tests	4.5.7	6.0 SCFH criteria "Across-the-Valve" applies
23.	Valve Disassembly Inspection	4.5.11	If deemed necessary
24.	Valve Re-Assembly	4.5.12	If event 23 is performed
25.	Leakage Tests	4.5.7	If event 23 is performed
26.	MSIV Heat-Up	4.5.9	
27.	Start-Up Tests	4.5.10.2	
28.	Leakage Tests	4.5.7	
29.	MSIV Heat-Up	4.5.9	
30.	Operational Test (Phase-1)	4.5.10.3	1st 6 months of operation
31.	Leakage Tests	4.5.7	17 SCFH criteria "Across-the-Valve" applies

TABLE 1

TEST EVENTS AND SEQUENCE
(Continued)

Event	Description	Ref. Para.	Remarks
32.	MSIV Heat-Up	4.5.9	
33.	Operational Test (Phase-2A)	4.5.10.4.1	6-12 months of operation
34.	Leakage Tests	4.5.7	17 SCFH criteria "Across-the-Valve" applies
35.	MSIV Heat-Up	4.5.9	
36.	Operational Tests (Phase-2B)	4.5.10.4.2	12-18 months of operation
37.	Leakage Tests	4.5.7	17 SCFH criteria "Across-the-Valve" applies
38.	Post-Test Disassembly and Inspection	6.0	

TABLE 2

MSIV TEST CYCLE SUMMARY

Event	No. and Type Cycle Full	RPS	Temp (Amb/Hot)	Press (psig)	Flow (Yes/No)
(Group 1)					
6	1/2 (Open)		Hot	5	No
7	16 (Close/ Open)		Hot	900/1020	Yes
		8 (Partials)	Hot	900/1020	No
	1/2 (Close)		Hot	900/1020	No
9	1/2 (Open)		Hot	5	No
10	10 (Close/ Open)		Hot	900/1020	Yes
		6 (Partials)	Hot	900/1020	No
	1/2 (Close)		Hot	900/1020	No
12	1/2 (Open)		Hot	5	No
13	2 (Close/ Open		Hot	900/1020	Yes
		6 (Partials)	Hot	900/1020	Yes
	1/2 (Close)		Hot	900/1020	No
15	1/2 (Open)		Hot	5	No
16	2 (Close/ Open)		Hot	900/1020	Yes
		6 (Partials)	Hot	900/1020	No
	1/2 (Close)		Hot	900/1020	No
Total	34 (Full)				
		26 (Partials)			
(Group 2)					
21	1/2 (Open)		Ambient	0	No
	12 (Close/ Open)		Ambient	0	No
		7 (Partials)	Ambient	0	No
	1/2 (Close)		Ambient	0	No
Total	13 (Full)				
		7 (Partials)			

TABLE 2

MSIV TEST CYCLE SUMMARY
(Continued)

Event	No. and Type Cycle Full	RPS	Temp (Amb/Hot)	Press (psig)	Flow (Yes/No)
(Group 3)					
26	1/2 (Open)		Hot	5	No
27	16 (Close/ Open)		Hot	900/1020	Yes
		8 (Partials)	Hot	900/1020	No
	1/2 (Close)		Hot	900/1020	No
29	1/2 (Open)		Hot	5	No
30	10 (Close/ Open)		Hot	900/1020	Yes
		6 (Partials)	Hot	900/1020	No
	1/2 (Close)		Hot	900/1020	No
32	1/2 (Open)		Hot	5	No
33	2 (Close/ Open)		Hot	900/1020	Yes
		6 (Partials)	Hot	900/1020	No
	1/2 (Close)		Hot	900/1020	No
35	1/2 (Open)		Hot	5	No
	2 (Close/ Open)		Hot	900/1020	Yes
		6 (Partials)	Hot	900/1020	No
	1/2 (Close)		Hot	900/1020	No
Total	34 (Full)				
		26 (Partials)			

APPENDIX "A"

NINE-2 MODIFIED DESIGN CONFIGURATION

1.0 This appendix describes the modified design configuration of the NMP-2 MSIV from that which was originally provided to Niagara Mohawk Corporation.

1.1 The originally supplied MSIV is described by Gulf and Western EPG Assembly/Bill of Materials E24-900-15, Revision K and Actuator Assembly/ Bill of Materials E-1235616, Revision F.

1.2 Modification made to the valve assembly are as follows:

a. The spool/seat springs were modified by removing (4) four of the 115 lb springs at the 270° location (looking into the inlet/outlet bore) and adding (8) eight 57 lb. springs (nested with the 115 lb springs) at the 90° location as authorized by SWEC E&DCR #C94753B.

b. The inlet and outlet valve body spool bores were overlayed with Inconel as authorized by SWEC E&DCR #10523, 10524, 10510.

c. Spool packing changed from John Crane 187-I to either Chesterton 1000 or 1000C with graphite coating or Lattytex 117 as authorized by SWEC E&DCR #C94706B no lubricant used with Lattytex 117 packing.

d. Thrust washer I.D./O.D. dimensions and material (to bronze) were changed as authorized by SWEC E&DCR #C94748 and C94743 respectively.

1.3 Modifications made to the actuator assembly are as follows:

a. The mechanical latch mechanism was deleted. This deletion included any and all related parts as authorized by SWEC E&DCR #M10032 and M10030C.

b. Incorporated a new hydraulic system design as authorized by SWEC E&DCR # M10030G.

c. Solenoid valve header modified as authorized by SWEC E&DCR #M10030A.

