Revision 13
09/20/94

PUMP AND VALVE
INSERVICE TESTING PROGRAM

FOR

DUANE ARNOLD ENERGY CENTER

Commercial Service Date: February 1, 1975
(Docket No. 50-331)

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REVISION NOTES

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RECORD OF REVISIONS

REVISION NUMBER	DESCRIPTION OF REVISION REASON FOR THE CHANGE	DATE REVISED
Original		March 1, 1978
Rev. 1		October 1978
Rev. 2		May 1, 1980
Rev. 3		November 1, 1980
Rev. 4		January 1, 1983
Rev. 5		December 23, 1983
Rev. 6		August 1, 1984
Rev. 7		November 1, 1985
Rev. 8		April 1, 1987
Rev. 9		January 5, 1990
Rev. 10		August 14, 1990
Rev. 11		September 13, 1991
Rev. 12		September 20, 1993
Rev. 13		September 20, 1994

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INSERVICE TESTING (IST) PROGRAM PLAN
DUANE ARNOLD ENERGY CENTER

1.0 INTRODUCTION

This document outlines the Duane Arnold Energy Center, IST Program for the third 10-year interval based on the requirements of Section XI of the ASME Boiler and Pressure Vessel Code, 1989 Edition. Subsections IWP and IWV thereto refer to implementing the requirements of ASME/ANSI OM-6 and OM-10, respectively. In this regard, per References 2.1 and 2.9, this revision of the Duane Arnold Energy Center IST Program is based on the applicable requirements set forth in ASME/ANSI OM-1987 "Operation and Maintenance of Nuclear Power Plants" including ASME/ANSI OMa-1988 Addenda.

Revision 13 of the Duane Arnold Energy Center ASME Inservice Inspection (IST) Program will be in effect through the end of the third 120-month (10-year) interval unless changed and re-issued for reasons other than the routine update required at the start of the fourth interval per 10 CFR 50.55a(f). The third inspection interval begins on February 1, 1995 and ends on January 31, 2005.

2.0 REFERENCE DOCUMENTS

This Program Plan was developed per the requirements and guidance provided by the following documents:

2.1 Title 10, Code of Federal Regulations, Part 50.55a (1-1-93 Ed.).
2.2 NRC Regulatory Guides - Division 1
2.3 Standard Review Plan 3.9.6, "Inservice Testing of Pumps and Valves
2.4 Updated Final Safety Analysis Report, Duane Arnold Energy Center
2.5 Duane Arnold Energy Center Technical Specifications
2.6 ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition
2.7 NRC Generic Letter 89-04, "Guidance on Developing Acceptable Inservice Testing Programs"
2.8 ASME/ANSI OM-1987 "Operation and Maintenance of Nuclear Power Plants" including ASME/ANSI OMa-1988 Addenda.
2.9 NUREG-1482, Guidelines for Inservice Testing at Nuclear Power Plants (DRAFT)

3.0 PROGRAM DEVELOPMENT

ASME B&PV Code, Section XI (hereby referred to as 'the Code') requires that the owner of each nuclear power plant prepare and submit a "plan" for testing and inspection of systems and components under the jurisdiction of the Code and in compliance with Title 10, Part 50 of the Code of Federal Regulations (Para. 50.55.a). With respect to the elements of that plan related to the testing of pumps and valves, Section XI, Subsections IWP and IWV direct each licensee to comply with the applicable portions of ASME/ANSI OM-6 and OM-10. In response to this, the NRC directed that pump and valve testing should be performed in accordance with ASME/ANSI OM-1987 including OMa-1988 Addenda. Specifically, Part 1 of OM-1987 and Paragraphs 1.1 of OMa-1988 Addenda, Parts 6 and 10, establish the Program scope with the provision that the rules apply only to ISI Classes 1,2, and 3 as stated by the NRC via Federal Register, Vol. 56, No. 21 dated January 31, 1991.

In accordance with ASME/ANSI OM-1987 with OMa-1988 Addenda, the following are required to be included in the testing Program:

* Centrifugal and positive displacement pumps that are provided with an emergency power source and required to perform a specific function in

    1) Shutting down the reactor to the cold shutdown condition;

    2) Maintaining the cold shutdown condition; or

    3) Mitigating the consequences of an accident.

* Active or passive valves (and their actuating and position indicating systems) which are required to perform a specific function in

    1) Shutting down the reactor to the cold shutdown condition;
    2) Maintaining the cold shutdown condition; or
    3) Mitigating the consequences of an accident.

* Pressure relief devices that protect systems or portions of systems which perform a required function in

    1) Shutting down the reactor to the cold shutdown condition;

    2) Maintaining the cold shutdown condition; or

    3) Mitigating the consequences of an accident.

In addition to the general Code requirements outlined above, there are other interpretations and positions that have come about as a result of past regulatory and licensee actions including NUREG-1482 (Reference 2.9). Other than these, there is no specific guidance for developing the IST Program scope of testing.

In light of this, a set of rules was established by which the scope of the Duane Arnold Energy Center ASME Section XI IST Program is determined including components that are to be included and the extent and type of testing required for each. Based on these rules the philosophy and assumptions used in determining the test requirements for selected pumps and valves was documented.

3.1 Initial Program Scope

In the course of developing the Program scope, each of the significant safety systems (included within the ISI-class boundaries) were evaluated with respect to the function of each component and the need for its operability as it relates to the scope of Section XI. Supporting documents used include,

Final Safety Analysis Report (FSAR);
Technical Specifications;
Past program correspondence;
Operating Procedures (Normal, Emergency and Off-Normal); and
Plant System Descriptions.

The sequence followed during the development effort was as follows:

1) Each of the plant systems was subjected to an overview to determine any potential active safety function as described in the scope statement. Those systems with no obvious safety functions were then excluded from further consideration. Plant documents as well as operating staff inputs were utilized in this phase.

2) For the remaining systems, flow diagrams were studied and any component that could possibly have an active or passive safety function (other than simply maintaining the pressure boundary) were identified for further evaluation.

3) The function of each component identified in 2, above, was determined based on available documentation, staff input or general experience of the evaluator. Testing requirements were derived based on the component function(s) and the applicable rule(s).

4) Available documents were reviewed and specific or implied component operational requirements were compared to the information derived in 3, above.

5) The results of Steps 1 through 4, above, were reviewed by several knowledgeable members of the plant staff and evaluated for accuracy and consistency. Based on this review, the final program scope was derived and the IST Program Plan developed.

3.2 Program Update

During the third 10-year interval it is expected that the scope of the Program will occasionally be modified in response to unrelated activities including, but not limited to,

1) Plant design changes;
2) Changes in operating conditions (e.g. normal valve lineup);
3) Changes in accident mitigating procedures philosophy.

As a result, it is expected that the IST Program may be revised to ensure continued compliance with the Code requirements relating to the scope of the test program.

The supervisor responsible for maintaining the IST Program is provided copies of all plant modifications that are designated by Engineering to have a potential IST impact. He is also provided copies of any safety evaluations that would accompany any significant change in plant operating or accident mitigation philosophy or that might have a direct impact on the IST Program. Should a change require a Program revision, the IST Coordinator would then implement the change to the Program Plan and the appropriate test procedure(s) in a timely manner.

4.0 INSERVICE TESTING PROGRAM FOR PUMPS

4.1 Code Compliance

This IST Program for pumps meets the requirements of Reference 2.8, Part 6 and any applicable interpretations or additional requirements imposed by References 2.7 and 2.9. Paragraph and table references in this section refer to specific paragraphs and tables in Reference 2.8. Where these requirements have been determined to be impractical, conformance would cause unreasonable hardship without any compensating increase in safety, or an alternative test provides an acceptable level of quality and safety, relief from Code requirements is requested pursuant to the requirements of 10 CFR 50.55a(f)(5)(iii) and References 2.7 and 2.9. (See Appendix B)

4.2 Allowable Ranges of Test Quantities

The allowable ranges for test parameters as specified in Reference 2.8, Part 6, Table 3 will be used for all measurements of pressure, flow, and vibration except as provided for in specific relief requests.