1.4 The "As Installed" NMP-2 MSIV configuration does not use the upper and lower stuffing box leak-off. The leak-offs are plugged by use of a nipple and pipe cap.

APPENDIX B

VALVE ASSEMBLY/RE-ASSEMBLY

The following events and sequence were used in assembling the valve at the NMP-2 site using the instructions specified in Crosby Valve Division Installation, Operation and Maintenance Manual for the 24 Inch, 900 Class MSIV with Series 600 Actuator, identified as SWEC Specification No. P303D.

EVENT	DESCRIPTION
1.	LAP Ball and Seat
2.	Install Roller Bearing Assemblies
3.	Size thrust washer in accordance with SWEC E&DCR #C94826
4.	Cut and form spool seat packing (Refer to SWEC E&DCR #C94706B)
5.	Install spool seats with modified spring configuration.
6.	Jack open spool seats.
7.	Install spool seat retainer with special tool.
8.	Remove spool seat jacking tool.
9.	Lower ball into valve body in its open position while ball is suspended. Rotate ball to closed position manually. (Note: Seats are in the open - not seated - position and dry.)
10.	Install jacking tool and remove spool seat retainer and jack open spool seat.
11.	Position ball vertically so that the ball is .016 to .020 inches from the upper most surface of the lower thrust washer.
12.	Slowly seat the spool to the ball and record amount and direction of axial movement of the ball trunnion.
13.	Align the trunnion into its upright center position from the body/bonnet guide surface using the 4 point position method.

- o Install lower trunnion packing (temp).
- o Perform pressure/leak (snoop) test across seats at 3 psig (5 max)
- o Flood cavity (3 psig still on), look for spool packing and seat leakage.
- o After test, drain and remove temporary packing.

EVENT	DESCRIPTION
14.	Lower bonnet and align.
15.	Install pressure seal assembly and bonnet hold down ring. Align concentric to the ball valve and torque-up.
16.	Install upper and lower packing in the respective stuffing boxes. Verify that stuffing box packing leak-off is properly plugged off.
17.	With the valve in the closed position, mark the valve's "Closed" and "Open" position. Valve shall not be rotated to the "Open" position for markings.
18.	Perform a "Between-the-Seat" leak tests for information at 40 psi. Perform a snoop type leak test at body/bonnet joint for information.
19.	Perform a cold hydro-static test for at least 15 minutes with 1015 to 1020 psig applied and with the valve in its closed position. Torque-up the bonnet pull-up ring to the required torque value. Inspect for leakage past the pressure and trunnion packing sealed joints. Record torque value used and inspection results.
20.	Drain water used for the hydro-static test from valve body bowl cavity and the test system attached piping.
21.	Installation of MSIV actuator to consist of:

(a) Prior to valve installation:

1 - Inspect actuator to assure that configuration is representative of actual configuration installed at the NMP-2 plant (Inspection to be performed by NMP-2 personnel)

2 - Wire actuator and perform control circuit checkout (to be performed by NMP-2 personnel).

3 - Verify pump operability on both actuator pumps (to be performed by NMP-2 personnel)

4 - Set-up limit switches and pressure switches (to be performed by NMP-2 personnel with Crosby calibration lab personnel assistance).

5 - Verify hydraulic system is leak free prior to valve installation.

EVENT DESCRIPTION

(b) Actuator installation onto the valve will be performed by NMP-2 and Crosby personnel. The following key event sequence shall be followed:

1 - Torque actuator to body

2 - Check "close" match mark. Adjust as necessary.

3 - Cycle valve to verify limit switches. Ball shall be wetted during this verification step.

Record total number of full cycles needed to verify adjustment. Record information identified by 4.5.8.4 and 4.5.8.5 during valve cycling.

4 - Valve assembly now ready for operational testing.

APPENDIX "C"

CRITICAL DIMENSIONS/FEATURES

Measurements and inspections of the following features are to be taken for information and post-test inspection purposes prior to or during valve assembly; as appropriate:

(1) Valve Body (*) (a) Body Bore (Inlet/Outlet) (3 places)
(*) (b) Body to Bonnet I.D. (3 places)
(c) The thrust washer body seating surface dimension to the lower body bore inside diameter.
(*) (d) The lower body (trunnion area) 9.020 nominal inside diameter.
(*) (e) The roller bearing body cavity inside diameter

(2) Bonnet (*) (a) The 9.020 nominal inside diameter dimension (trunnion area) (3 places).
(*) (b) The Bonnet to body outside diameter (3 places).
(*) (c) The 9.988 nominal inside diameter dimension (3 places).
(d) Roller bearing inside diameter dimension (3 places).

(3) Lantern Ring (a) The 8.995 inside diameter.
(b) The 9.960 outside diameter.

(4) Roller Bearing (a) The inside diameter (3 places).
(b) The outside diameter (3 places).

(5) Bearing Plates (packing Gland)
(a) The inside diameter (3 places).
(b) The outside diameter (3 places).

(6) Thrust Washer (a) Inside diameter.
(b) Outside diameter.
(c) Thickness
(*) (d) Surface condition.