4.3 Testing Intervals

The test frequency for pumps included in the Program will be as set forth in Reference 2.8, Part 6, Section 5, Reference 2.9, Paragraph 5.1.1, and related relief requests. An allowable extension, not to exceed +25 percent of the surveillance interval, may be applied to a test schedule as allowed by the Duane Arnold Energy Center Technical Specifications to provide for operational flexibility.

4.4 Pump Program Tables

Appendix A lists those pumps included in the IST Program with references to parameters to be measured and applicable requests for relief.

4.5 Relief Requests for Pump Testing

Relief requests PR-01 through PR-09 are initiated per 10CFR50.55a where appropriate and are included in Appendix B.

5.0 INSERVICE TESTING PROGRAM FOR VALVES

5.1 Code Compliance

This IST Program for valves meets the requirements of Reference 2.8, Parts 1 and 10 and any appropriate interpretations or additional requirements imposed by References 2.7 and 2.9. Paragraph and table references in this section refer to specific paragraphs and tables in Reference 2.8. Where these requirements have been determined to be impractical, conformance would cause unreasonable hardship without any compensating increase in safety, or an alternative test provides an acceptable level of quality and safety, relief from Code requirements is requested pursuant to the requirements of 10 CFR 50.55a(f)(5)(iii) and Reference 2.7. (See Appendix D)

5.2 Stroke Time Acceptance Criteria

When required, the acceptance criteria for the stroke times of power-operated valves will be as set forth in References 2.7 and 2.8.

5.3 Check Valve Testing

Where required, full-stroke exercising of check valves to the open position using system flow requires that a test be performed whereby the predicted full accident condition flowrate through the valve be verified and measured or full stroke of the obturator is verified by appropriate methods. Any deviation to this requirement must satisfy the requirements of Reference 2.7, Position 1.

5.4 Testing Intervals

The test frequency for valves included in the Program will be as set forth in Reference 2.8, Parts 1 and 10. An allowable extension, not to exceed +25 percent of the surveillance interval, may be applied to the test schedule as allowed by the Duane Arnold Energy Center Technical Specifications to provide for operational flexibility.

5.5 Valve Program Tables

Appendix C lists those valves included in the IST Program with references to required testing, respective test intervals, and applicable requests for relief.

5.6 Deferred Testing

Where quarterly testing of valves is impractical or otherwise undesirable, testing may be deferred and performed during cold shutdown or refueling periods as permitted by Reference 2.8, Part 10, Paragraphs 4.2.1.2 and 4.3.2.2. The valve program table identifies those valves to which deferred testing applies and the respective technical justification for each is provided in Appendices E and F, respectively.

5.7 Relief Requests for Valve Testing

Relief requests VR-01 through VR-23 associated with valve testing are provided in Appendix D.

APPENDIX A

INSERVICE TESTING PLAN - PUMPS

APPENDIX A: INSERVICE TESTING PLAN - PUMPS

LEGEND FOR PUMP TABLES

SYSTEM	The system in which the pump is installed.
PUMP NO	Numerical designator indicated on the respective flow diagram.
P&ID	Corresponds to the flow diagram on which the pump appears
COORD	Corresponds to the drawing coordinates of the pump
Test Parameters	The table indicates by an abbreviation that a test parameter is determined and at what frequency the test is performed. The abbreviations refer as follows:

N	Not measured
N/A	Not applicable
QR	Measured during quarterly testing
Y	Measured with deviation (See relief request)
2Y	Measured during testing performed at 2-year intervals

PR-XX	Where indicated, this refers to the specific relief request where there is a deviation from the Code requirement related to the measurement or analysis of the subject parameter.

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APPENDIX A: INSERVICE TESTING PLAN - PUMPS

SYSTEM	PUMP NO	P&ID	COORD	SPEED	DIFF PRES	FLOWRATE	VIBRATION	NOTES
RHR SVC WTR	1P-022A	M-146	A-8	N/A	QR	QR	QR	1,2
RHR SVC WTR	1P-022B	M-146	A-5	N/A	QR	QR	QR	1,2
RHR SVC WTR	1P-022C	M-146	A-7	N/A	QR	QR	QR	1,2
RHR SVC WTR	1P-022D	M-146	A-5	N/A	QR	QR	QR	1,2
DIESEL FO	1P-044A	M-132	A-2	N/A	QR	QR	N	1,2,3,5
DIESEL FO	1P-044B	M-132	A-3	N/A	QR	QR	N	1,2,3,5
EMERG SW	1P-099A	M-146	A-7	N/A	QR	QR	QR	1,2
EMERG SW	1P-099B	M-146	A-6	N/A	QR	QR	QR	1,2
SCREEN WASH	1P-112A	M-129	C-7	N/A	QR	QR	QR	1,3
SCREEN WASH	1P-112B	M-129	C-3	N/A	QR	QR	QR	1,3
RIVER WATER	1P-117A	M-129	C-7	N/A	QR	QR	QR	1,2,PR-2
RIVER WATER	1P-117B	M-129	C-4	N/A	QR	QR	QR	1,2,PR-2

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APPENDIX A: INSERVICE TESTING PLAN - PUMPS

SYSTEM	PUMP NO	P&ID	COORD	SPEED	DIFF PRES	FLOWRATE	VIBRATION	NOTES
RIVER WATER	1P-117C	M-129	C-6	N/A	QR	QR	QR	1,2,PR-2
RIVER WATER	1P-117D	M-129	C-3	N/A	QR	QR	QR	1,2,PR-2
CORE SPRAY	1P-211A	M-121	C-3	N/A	Y	QR	QR	1,PR-2
CORE SPRAY	1P-211B	M-121	C-4	N/A	Y	QR	QR	1,PR-2
HPCI	1P-216	M-123	D-2	QR	Y PR-3,4,5	QR PR-4,5	Y PR-7	
RCIC	1P-226	M-125	D-4	QR	Y PR-6	Y PR-6	QR	1,3,PR-6
RHR	1P-229A	M-120	B-3	N/A	QR	QR	QR	1,PR-2
RHR	1P-229B	M-119	B-3	N/A	QR	QR	QR	1,PR-2
RHR	1P-229C	M-120	B-3	N/A	QR	QR	QR	1,PR-2
RHR	1P-229D	M-119	B-3	N/A	QR	QR	QR	1,PR-2
SBLC	1P-230A	M-126	B-5	N/A	QR	QR	QR PR-1	1,3
SBLC	1P-230B	M-126	C-5	N/A	QR	QR	QR PR-1	1,3

NOTES

1. This pump is driven by a squirrel-cage induction motor operating at essentially constant speed; therefore, speed measurements are not required.

2. The value of suction pressure used to calculate pump differential pressure is derived indirectly from a measurement of pump submergence beneath the surface of liquid in a pit or tank.

3. This pump is located outside of the ISI-code boundaries and, as such, any associated request for relief from Code requirements need not be approved by regulatory authorities.

4. Under normal plant operating conditions the drain associated tank/pot does not have sufficient inventory to perform a test. Therefore, it is tested at a 2-year interval per Part 6, Paragraph 5.5.

5. Part 6, Paragraph 4.6.4 requires that vibration measurements be taken on accessible bearing housings. Since the diesel fuel oil pumps and motors are submerged within the diesel fuel oil storage tank, they are considered to be inaccessible and, therefore, vibration measurements are not taken.

APPENDIX B

RELIEF REQUESTS - PUMPS

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RELIEF REQUEST NO. PR-01

PUMPS:

1P-230 A&B - Standby Liquid Control Injection (SBLC)

TEST REQUIREMENT:

The frequency response range of the vibration measuring transducers and their readout system shall be from one-third minimum pump shaft rotational speed to at least 1000 Hz. (Part 6, Para. 4.6.1.6)

BASIS FOR RELIEF:

The nominal shaft rotational speed of these pumps is 242 RPM which is equivalent to approximately 4 Hz. Based on this frequency and Part 6, Para. 4.6.1.6, the required frequency response range of instruments used for measuring pump vibration is 1.33 to 1000 Hz. Procurement and calibration of instruments to cover this range to the lower extreme (1.33 Hz) is impractical due to the limited number of vendors supplying such equipment and the level of sophistication and cost of the equipment.