(7) Ball (a) Outside trunnion diameters (top/bottom) (various locations from ball).
(*) (b) Surface condition along shafts.
(c) Thrust washer sizing dimension (e places).

(8) Spring Retainer
(a) Outside diameter (3 places).
(b) Inside diameter (3 places).

(9) Spring Cover (a) Inside diameter (3 places).

(10) Spool/Seat.(*) (a) Outside diameter (3 places on spool to body surface feature).
(*) (b) Inside diameter (3 places on spool to packing surface feature).
(c) Inside diameter (3 places on spool to spring retainer surface feature).

(*) Visually inspect feature for surface condition and record observations(s). Photograph surface condition(s) wherever possible.

APPENDIX "D"

Valve Assembly Instrumentation Locations

	LOCATION	INSTRUMENT	QTY (Minimum)	Basic Purpose	Remarks
1.	Valve Body Centerlines	Thermocouple(s)	2	Valve Temperature	One thermocouple on either side of valve body.
2.	Upper trunion	Lanyard Potentiometer or equivalent	1	Valve Angular displacement and closure time	
3.	Lower trunion centerline	LVDT	1	Axial motion or ball	
4.	Lower Body Surface	LVDT	1	Relative motion between ball and body during heat-up	
5.	Actuator Clevis Yoke or upper trunion	Stain Gage(s)	1	Torque on upper trunion	
6.	Lower body area	Acoustic Monitor	AR	Noise signature for diagnostic purposes	
7.	Yoke/trunion coupling area	Proximity Gages	AR	Relative motion/ displacement between yoke and trunion during actuation	
8.	Hydralic Cylinder	As installed Pressure Gague	N/A	Hydraulic Cylinder Pressure/Characteristic	
9.	Actuator solenoid operated valve	As Installed	N/A	Measure Actuation Signal for total closure time determination.	

LEGEND: AR - As Required
N/A - Not applicble

APPENDIX "E"

MSIV PNEUMATIC LEAK TEST PROCEDURE

This test procedure shall be used for the pneumatic leak testing of the NMP-2 MSIV prototype valve design. The procedure to be used is equivalent to the Nine Mile Point Nuclear Station Unit 2 instrument surveillance procedure No. N2-ISP-CNT-R@002, Revision 5, Attachment 2 through 9 and Attachment 181 through 188 which is applicable to the MSIV Type "C" containment isolation valve leak rate test procedure. This procedure also requires that an "Across-the-Valve" leak rate test be performed for compliance with NMP-2 licensing condition.

1.0 Test Equipment

1.1 The test equipment to be used shall be the same as that used at the NMP-2 site or its approved equivalent.

1.2 The test equipment should consist of volumetric leak rate monitors (or equivalent), a stopwatch (cronus model 35 or equivalent), a filter for air service, two air hoses, Snoop leak detection liquid or equivalent, drain hoses for drain connection tail piece and a test pressure gage of 0-60 psig range or equivalent, Rotometer (Brooks 0-50 scfh or equivalent).

2.0 Prerequisites

2.1 Personnel responsible for performing the test shall read and understand this procedure prior to commencing the test.

2.2 The valve body temperature shall be at stable temperature conditions prior to performing the leak rate tests.

2.3 All leak rate monitoring devices used shall be in calibration.

2.4 A copy of all completed leak rate data sheets shall be provided to the test facility test engineer for inclusion into the "Test Record File" and inclusion into the test report following completion of testing.

2.5 Prior to performing the leak test verify operability of the leak rate testing equipment in accordance with Attachment E-1.

2.6 Install blank flanges at the F1 and F2 test loop locations per Figure 1.

3.0 Between-The-Seat Leakage Test

3.1 Verify that valve is in closed position.

_____ / _____
Initials Date

3.2 Open vents "A", "B", and "C" depicted in Figure 1 and drain the respective loop and test valve cavities.

_____ / _____
Initials Date

If significant amounts of water have condensed inside the valve cavity removing the valve vent plug may be required to assure proper drainage.

3.3 Attach LRM test hose and pressure gage to the vent "B" tailpiece.

_____ / _____
Initials Date

3.4 Close Vent "B" and test air hose for leaks. Reopen Vent "B" when complete.

_____ / _____
Initials Date

3.5 Charge test volume as follows:

3.5.1 Place "Range Selector" in charge position.

_____ / _____
Initials Date

3.5.2 Place "Test Level Valve" in test position.

_____ / _____
Initials Date

3.5.3 Place "Test Valve" in flow position.

_____ / _____
Initials Date

3.5.4 Place Pressure Regulator in full clock wise position (maximum flow).

_____ / _____
Initials Date

3.5.5 Test volume is now charging. When pressure as read on remote pressure gage reads between 35-40 psig place the "Test Level Valve" in the closed position.

_____ / _____
Initials Date

3.5.6 Adjust Pressure Regulator to between 40-42 psig as indicated on the LRM pressure gage.

_____ / _____
Initials Date

3.5.7 Place "Range Selector" in high position.

_____ / _____
Initials Date

3.5.8 Return "Test Level Valve" to test position.

_____ / _____
Initials Date

3.5.9 Verify that pressure within the test volume is between 40-42 psig ~~or~~ as indicated on the LRM pressure gage.

_____ / _____
Initials Date

3.5.10 Adjust "Range Selector" to appropriate range setting to provide for proper leak rate indication.

_____ / _____
Initials Date

3.6 Verify that thermal stabilization has occurred. This is indicate when leakage indication is not steadily increasing or decreasing ~~when~~ and the applied pressure is constant.