These are of a simplified reciprocating (piston) positive displacement design with rolling element bearings, Model Number TD-60, manufactured by Union Pump Corporation. Union Pump Corp. has performed an evaluation of the pump design and has determined that there are no probable sub-synchronous failure modes associated with these pumps under normal operating conditions. Furthermore, there are no known failure mechanisms that would be revealed by vibration at frequencies below that related to shaft speed (4 Hz); thus no useful information is obtained below this frequency nor will indication of pump degradation be masked by instrumentation unable to collect data below this frequency.

RELIEF REQUEST NO. PR-01 (cont.)

BASIS FOR RELIEF (cont.):

The requirement to measure vibration with instruments with response to 1/3 shaft speed stems from the need to detect oil whip or oil whirl associated with journal bearings. In the case of these pumps, there are no journal bearings to create these phenomena, thus satisfying the frequency response range criteria would serve no significant purpose. The significant modes of vibration with respect to equipment monitoring are as follows:

* 1-Times Crankshaft Speed - An increase in vibration at this frequency may be an indication of rubbing between a single crankshaft cheek and rod end, cavitation at a single valve, or coupling misalignment.

* 2-Times Crankshaft Speed - An increase in vibration at this frequency may be an indication of looseness at a single rod bearing or crosshead pin, a loose valve seat in the fluid cylinder, a loose plunger/crosshead stub connection, or coupling misalignment.

* Other Multiples of Shaft Speed - An increase in vibration at other frequencies may be indications of cavitation at several valves, looseness at multiple locations, or bearing degradation.

Based on the foregoing discussion, it is clear that monitoring pump vibration within the frequency range of 4 to 1000 Hz will provide adequate information for evaluating pump condition and ensuring continued reliability with respect to the pumps' function. Compliance with the Code requirement would result in a significant hardship and cost without any compensating increase in pump performance or plant safety.

NOTE: The Standby Liquid Control Pumps are not within the DAEC ISI-Code boundaries and thus are not classified as ISI Class 1,2, or 3. Thus approval of this relief request is not required.

ALTERNATE TESTING:

Vibration levels of the Standby Liquid Control Pumps will be measured in accordance with the applicable portions of Part 6, Paragraph 4.6 with the exception of the lower frequency response limit for the instrumentation (Para. 4.6.1.6). In this case the lower response limit of the vibration measuring equipment will be 4.03 Hz or less.

RELIEF REQUEST NO. PR-02

PUMPS:

1P-117A thru 1P-117D - River Water Pumps
1P-211A and 1P-211B - Core Spray Pumps
1P-229A thru 1P-229D - Residual Heat Removal (RHR) Pumps

TEST REQUIREMENT:

An inservice test shall be conducted with the pump operating at specified reference conditions. (Part 6, Para. 5.2)

The resistance of the system shall be varied until the flowrate equals the reference value. The pressure shall then be determined and compared to its reference value. Alternatively, the flow rate can be varied until the pressure equals the reference value and the flow rate shall be determined and compared to the reference flow rate value. (Part 6, Para. 5.2(b))

After pump conditions are as stable as the system permits, each pump shall be run at least 2 minutes. At the end of this time at least one measurement or observation of each of the quantities required shall be made and recorded. (Part 6, Para 5.5)

BASIS FOR RELIEF:

Operating experience has shown that flow rates (independent variables during inservice performance testing) for these pumps cannot be readily duplicated with the present flow control systems. Flow control for these systems can only be accomplished through the operation of large valves as throttling valves. Because these valves are not generally equipped with position indicators which reflect percent open, the operator must repeatedly "jog" the associated motor or air operator to make minor adjustments in flow rate. These efforts to exactly duplicate the reference flowrate require excessive valve manipulation which could ultimately result in damage to valves and their operators.

Since using this method precludes operating the pumps at the "established" reference conditions for any appreciable period of time, the 2-minute run time (interpreted to be at reference conditions) can only be applied at those points where data is taken.

RELIEF REQUEST NO. PR-02 (cont.)

BASIS FOR RELIEF (cont.)

The method described below is essentially equivalent to that required per Part 6, Paragraph 5.2 and will provide an equal measure of assurance of pump operability to that of the Code.

ALTERNATE TESTING:

The prescribed alternate test method establishes reference values for flow rate and differential pressure during a reference value test per Part 6, Paragraph 4. The reference flow rate (Q_r) and differential pressure (dP_r) define a point on the pump performance curve as shown in Figure PR-02-1. The solid line in Figure PR-02-1 represents the pump curve which exists during the reference value test.

If the pump characteristics were to degrade during time, the pump would operate on a different curve as represented by the broken line in Figure PR-02-1. Given that Q_r cannot be duplicated exactly in subsequent tests, inservice tests will be performed by taking two separate and distinct sets of measurements and establishing a differential pressure that corresponds to Q_r for the inservice test as described.

After the pump has run for at least two minutes, a flow rate will be obtained which is lower than the reference flow rate (Q_r) but greater than a specified lower limit established in the test procedure. When the lower flowrate(Q_l)is established, the corresponding suction (P_{il}) and discharge pressures (P_{dl}) will be measured and the differential pressure (dP_l) corresponding to the lower flow rate will be computed by:

$$dP_l = P_{dl} - P_{il}$$

Next, the flowrate will be adjusted to a value higher than Q_r but less than a specified upper limit established in the test procedure. Again the corresponding suction and discharge pressures will be measured and the associated differential pressure (dP_h) corresponding to Q_h will be computed.

RELIEF REQUEST NO. PR-02 (cont.)

ALTERNATE TESTING (cont.):

As shown in Figure PR-02-1, the two pump operating points established above define a small portion of the pump curve. It is assumed that the curve included between these points is linear and the general equation of the line between points (Q_l, dP_l) and (Q_h, dP_h) is thus:

$$dP = a - bQ$$

Writing the above equation in terms of Q_l, dP_l, Q_h and dP_h and solving for dP yields:

$$dP = dP_l + \left(\frac{dP_l - dP_h}{Q_h - Q_l}\right)(Q_l - Q_r) \qquad \text{(Eq. 1)}$$

Given that the pump curve is nearly linear between Q_l and Q_h, Equation 1 gives an accurate value for dP which corresponds to Q_r. This precise value of dP obtained analytically is then compared to the Alert and Action Required limits which are computed from the reference differential pressure (dP_r) based on Part 6, Table 3.

A key assumption in this approach is that the pump curve between Q_l and Q_h is linear. To support this assumption, the values for Q_l and Q_h will be bounded procedurally to fall within a narrow range of Q_r, so that the curve in that range approaches linearity. The appropriate flowrate range between the lower and upper limits will be determined on a pump by pump basis.

RELIEF REQUEST NO. PR-02 (cont.)

ALTERNATE TESTING (cont.):

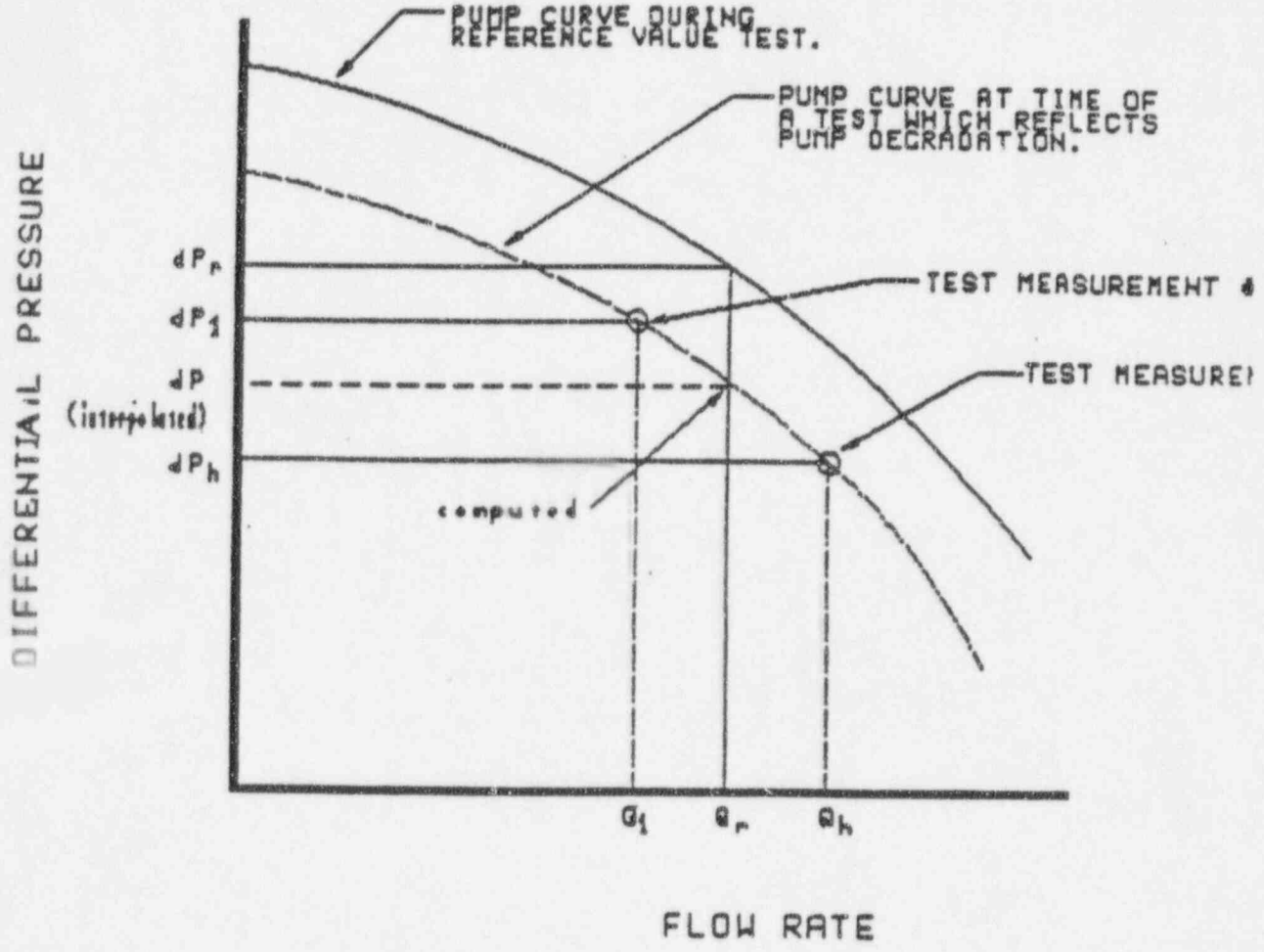

Figure PR-02.1 Alternate Testing Approach For Determination Of Hydraulic Change

RELIEF REQUEST NO. PR-03

PUMPS:

1P-216 - High Pressure Coolant Injection (HPCI) Pumps

TEST REQUIREMENT:

Instrument accuracy shall be within the limits of Table 1. (Part 6, Para. 4.6.1.1)

The full scale range of each analog instrument shall not be greater than three times the reference value. Part 6, Para. 4.6.1.2)

BASIS FOR RELIEF:

The instrumentation loop accuracy for HPCI pump suction pressure is ±2.06 percent (excluding calibration) and the range is -30" - 85 psig.

The installed HPCI suction pressure gauge is sized to accommodate post accident torus pressures (85 psig); however, during testing the only source of pressure for the HPCI suction line comes from the head of the condensate storage tank (approximately 20 psig.). Given the installed instrument loop, the maximum reading error is less than 2.5 psi. Considering that the typical HPCI pump differential pressure during inservice testing is approximately 1,100 psid, an additional error of 2.5 psi in reading the pump suction pressure is inconsequential with respect to evaluating pump operability or degradation.

During the first and second ISI inspection intervals the test results obtained using this instrumentation have proven to be satisfactory and consistent providing reliable information.

ALTERNATE TESTING:

During inservice testing of the HPCI pump, suction pressure will be measured with the installed instrumentation. During testing a digital Multimeter will be inserted into the instrument loop, yielding readings equivalent to a 0-60 psi, 2% of Full-Scale pressure gauge.

RELIEF REQUEST NO. PR-04

PUMP:

1P-216 - High Pressure Coolant Injection Pump

TEST REQUIREMENT:

An inservice test shall be conducted with the pump operating at specified reference conditions. (Part 6, Para. 5.2)

The resistance of the system shall be varied until the flowrate equals the reference value. The pressure shall then be determined and compared to its reference value. Alternatively, the flow rate can be varied until the pressure equals the reference value and the flow rate shall be determined and compared to the reference flow rate value. (Part 6, Para. 5.2(b))

After pump conditions are as stable as the system permits, each pump shall be run at least 2 minutes. At the end of this time at least one measurement or observation of each of the quantities required shall be made and recorded. (Part 6, Para. 5.5)

BASIS FOR RELIEF:

Operating experience has shown that flow rates (independent variables during inservice performance testing) for the HPCI pump cannot be readily duplicated with the present flow control systems. Efforts to exactly duplicate the reference values would require excessive valve manipulation which could ultimately result in damage to valves or operators. In order to perform accurate trending and data analysis, the use of an accurate reference value is very important. The complexities of the flow control systems found within these systems makes it extremely difficult to exactly duplicate the reference values.

Current NRC policy promulgated via NUREG-1482 allow using a "graphical" method of test result interpretation.

ALTERNATE TESTING:

Pump differential pressure and flow rate will be evaluated using a reference value test derived pump curve over a limited range of pump operation. This reference value test pump curve will be restricted to an operating regime that

RELIEF REQUEST NO. PR-04 (cont.)

ALTERNATE TESTING (cont.):

is representative of the pump operation under accident conditions or conditions that are the most sensitive indicator of pump degradation.

Based on the reference value test pump curve, acceptance criteria curves will be established for the upper and lower required action and alert range limits.

Detailed Technical Description:

The reference value curve will be established by measuring a minimum of five (5) sets of differential pressure/flowrate data when the pump combination is known to be operating acceptably. The measurements will be distributed across the expected range of potential inservice test conditions.

The equation for the reference value curve will then be computed using a third order polynomial regression technique that employs a least-squares fit of the data by successive polynomials of orders 1 through 3. The standard deviation about the regression line will be evaluated for each case. The resulting reference value curve is expressed as a third order polynomial in the general form:

$$y=a_3x^3+a_2x^2+a_1x+a_0 \quad \text{where}$$

y is the dependent variable and
x is the independent variable

The Required Action and Alert Range Curves will be scaler multiples of the reference value curve.

The measurements taken during inservice testing will be restricted to only those falling within the envelope of reference value test measurements. The inservice test differential pressure/flowrate test results will be plotted on a typical pump curve or evaluated by an equivalent tabular method and the results included in the permanent test records.

RELIEF REQUEST NO. PR-04 (cont.)

ALTERNATE TESTING (cont.):

Finally, the combined differential pressure/flowrate test results will be evaluated for variation from test-to-test to identify any pump degradation. In addition, the results of all IST testing will be evaluated with respect to operability criteria for flowrate and differential pressure set forth in the DAEC Technical Specifications and UFSAR.

Pump vibration values will be measured at the highest and lowest points used for constructing the pump curve. From this data the vibration acceptance criteria will be derived in accordance with Part 6, Paragraph 6.1 and Relief Request PR-07 using the most conservative vibration data.

When the reference curve may have been affected by repair, replacement, or routine service, a new reference curve will be established or the previous curve will be revalidated by conducting an inservice test.

Pump operating run time is limited by torus temperature limitations, thus allowing the pump to stabilize for 2 minutes at each data point may cause torus temperature to rise to a point where the test may be prematurely terminated. To alleviate this concern during reference value tests, initially the pump will be operated under nominal conditions for at least 2 minutes to allow instrument stabilization. Following this, the flowrate will be adjusted as required to obtain the required number of data points. At each data point readings will be taken as soon as conditions stabilize; however, the 2-minute operation time at each data point will not be imposed.