Record Temperature Stabilization Period:

TIME START_____ TIME END_____ _____

3.7 Perform the leakage test for 15 consecutive minutes and record the data required on the valve leakage test data sheet. Leakage rates from the LRM are to be recorded at every (1) one minute intervals.

3.7.1 If leakage exceeds 6.0 SCFH during the Between-The-Seat leak rate testing, inspect the trunion packing and pressure seal areas for evidence of leakage pass those joints using the "Snoop" leak detection method. Record results on a supplemental valve leakage rate data sheet and attach to the Table E-1 data sheet.

3.8 Depressurize the test volume as follows:

3.8.1 Close Vent "B".

3.8.2 Place the "Test Level Valve" in closed position.

_____ / _____
Initials Date

3.8.3 Return the LRM Pressure Regulator to the full counter clockwise position (no pressure).

_____ / _____

3.8.4 Disconnect test hose and pressure gage from Vent "B" tailpiece.

_____ / _____

3.8.5 Open Vent "B" (volume now depressurizing).

_____ / _____
Initials Date

4.0 Across-the-valve leak rate test.

_____ / _____
Initials Date

4.1 Close Vent "A" and Vent "B" (Vent "C" open from previous test).

_____ / _____
Initials Date

4.2 Attach LRM test hose and pressure gage to Vent "A" tailpiece.

_____ / _____
Initials Date

4.3 Attach Rotometer to Vent "C" tailpiece.

_____ / _____
Initials Date

4.4 Test air hose to Vent "A" tailpiece for leakage.

_____ / _____
Initials Date

4.5 Repeat the procedural steps identified in steps 3.5.1 through 3.5.10.

_____ / _____
Initials Date

4.6 Verify that thermal stabilization has occurred. This is indicated when leakage indication is not steadily increasing or decreasing ~~when~~ and the applied pressure is constant.

Record Temperature Stabilization Period:

TIME START_____ TIME END_____ _____

4.7 Perform the leakage test for 15 consecutive minutes and record the data required on the valve leakage test data sheet. Leakage rates from the LRM and Rotometers are to be recorded at every (1) one minutes intervals.

_____ / _____
Initials Date

4.7.1 If leakage exceeds 6.0 SCFH during the Between-The-Seat leak rate testing, inspect the trunion packing and pressure seal areas for evidence of leakage pass those joints using the "Snoop" leak detection method. Record results on a supplemental valve leakage rate data sheet and attach to the Table E-1 data sheet.

_____ / _____
Initials Date

4.8 LRM and Rotometer should be within 20% of each other. If not, external leakage in the Test Volume shall be rechecked. The rotometer is only an informational device to verify LRM indication is actually going through the valve. The LRM is the only official indication.

_____ / _____
Initials Date

4.9 Depressurize Valve cavity as follows:

4.9.1 Open Vent "B".

_____ / _____
Initials Date

5.0 Informational Leak Rate Test (Across inlet seat).

5.1 Close Vent "C".

5.2 Connect Rotometer to Vent "B".

5.3 Verify that thermal stabilization has occurred. This is indicated when leakage indication is not steadily increasing and decreasing when the applied pressure is constant.

Record Temperature Stabilization Period:

TIME START_____ TIME END_____ _____

5.4 Perform the leakage test for 15 consecutive minutes and record the data required on the valve leakage test data sheet. Leakage rates from the LRM and Rotometer are to be recorded at every (1) one minute intervals.

_____ / _____
Initials Date

5.4.1 If leakage exceeds 6.0 SCFH during the Between-The-Seat leak rate testing, inspect the trunion packing and pressure seal areas for evidence of leakage pass those joints using the "Snoop" leak detection method. Record results on a supplemental valve leakage rate data sheet and attach to the Table E-1 data sheet.

_____ / _____
Initials Date

5.5 LRM and Rotometer should be within 20% of each other. If not, external Leakage in the Test Volume shall be rechecked. The rotometer is only an informational device to verify LRM Leakage indication is actually going through the valve. The LRM is the only official indication.

_____ / _____
Initials Date

5.6 Depressurize the Test Volume as follows:

5.6.1 Close Vent "A".

_____ / _____
Initials Date

5.6.2 Place "Test Level Valve" in the closed position.

_____ / _____
Initials Date

5.6.3 Return the LRM Pressure Regulator to the full counter clockwise position.

_____ / _____
Initials Date

5.6.4 Disconnect the test hose and pressure gage from Vent "A" tailpiece.

_____ / _____
Initials Date

5.6.5 Reopen Vent "A" (Test Volume now depressurizing).

_____ / _____
Initials Date

6.0 After completing tests per Sections 3,4 and 5 secure the test equipment as follows:

6.1 Insure vent valves "A", "B" and "C" are closed.

_____ / _____
Initials Date

6.2 Turn off LRM power switch and disconnect power supply.

_____ / _____
Initials Date

6.3 Secure air supply and remove air supply hose from LRM.

_____ / _____
Initials Date

6.4 Disconnect rotometer and test hose on Vent "B" tailpiece.

_____ / _____
Initials Date

6.5 Remove blank flange from the "F1" and "F2" test locations depicted on figure 1.

_____ / _____
Initials Date

6.6 Store test equipment in secure location away from test area.

_____ / _____
Initials Date

7.0 Verify all data sheets are complete and provide to verifier.

_____ / _____
Initials Date

7.1 Provide the original data sheet to the test facility test engineer for inclusion into the Test Record File.

_____ / _____
Initials Date

LRM LEAK RATE = SUM OF TOTAL FLOW RATE/15 + LRM INSTRUMENT

ERROR = _____ (SCFH).