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RELIEF REQUEST NO. PR-05

PUMP:

1P-216 - High Pressure Coolant Injection Pump

TEST REQUIREMENT:

An inservice test shall be run on each pump. (Part 6, Para. 4 and 5)

BASIS FOR RELIEF:

There are no suitable provisions for measuring the pressure in the cross-over piping between the HPCI booster and main pumps. Since these pumps are driven by a common driver and are connected in tandem, they are necessarily tested together, simultaneously, under the same operating conditions (flowrate and turbine speed). Therefore measuring the inlet pressure of the booster pump and calculating the differential pressure of the pump combination will effectively verify operability and serve to monitor the performance of the pair.

ALTERNATE TESTING:

During inservice testing of these pumps the differential pressure of the pump combination will be determined from measurements of the suction and discharge pressures of the booster and main pumps, respectively. This data will be used to evaluate the performance of the pump combination in a manner such that the combination will be treated as a single multi-stage pump.

RELIEF REQUEST NO. PR-06

PUMP:

1P-226 - Reactor Core Isolation Cooling (RCIC) Pump

TEST REQUIREMENT:

An inservice test shall be conducted with the pump operating at specified reference conditions. (Part 6, Para. 5.2)

The resistance of the system shall be varied until the flowrate equals the reference value. The pressure shall then be determined and compared to its reference value. Alternatively, the flow rate can be varied until the pressure equals the reference value and the flow rate shall be determined and compared to the reference flow rate value. (Part 6, Para. 5.2(b))

After pump conditions are as stable as the system permits, each pump shall be run at least 2 minutes. At the end of this time at least one measurement or observation of each of the quantities required shall be made and recorded. (Part 6, Para. 5.5)

BASIS FOR RELIEF:

Operating experience has shown that flow rates (independent variables during inservice performance testing) for these pumps cannot be readily duplicated with the present flow control systems. Flow control for these systems can only be accomplished through the operation of large valves as throttling valves. Because these valves are not generally equipped with position indicators which reflect percent open, the operator must repeatedly "jog" the associated motor or air operator to make minor adjustments in flow rate. These efforts to exactly duplicate the reference flowrate require excessive valve manipulation which could ultimately result in damage to valves and their operators.

Since using this method precludes operating the pumps at the "established" reference conditions for any appreciable period of time, the 2-minute run time (interpreted to be at reference conditions) can only be applied at those points where data is taken.

RELIEF REQUEST NO. PR-06 (cont.)

BASIS FOR RELIEF (cont.)

The method described below is essentially equivalent to that required per Part 6, Paragraph 5.2 and will provide an equal measure of assurance of pump operability to that of the Code.

NOTE: This pump is not within the ISI-class boundaries and thus this request for relief does not require regulatory approval.

ALTERNATE TESTING:

The prescribed alternate test method establishes reference values for flow rate and differential pressure during a reference value test per Part 6, Paragraph 4. The reference flow rate (Q_r) and differential pressure (dP_r) define a point on the pump performance curve as shown in Figure PR-06-1. The solid line in Figure PR-06-1 represents the pump curve which exists during the reference value test.

If the pump characteristics were to degrade during time, the pump would operate on a different curve as represented by the broken line in Figure PR-06-1. Given that Q_r cannot be duplicated exactly in subsequent tests, inservice tests will be performed by taking two separate and distinct sets of measurements and establishing a differential pressure that corresponds to Q_r for the inservice test as described.
After the pump has run for at least two minutes, a flow rate will be obtained which is lower than the reference flow rate (Q_r) but greater than a specified lower limit established in the test procedure. When the lower flowrate(Q_1)is established, the corresponding suction (P_{i1}) and discharge pressures (P_{d1}) will be measured and the differential pressure (dP_1) corresponding to the lower flow rate will be computed by:

$$dP_1 = P_{d1} - P_{i1}$$

Next, the flowrate will be adjusted to a value higher than Q_r but less than a specified upper limit established in the test procedure. Again the corresponding suction and

RELIEF REQUEST NO. PR-06 (cont.)

ALTERNATE TESTING (cont.):

discharge pressures will be measured and the associated differential pressure (dP_h) corresponding to Q_h will be computed.

As shown in Figure PR-06-1, the two pump operating points established above define a small portion of the pump curve. It is assumed that the curve included between these points is linear and the general equation of the line between points (Q_l, dP_l) and (Q_h, dP_h) is thus:

$$dP = a - bQ$$

Writing the above equation in terms of Q_l, dP_l, Q_h and dP_h and solving for dP yields:

$$dP = dP_l + \left(\frac{dP_l - dP_h}{Q_h - Q_l}\right)(Q_l - Q_r) \qquad \text{(Eq. 1)}$$

Given that the pump curve is nearly linear between Q_l and Q_h, Equation 1 gives an accurate value for dP which corresponds to Q_r. This precise value of dP obtained analytically is then compared to the Alert and Action Required limits which are computed from the reference differential pressure (dP_r) based on Part 6, Table 3.

A key assumption in this approach is that the pump curve between Q_l and Q_h is linear. To support this assumption, the values for Q_l and Q_h will be bounded procedurally to fall within a narrow range of Q_r, so that the curve in that range approaches linearity.

RELIEF REQUEST NO. PR-06 (cont.)

ALTERNATE TESTING (cont.):

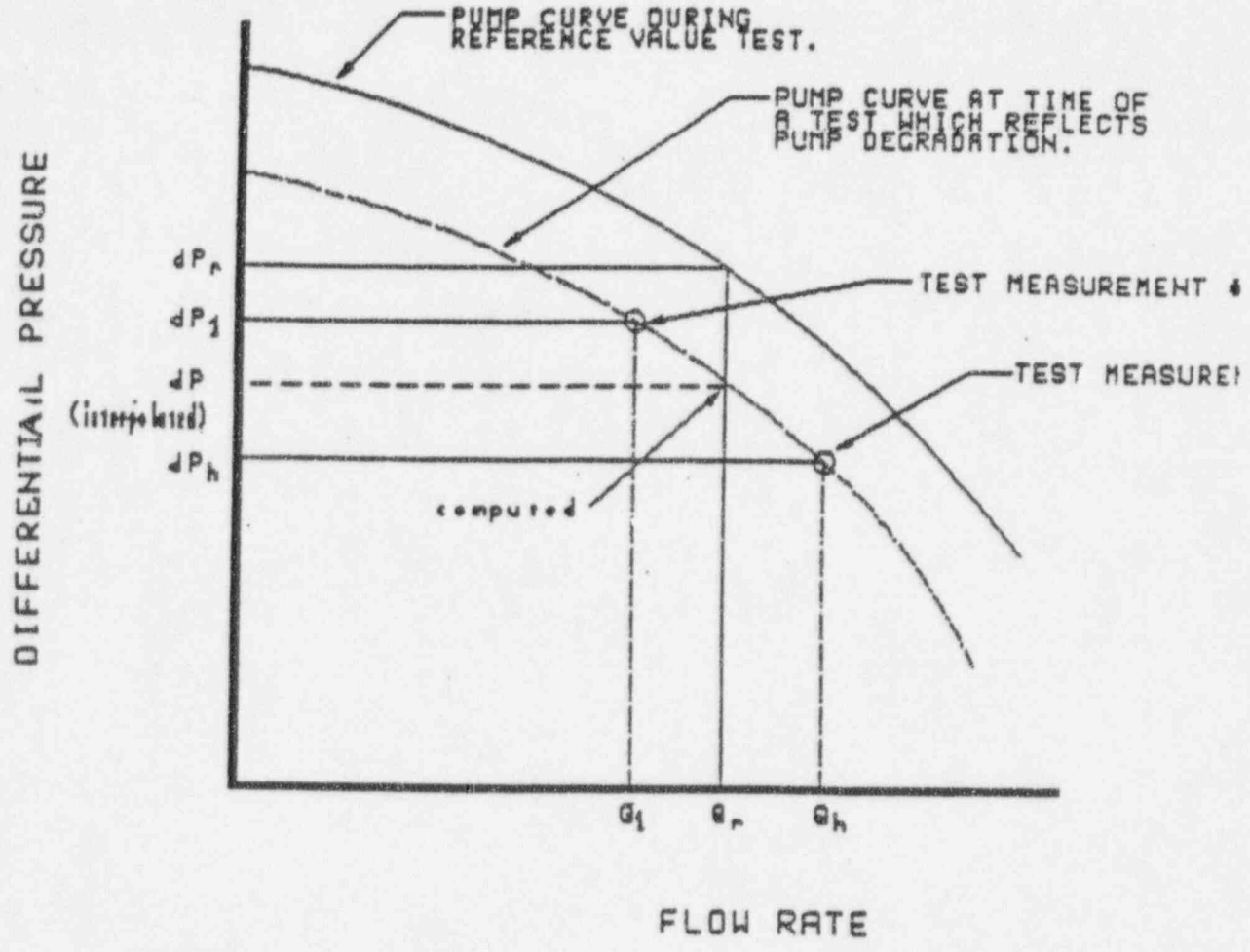

Figure PR-006.1 Alternate Testing Approach for Determination of Hydraulic Change

RELIEF REQUEST NO. PR-07

PUMPS:

1P-216 - High Pressure Coolant Injection (HPCI)

TEST REQUIREMENT:

The acceptance criteria for pump vibration shall be determined from OM Part 6, Table 3a. Specifically, should measured vibration velocity equal or exceed 0.325 in/sec, the corrective action of Paragraph 6.1, doubling the test frequency, must be imposed until the cause of the deviation has been determined and the condition corrected.

BASIS FOR RELIEF:

The HPCI pump combination consists of two separate centrifugal pumps in series driven on a common shaft, through gear reduction, by a non-condensing steam turbine. Due to the arrangement and design of the various components (which is generally a General Electric standard), several of the operating vibration levels at various locations are typically in the range of 0.3 to 0.5 in/sec. This is considered to be a generic industry condition.

At several facilities, the utility has attempted to reduce vibration levels by modification of the booster pump impeller and other approaches such as opening clearances within the pump casing. To date, these approaches at many utilities have not been successful in reducing vibration velocity levels to a level below 0.325 in/sec.

The operational vibration characteristics of the Duane Arnold Energy Center (DAEC) HPCI pump combination have been analyzed and evaluated by IES Utilities Inc. As a result, it has been determined that pump vibration levels are related to the combination of interaction of the impeller vanes, casing, volute design amplified by bearing resonance and fluid reaction (pulsing) in the short connecting piping between the two pumps. Alignment and foundation were evaluated and it was determined that they were not contributing to the elevated vibration levels. It was determined that the vibration being experienced in the HPCI pumps is not indicative of pump degradation or conditions that would suggest that the pumps are unreliable or incapable of reliably fulfilling their safety function.

Analyses of pump installations similar to the one at DAEC have been evaluated and it was determined that reliable operation of these pumps can be expected with vibration levels of 0.7 in/sec without undue concern for the onset of vibration induced failure.

RELIEF REQUEST NO. PR-07 (cont.)

BASIS FOR RELIEF (Cont'd):

The HPCI pump combination has undergone testing and vibration monitoring in conjunction with the previous editions of the ASME Code over the past 15 years. During that time, there has been no evidence of degradation or pump failure to suggest that the existing vibration levels are functionally significant. The application of spectrum analyses in addition to the existing Code requirement (broad band) will enhance the monitoring capability further ensuring that the pumps are operating properly.

The HPCI pumps are standby emergency pumps that are operated infrequently, normally for testing purposes. Thus, during periods between testing, it is reasonable to assume that no pump degradation is taking place that would manifest itself in changes of vibration levels. Therefore, testing these pumps at increased frequency serves no useful purpose and increases equipment wear.

In consideration of the foregoing, subjecting the HPCI pumps to a doubling of the normal test frequency (quarterly) provides no useful information and adds no measure of additional level of pump reliability. Continued testing of these pumps on a quarterly frequency is proposed.

ALTERNATE TESTING:

The vibration data measured during inservice testing of the HPCI pumps will be evaluated in accordance with the operability limits imposed by Table 3a except that the test frequency will not be doubled when vibration levels equal or exceed 0.325 in/sec. Consistant with Table 3a, vibration levels greater than .70 in/sec will result in the pump being declared inoperable.

RELIEF REQUEST NO. PR-07 (cont.)

ALTERNATE TESTING (cont.)

During inservice testing (quarterly and post-maintenance) of the HPCI pumps, IES Utilities Inc. will record vibration data and perform spectrum analyses at selected points that typically exceed levels of 0.325 in/sec. These analyses will be completed and subjected to a formal evaluation within one (1) week of test performance. A spectrum analysis measures a narrow vibration band width over a wide frequency range and indicates the frequency and magnitude of vibration peaks, which permits identificaiton of problems with bearings and other pump mechanical components. The spectrum analysis allows a more comprehensive evaluation of pump condition than the Code required wide range vibration measurements. Should the evaluation result in a condition suggesting that the pump combination may be degrading, the pumps will be tested at an increased frequency - consistent with the Code requirement.

RELIEF REQUEST NO. PR-08

RESERVED

RELIEF REQUEST NO. PR-09

RESERVED

APPENDIX C

INSERVICE TESTING PLAN - VALVES

APPENDIX C: INSERVICE TESTING PLAN - VALVES

LEGEND FOR VALVE TABLES

VALVE IDENT Plant alpha-numerical designator for the subject valve

COOR Coordinate location of the valve on the designated drawing

CLASS ISI Classification of the valve

CAT Valve category per Part 10, Paragraph 1.4

SIZE Valve's nominal size in inches

TYPE Valve types as follows:

AP	Air-operated pilot
ANG	Angle
AV	Auto-vent
BAL	Ball
BTF	Butterfly
CK	Check
DIA	Diaphragm
GA	Gate
GL	Globe
PLG	Plug
RPD	Rupture Diaphragm
RV	Relief
SCK	Stop-check
SH	Explosive shear
SV	Safety
TV	Trip valve
XFC	Excess Flow Check
3WY	Three-way

ACT. Valve actuator type as follows:

AO	Air-operated
AP	Air-ilot operated
EXP	Explosively actuated
HO	Hydraulic
M	Manual valve
MSA	Self and manual operated
MO	Electric motor-operated
SA	Self-actuated
SAM	Self and motor-operated
SO	Solenoid-operated

LEGEND FOR VALVE TABLES (cont.)

NORM POS. Designates the normal position of the valve during plant operation at power. Abbreviations are as follows:

C	Closed
C/KL	Key-locked closed
C/FO	Closed - fails open
C/FC	Closed - fails closed
LC	Locked closed
LO	Locked open
ND	Normally de-energized
NE	Normally energized
O	Open
O/KL	Key-locked open
O/FO	Open - fails open
O/FC	Open - fails closed
SYS	Position dependant on system operation

TEST REQ Identifies the test requirements for a valve as follows:

AT-1	Type C Leaktest
AT-2	Excess Flow Check Valve Test
AT-4	Torus/Drywell Vacuum Breaker Leaktest
AT-5	Pressure Isolation Valve Leak Test
AT-6	Accumulator Check Valve Leak Test
AT-7	Purge/Vent Pressure Decay Test
BTD	Full-stroke exercise test to DE-ENERGIZED
BTE	Full-stroke exercise test to ENERGIZED
BTO	Full-stroke exercise time test to OPEN position
BTC	Full-stroke exercise time test to CLOSE Position
BT-VOP	Vacuum breaker operational test (Part 1, 1.3.4.3)
CTCME	Check valve mechanical exercise-CLOSED
CTOME	Check valve mechanical exercise-OPEN
CT-CC	Check valve exercise test to the CLOSED Position
CT-CO	Check valve exercise test to the OPEN Position
CT-PO	Check valve partial exercise- OPEN
CT-RDI	Rupture diaphram inspection
CT-RDR	Rupture diaphram replacement
CT-SP	Safety/Relief Valve Setpoint Verification Test
CT-VSP	Check Valve/Vacuum Breaker Setpoint Test
DSBY	Check valve disassembly/inspection
DT-	Explosive Valve Test
DT-REC	Record verification for explosive valves
FST	Fail-safe Test
PIT	Remote Position Indication Verification Test

FREQ — The required test interval as follows:

CS	Cold shutdown as defined by Tech. Specs.
CS-I	Cold shutdown w/ containment de-inerted
QR	Quarterly - every 92 days (during plant operation)
RR	Each reactor refueling outage (cycle)
R2	50% of main steam relief and safety valves are tested during successive refueling outages
2Y	Every 2 years
6M	Semi-annually (every 6 months)
10Y	Safety/relief valves are tested on a sampling basis at 10-year intervals.