DATA TAKEN BY: _____ DATE: _____

COMPUTATION BY: _____ DATE: _____

VERIFIED BY: _____ DATE: _____

DISPOSITION (ACCEPT/REJECTED): _____

Serial No. _____

Test Date: _____

LRM FLOW AND ELECTRICAL INTEGERITY CHECK

INITIALS

7.1.4. Perform the following Flow Integrity Check once per shift or prior to using the LRM for testing:

7.1.4.1 Place the REGULATOR in the FULL DECREASE position (CCW). _____

7.1.4.2 Place the RANGE SELECTOR in the CHARGE position. _____

7.1.4.3 Place the TEST VALVE in the DECAY position. _____

7.1.4.4 Place the TEST LEVEL VALVE in the TEST position. _____

7.1.4.5 Connect the LRM to a 110 Volt, 60 Hz electrical power source. _____

7.1.4.6 Press power switch and allow a ten (10) minute warmup. _____

NOTE: The LRM FLOW RATE indicator may display a readout of ±006 at a "no leak" condition. This is a normal indication and does not affect calibration of the LRM.

CAUTION

Do not exceed 150 psig in the following step.

7.1.4.7 Apply an oil-free, dry air or nitrogen source to INLET port of LRM and pressurize to 100-150 psig. _____

7.1.4.8 Check all pressure connections to the LRM for leakage. _____

7.1.4.9 Upon the completion of the warm up period, adjust ZERO control to obtain a readout of 0.0 ±0.00 on the PRESSURE indicator. _____

NOTE: There must be a constant supply pressure of 100-150 psi connected to the INLET of the LRM for zeroing of the flow displays.

NOTE: Ensure the test port on the LRM is open to atmosphere.

7.1.4.10 Select the LOW range and adjust the ZERO control to obtain a readout of 0.000 ±0.001 on the FLOW RATE INDICATOR. _____

7.1.4.11 Select the MID range and adjust the ZERO control to obtain a readout of 0.00 ±0.01 on the FLOW RATE INDICATOR. _____

7.1.4.12 Select the HIGH range and adjust the ZERO control to obtain a readout of 00.0 ±0.1 on the FLOW RATE INDICATOR. _____

Test Date _____

INITIALS

7.1.4.13 Install LOW (&MID) leak-test fixture ("calibrated leak") in the LRM TEST port. _____

7.1.4.14 Place the RANGE switch and RANGE valve in the LOW position. _____

7.1.4.15 Place the TEST LEVEL valve in the CLOSED position. _____

7.1.4.16 Place the TEST valve in the FLOW position. _____

NOTE: Calibration data sheets are located in the Operation Manual (Ref. 2.20) for the specific LRM being used.

7.1.4.17 Adjust the PRESSURE REGULATOR control as necessary to obtain the flow integrity check pressure specified on the LRM Operation Manual calibration data sheets for the LOW range. Record the check pressure value. Pressure _____ psig. _____

7.1.4.18 Place the TEST LEVEL valve in the TEST position. (Re-adjust the REGULATOR control, as necessary, to maintain the flow integrity check pressure). _____

7.1.4.19 Verify the LRM FLOW RATE indicator stabilizes. _____

7.1.4.20 Verify the LRM FLOW RATE indicator readout to be within the range specified on the LRM Operation Manual calibration data sheets under FLOW INTEGRITY CHECK (Ref. 2.20) for the LOW range. Record the FLOW RATE indication. Flow Rate _____ SCFH. _____

7.1.4.20.1 If the Voltmetics Model 14342-35 is being used, remove the Low range leak-test fixture and install the Mid range leak-test fixture. _____

7.1.4.21 Place the RANGE switch and RANGE valve in the MID position. _____

7.1.4.22 Adjust the PRESSURE REGULATOR control as necessary to obtain the flow integrity check pressure specified on the LRM Operation Manual calibration data sheets for the MID range. Record check pressure value. Pressure _____ psig. _____

7.1.4.23 Verify the LRM FLOW RATE indicator stabilizes. _____

Test Date _____

INITIALS

7.1.4.24 Verify the FLOW RATE indication to be within the range specified on the LRM Operation Manual calibration data sheets under FLOW INTEGRITY CHECK for the MID range. Record FLOW RATE indication.
Flow Rate _____ SCFH. _____

7.1.4.25 Place the TEST LEVEL valve in the CLOSED position. _____

7.1.4.26 Remove the LOW (&MID) leak-test fixture ("calibrated leak") from the LRM TEST port. _____

7.1.4.27 Install the HIGH leak-test fixture ("calibrated leak") in the LRM TEST port. _____

7.1.4.28 Place the RANGE switch and the RANGE valve in the HIGH position. _____

7.1.4.29 Adjust the PRESSURE REGULATOR control as necessaary to obtain the flow integrity check pressure specified on the LRM Operation Manual calibration data sheet for the High range. Record the check pressure value.
Pressure _____ psig. _____

7.1.4.30 Verify the LRM FLOW RATE indicator stabilizes. _____

7.1.4.31 Verify the LRM FLOW RATE indication to be within the range specified on the LRM Operation Manual calibration data sheets under FLOW INTEGRITY CHECK for the HIGH range. Record the FLOW RATE indication.
Flow Rate _____ SCFH. _____

NOTE: If flow rates are not within the ranges specified on the LRM operation Manual's calibration data sheets, the LRM shall not be used to perform this surveillance.