RELIEF — Refers to the specific relief request associated with the indicated test requirement. (See Appendix D)

DEF TEST — Refers to the specific justification for deferred testing (cold shutdown or refueling) associated with the indicated test requirement. (See Paragraph 5.6)

DRAWING: C51-1-7(APED) - TIP SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
1S260A/BALL	A-1	NC	A	0.375	BAL	SO	C	AT-1	2Y			
								BTC	QR			
								FST	QR			
								PIT	2Y			
1S260A/SHEAR	A-1	NC	D	0.375	SH	EXP	O/KL	DT-E	2Y			
								DT-REC	2Y			
1S260B/BALL	A-1	NC	A	0.375	BAL	SO	C	AT-1	2Y			
								BTC	QR			
								FST	QR			
								PIT	2Y			
1S260B/SHEAR	A-1	NC	D	0.375	SH	EXP	O/KL	DT-E	2Y			
								DT-REC	2Y			
1S260C/BALL	A-1	NC	A	0.375	BAL	SO	C	AT-1	2Y			
								BTC	QR			
								FST	QR			
								PIT	2Y			
1S260C/SHEAR	A-1	NC	D	0.375	SH	EXP	O/KL	DT-E	2Y			
								DT-REC	2Y			
V-43-503	A-1	NC	A/C	0.375	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-01	

DRAWING: M-103 - MAIN STEAM SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-1054	F-7	2	B	6.000	GA	MO	O	PIT	2Y			
MO-1055	F-7	2	B	6.000	GA	MO	O	PIT	2Y			

DRAWING: M-109 - CONDENSATE AND DEMINERALIZED WATER SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-09-065	F-3	NC	A	1.000	GA	M	C	AT-1	2Y			(1)
V-09-113	F-3	NC	A	1.000	GA	M	C	AT-1	2Y			(1)

DRAWING: M-112 - REACTOR BUILDING COOLING WATER SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-4841A	E-3	NC	A	4.000	GA	MO	O	AT-1	2Y			
								BTC	CS		CSJ-02	
								PIT	2Y			
MO-4841B	F-3	NC	A	4.000	GA	MO	O	AT-1	2Y			
								BTC	CS		CSJ-02	
								PIT	2Y			
PSV-4842	F-2	NC	C	0.750	RV	SA	SYS	CT-SP	10Y			

DRAWING: M-113 - RHR SERVICE WATER SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-1956A	F-3	3	B	4.000	GA	AO	C/FO	BTO	QR	VR-23		
								FST	QR			(2)
CV-1956B	F-1	3	B	4.000	GA	AO	C/FO	BTO	QR	VR-23		
								FST	QR			(2)
CV-2080	F-5	3	B	6.000	GL	AO	C/FO	BTO	QR	VR-23		(2)
								FST	QR			
CV-2081	F-5	3	B	6.000	GL	AO	C/FO	BTO	QR	VR-23		(2)
								FST	QR			
MO-1943A	F-7	3	B	12.000	GA	MO	C/KL	PIT	2Y			
MO-1943B	F-7	3	B	12.000	GA	MO	C/KL	PIT	2Y			
MO-1947	C-6	3	B	16.000	GA	MO	C	BTO	QR			
								PIT	2Y			
MO-1998A	A-7	3	B	16.000	BTF	MO	O	PIT	2Y			(1)
MO-1998B	B-7	3	B	16.000	BTF	MO	O	PIT	2Y			(1)
MO-2039A	F-4	NC	B	4.000	GA	MO	O	BTC	QR			
								PIT	2Y			
MO-2039B	F-2	NC	B	4.000	GA	MO	O	BTC	QR			
								PIT	2Y			

DRAWING: M-113 - RHR SERVICE WATER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-2046	C-5	3	B	16.000	GA	MO	C	BTO PIT	QR 2Y			
MO-2077	F-4	3	B	4.000	GA	MO	O	BTC PIT	QR 2Y			
MO-2078	F-2	3	B	4.000	GA	MO	O	BTC PIT	QR 2Y			
PSV-1988	D-7	3	C	0.750	RV	SA	C	CT-SP	10Y			
PSV-2068	C-6	3	C	0.750	RV	SA	C	CT-SP	10Y			
SV-1956A	F-3	NC	B	0.500	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-1956B	F-2	NC	B	0.500	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-2080	F-5	NC	B	0.375	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-2081	F-5	NC	B	0.375	3WY	SO	NE	BTD	QR	VR-01		(3)
V-13-036	F-3	3	C	4.000	CK	SA	SYS	CT-CO	QR			
V-13-037	H-3	3	C	4.000	CK	SA	SYS	CT-CC	RR		RRJ-28	
V-13-051	F-4	3	C	4.000	CK	SA	SYS	CT-CO	QR			
V-13-052	H-4	3	C	4.000	CK	SA	SYS	CT-CC	RR		RRJ-28	

DRAWING: M-113 - RHR SERVICE WATER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-13-103	F-4	3	C	1.000	CK	SA	SYS	CT-CC	QR			
V-13-104	F-4	3	C	1.000	CK	SA	SYS	CT-CC	QR			
V-13-121	F-2	3	C	1.000	CK	SA	SYS	DSBY	RR	VR-19		
V-13-126	F-4	3	C	1.000	CK	SA	SYS	DSBY	RR	VR-19		
V-13-140	F-3	3	C	1.000	CK	SA	SYS	DSBY	RR	VR-19		
V-13-142	F-2	3	C	1.500	CK	SA	SYS	DSBY	RR			

DRAWING: M-114 - NUCLEAR BOILER SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF REQ	NOTES
AP-4412A	G-3	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4412C	G-2	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4413A	G-1	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4413C	F-1	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4415A	D-7	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4415C	G-2	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4416A	D-8	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4416C	F-1	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4418A	D-3	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)
AP-4418C	G-2	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01	(3)
								FST	QR	VR-01	(2) (3)

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
AP-4419A	D-1	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
AP-4419C	F-1	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
AP-4420A	E-7	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
AP-4420C	G-2	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
AP-4421A	E-8	NC	B	0.375	4WY	AP	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
AP-4421C	F-1	NC	B	0.375	2WY	SO	C/FO	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
CV-4412	E-3	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			
CV-4413	E-2	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4415	C-7	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			
CV-4416	C-8	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			
CV-4418	C-3	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			
CV-4419	C-2	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			
CV-4420	E-7	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			
CV-4421	E-8	1	A	20.000	GL	AO	O/FC	AT-1	2Y			
								BTC	QR	VR-22		
								FST	QR/RR		RRJ-02	
								PIT	2Y			

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4428	H-6	1	B	.500	GL	AO	C	BTC	CS		CSJ-01	
								PIT	2Y			
CV-4429	H-7	1	B	.500	GL	AO	C	BTC	CS		CSJ-01	
								PIT	2Y			
MO-4423	B-3	1	A	3.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								PIT	2Y			
MO-4424	B-3	1	A	3.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								PIT	2Y			
MO-4441	B-3	1	A/C	16.000	SC	MO	O/KL	AT-1	2Y			(6)
								BTC	CS		CSJ-03	
								PIT	2Y			
MO-4442	B-7	1	A/C	16.000	SC	MO	O/KL	AT-1	2Y			(6)
								BTC	CS		CSJ-03	
								PIT	2Y			
PSV-4400	B-5	1	B/C	6.000	RV	SAP	C/KL	BTC	RR		RRJ-04	
								BTO	RR		RRJ-04	
								CT-SP	R2			(4)