7.1.4.32 Place the TEST LEVEL valve in the CLOSED position. _____

7.1.4.33 Remove the HIGH leak-test fixture ("calibrated leak") from the LRM TEST port. _____

7.1.4.34 Place the RANGE switch in the LOW position. _____

7.1.4.35 Press and hold the AUTO VERIFY pushbutton. _____

7.1.4.36 Verify the LRM FLOW RATE indicator stabilizes. _____

Test Date _____

INITIALS

NOTE: LRM calibration data sheets are located in the LRM Operation Manual (Ref. 2.20) for the specific LRM being used.

7.1.4.37 Verify the LPM FLOW RATE indicator readout to be within the range specified under ELECTRICAL INTEGRITY CHECK (Ref. 2.20) for the LOW range.
Flow Rate _____ SCFH. _____

7.1.4.38 Place the RANGE switch in the MID position. _____

7.1.4.39 Press and hold the AUTO VERIFY pushbutton. _____

7.1.4.40 Verify the LRM FLOW RATE indicator stabilizes. _____

7.1.4.41 Verify the LRM FLOW RATE indication to be within the range specified on the LRM Operation Manual calibration data sheets under ELECTRICAL INTEGRITY CHECK (Ref. 2.20) for the MID RANGE. Record the FLOW RATE indication. Flow Rate _____ SCFH. _____

7.1.4.42 Place RANGE switch in the HIGH position. _____

7.1.4.43 Press and hold AUTO VERIFY pushbutton. _____

7.1.4.44 Verify the LRM FLOW RATE indicator stabilizes. _____

7.1.4.45 Verify the LRM FLOW RATE indicator readout to be within the range specified on the LRM Operation Manual calibration data sheets under ELECTRICAL INTEGRITY CHECK (Ref. 2.20) for the HIGH range. Record the FLOW RATE indication.
Flow Rate _____ SCFH. _____

7.1.4.46 Place the PRESSURE REGULATOR in the closed position (full CCW) prior to the start of testing. _____

APPENDIX "E"

TABLE E-1

TEST DATE: _____

Sheet 1 of _____

VALVE LEAKAGE RATE DATA SHEET

PRESSURE DIRECTION(BETWEEN-THE-SEATS/ACROSS-THE-VALVE): _____ _____

TEST EVENT NUMBER: _____

LRM RANGE SETTING: _____

BODY TEMPERATURE: Start _____ Finish _____

Time Interval(Min.)	Flow Rate (SCFH)( )	Flow Rate (SCFH)( )	Pressure (PSIG)	Remarks
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

SUM TOTAL OF

FLOW RATES: _____ (SCFH)

TRUNNION PACKING LEAKAGE (YES/NO) _____

PRESSURE SEAL LEAKAGE (YES/NO) _____

LRM INSTPUMENT ERROR: HIGH RANGE - ~~0.004 SCFH~~. 0.424 scfh

MID RANGE - 0.0424 SCFH/LOW RANGE - 0.004 SCFH.

LEAK RATE ACCEPTANCE CRITERIA: 6.0 SCFH

APPENDIX "E"

TABLE E-1

TEST DATE: _____

SUPPLEMENTAL LEAKAGE RATE DATA SHEET

REMARKS:

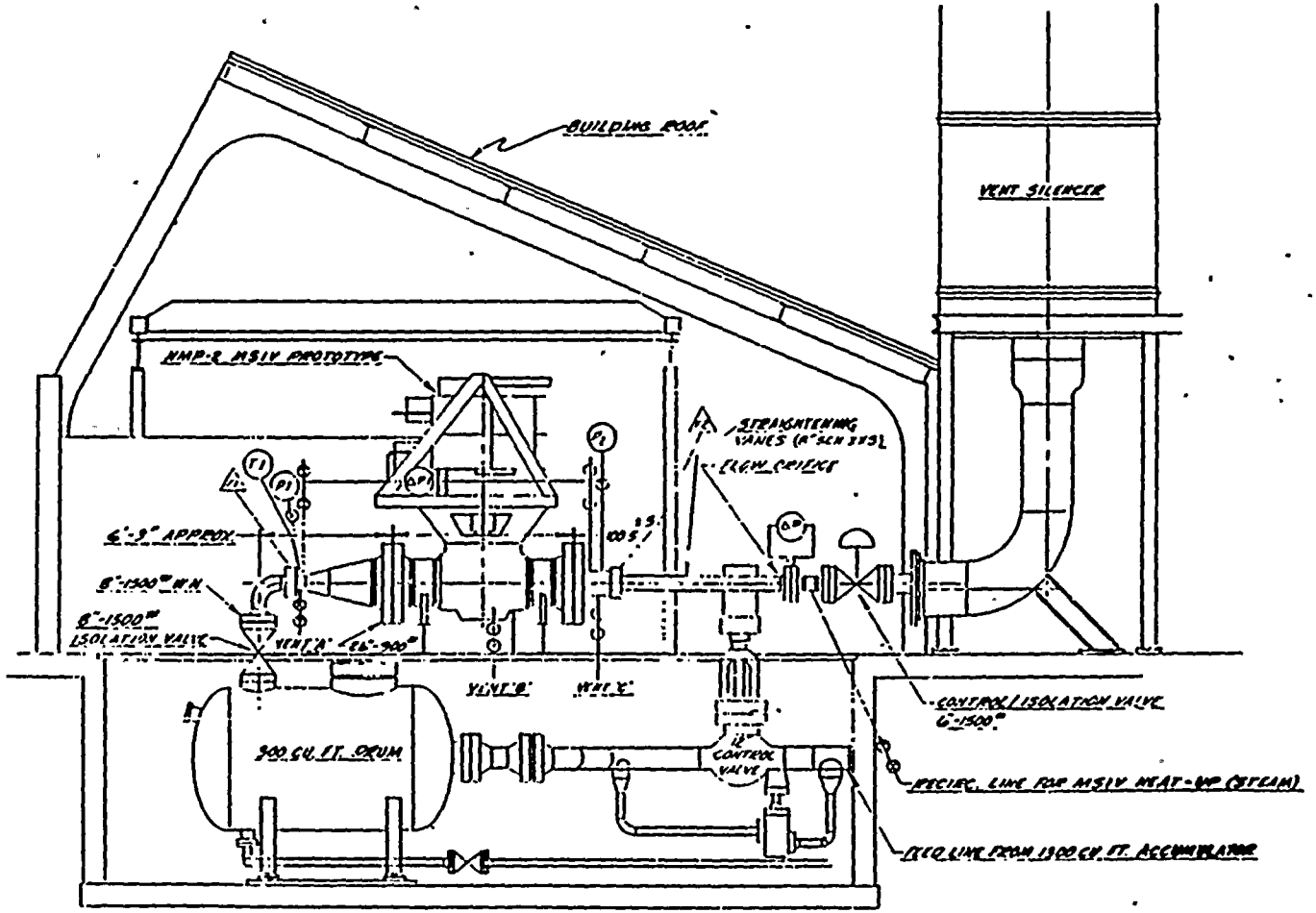


FIGURE 1

CROSBY — CROSBY VALVE & GAGE COMPANY, WRENTHAM, MA 02093			
DRAWN	DATE	TITLE	
ENG. APP.	SCALE	NMP-2 MSIV LEAKS TEST PROGRAM TYPICAL MSIV TEST ARRANGEMENT	
LTR	REVISIONS	DATE	
A			REF:
B			CWG NO. SK-10244 REV. B

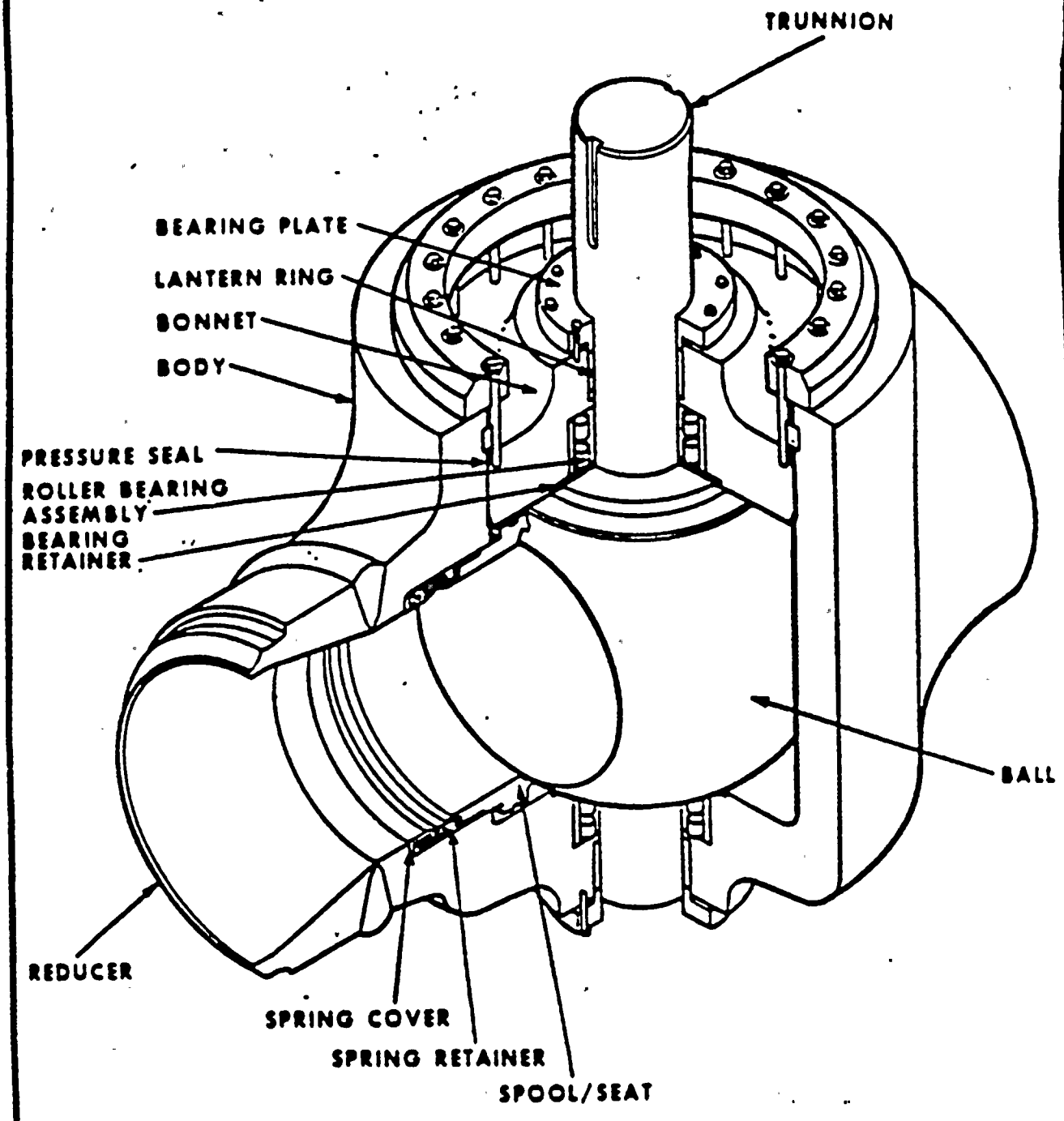
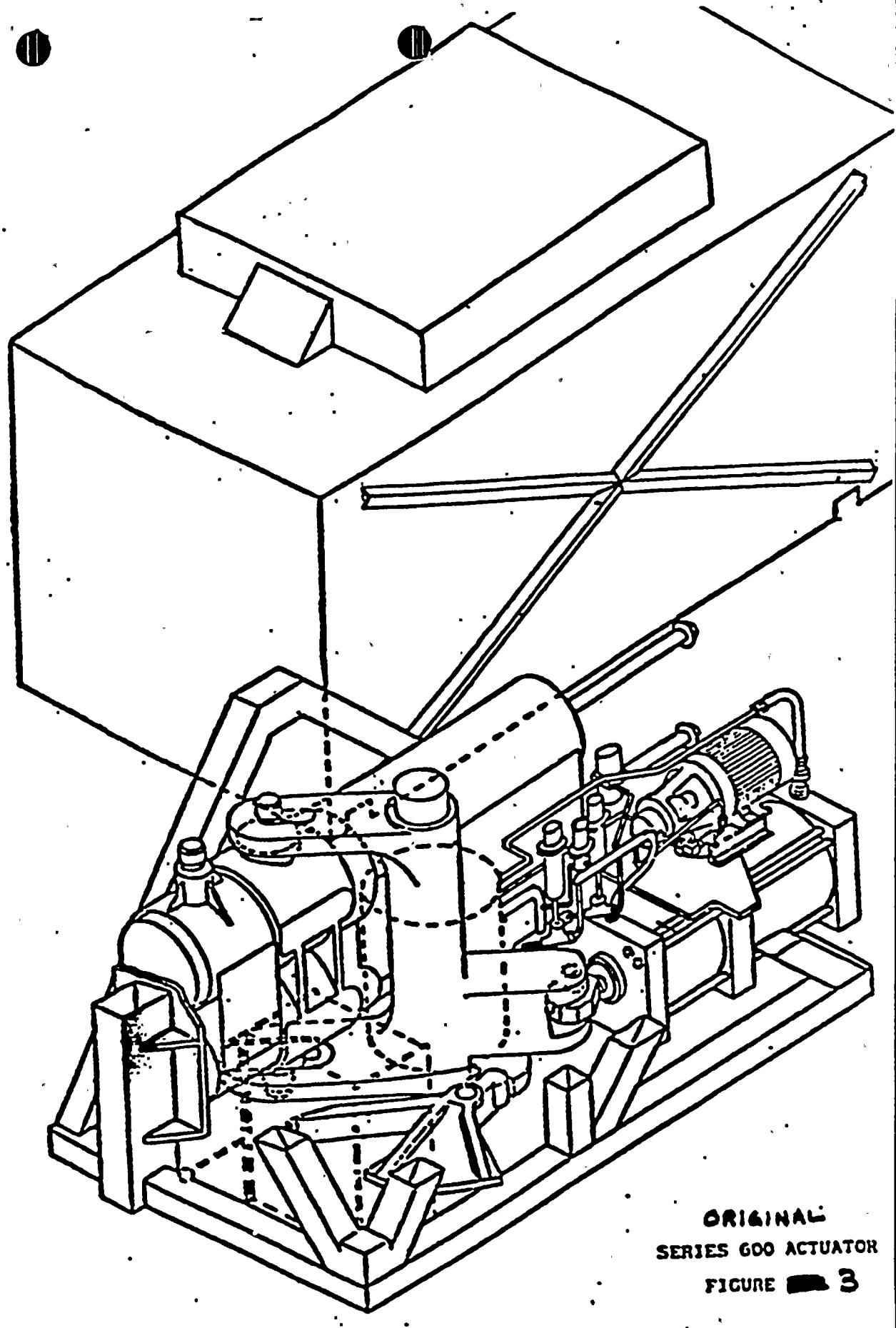


FIGURE [redacted] 2

MAIN STEAM ISOLATION VALVE
CUTAWAY VIEW

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



ORIGINAL

SERIES 600 ACTUATOR

FIGURE 3