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
PSV-4401	E-4	1	B/C	6.000	RV	SAP	C/KL	BTO	RR		RRJ-04	
								CT-SP	R2			(4)
PSV-4402	C-6	1	B/C	6.000	RV	SAP	C/KL	BTO	RR		RRJ-04	
								CT-SP	R2			(4)
PSV-4403	C-6	1	C	6.000	SV	SA	C	CT-SP	R2			(4)
PSV-4404	C-5	1	C	6.000	SV	SA	C	CT-SP	R2			(4)
PSV-4405	C-4	1	B/C	6.000	RV	SAP	C/KL	BTO	RR		RRJ-04	
								CT-SP	R2			(4)
PSV-4406	E-6	1	B/C	6.000	RV	SAP	C/KL	BTO	RR		RRJ-04	
								CT-SP	R2			(4)
PSV-4407	E-6	1	B/C	6.000	RV	SAP	C/KL	BTO	RR		RRJ-04	
								CT-SP	R2			(4)
PSV-4439A	B-5	3	C	6.000	RV	SA	C	CT-VSP	10Y	VR-16		
PSV-4439B	B-4	3	C	6.000	RV	SA	C	CT-VSP	10Y	VR-16		
PSV-4439C	A-5	3	C	6.000	RV	SA	C	CT-VSP	10Y	VR-16		

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
PSV-4439D	B-4	3	C	6.000	RV	SA	C	CT-VSP	10Y	VR-16		
PSV-4439E	A-5	3	C	6.000	RV	SA	C	CT-VSP	10Y	VR-16		
PSV-4439F	A-4	3	C	6.000	RV	SA	C	CT-VSP	10Y	VR-16		
SV-4400	E-5	NC	B	0.500	3WY	SO	ND	BTD	RR		RRJ-04	(3)
								BTE	RR		RRJ-04	
SV-4401	E-4	NC	B	0.500	3WY	SO	ND	BTD	RR		RRJ-04	(3)
								BTE	RR		RRJ-04	
SV-4402	C-6	NC	B	0.500	3WY	SO	ND	BTD	RR		RRJ-04	(3)
								BTE	RR		RRJ-04	
SV-4405	C-4	NC	B	0.500	3WY	SO	ND	BTD	RR		RRJ-04	(3)
								BTE	RR		RRJ-04	
SV-4406	F-6	NC	B	0.500	3WY	SO	ND	BTD	RR		RRJ-04	(3)
								BTE	RR		RRJ-04	
SV-4407	F-6	NC	B	0.500	3WY	SO	ND	BTD	RR		RRJ-04	(3)
								BTE	RR		RRJ-04	
SV-4412A	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4412B	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-4413A	F-2	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4413B	F-2	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4415A	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4415B	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4416A	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4416B	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4418A	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4418B	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4419A	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4419B	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-4420A	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4420B	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4421A	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4421B	G-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
								FST	QR	VR-01		(2) (3)
SV-4428	H-6	NC	B	.250	3WY	SO	ND	BTD	CS		CSJ-01	
SV-4429	H-7	NC	B	.250	3WY	SO	ND	BTD	CS		CSJ-01	
V-14-001	B-6	1	A/C	16.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-05	
								CT-CO	QR	VR-03		
V-14-003	B-4	1	A/C	16.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-05	
								CT-CO	QR	VR-03		
V-14-009	F-6	NC	A/C	2.000	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-014	C-6	NC	A/C	2.000	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-14-015	G-5	NC	A/C	2.000	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-016	D-5	NC	A/C	2.000	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-032	F-1	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-100	F-3	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-104	G-8	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-108	G-8	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-112	G-8	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-116	G-8	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-120	G-8	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	
V-14-124	G-8	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	RR		RRJ-06	

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4453A	E-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4453B	D-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4454A	E-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4454B	D-1	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4455A	C-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4455B	C-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4456A	C-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4456B	C-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-114 - NUCLEAR BOILER SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4457A	E-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4457B	D-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4458A	E-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4458B	D-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4459A	C-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4459B	C-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4460A	C-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4460B	C-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-115 - REACTOR VESSEL INSTRUMENTATION

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-4594A	D-3	2	A	1.000	GL	SO	C/FC	AT-1	2Y			(1)
								BTC	QR			
								FST	QR			
								PIT	2Y			
SV-4594B	D-6	2	A	1.000	GL	SO	C/FC	AT-1	2Y			(1)
								BTC	QR			
								FST	QR			
								PIT	2Y			
SV-4595A	D-3	NC	A	1.000	GL	SO	C/FC	AT-1	2Y			(1)
								BTC	QR			
								FST	QR			
								PIT	2Y			
SV-4595B	D-6	NC	A	1.000	GL	SO	C/FC	AT-1	2Y			(1)
								BTC	QR			
								FST	QR			
								PIT	2Y			
XFV-4501A	E-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4501B	E-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-115 - REACTOR VESSEL INSTRUMENTATION

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4503	E-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4504	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4505	C-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4506	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4507	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4508	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4510A	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-115 - REACTOR VESSEL INSTRUMENTATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4510B	E-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4511	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4512	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4513	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4514	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4515	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4516	B-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-115 - REACTOR VESSEL INSTRUMENTATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4518	D-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4519	D-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4528	D-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4562	E-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4578	F-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4579	F-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4580	F-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-115 - REACTOR VESSEL INSTRUMENTATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4581	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4582	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4583	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4584	D-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4585	D-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4586	F-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4587	F-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-115 - REACTOR VESSEL INSTRUMENTATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4588	F-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4589	F-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4590	D-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4591	D-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-116 - REACTOR RECIRCULATION

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4639	F-6	2	A	0.750	GL	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			
								PIT	2Y			(2)
CV-4640	F-6	NC	A	0.750	GL	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			
								PIT	2Y			(2)
MO-4627	C-2	1	B	22.000	GA	MO	O	BTC	CS		CSJ-04	
								PIT	2Y			
MO-4628	C-8	1	B	22.000	GA	MO	O	BTC	CS		CSJ-04	
								PIT	2Y			
MO-4629	C-3	1	B	4.000	GA	MO	O	BTC	CS		CSJ-05	
								PIT	2Y			
MO-4630	C-8	1	B	4.000	GA	MO	O	BTC	CS		CSJ-05	
								PIT	2Y			
SV-4639	F-6	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-4640	F-6	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		(3)
XFV-4607	A-5	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-116 - REACTOR RECIRCULATION

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4608	A-5	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4611	A-5	3	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4612	A-5	3	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4637	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4638	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4641A	H-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4641B	H-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-116 - REACTOR RECIRCULATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4642A	G-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4642B	G-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4643A	G-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4643B	G-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4644A	G-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4644B	G-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4663	F-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-116 - REACTOR RECIRCULATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4664	F-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4665	F-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4666	F-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4667	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4668	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4669	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4670	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-116 - REACTOR RECIRCULATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
XFV-4671	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4672	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4673	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4674	E-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								C-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4675	D-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-4676	D-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-116 - REACTOR RECIRCULATION (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF DEF TEST	NOTES
XFV-4677	D-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02	
								CT-CC	RR	VR-02	
								PIT	RR	VR-02	
XFV-4678	D-4	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02	
								CT-CC	RR	VR-02	
								PIT	RR	VR-02	
XFV-4679	A-1	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02	
								CT-CC	RR	VR-02	
								PIT	RR	VR-02	
XFV-4680	A-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02	
								CT-CC	RR	VR-02	
								PIT	RR	VR-02	
XFV-4681	A-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02	
								CT-CC	RR	VR-02	
								PIT	RR	VR-02	
XFV-4682	A-3	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02	
								CT-CC	RR	VR-02	
								PIT	RR	VR-02	

DRAWING: M-117 - CONTROL ROD DRIVE HYDRAULIC SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-1804A	A-5	NC	A	1.000	GL	AO	O	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-1804B	A-5	NC	A	1.000	GL	AO	O	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
SV-1804A	A-5	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-1804B	A-5	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-1840A	F-6	NC	B	1.000	3WY	SO	ND	BTE	RR		RRJ-07	
SV-1840B	F-6	NC	B	1.000	3WY	SO	ND	BTE	RR		RRJ-07	
V-17-052	E-3	1	A	3.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-08	
V-17-053	E-2	1	A	3.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-08	
V-17-062	G-6	NC	C	1.500	CK	SA	SYS	CT-CC	RR		RRJ-09	
								CT-CO	RR		RRJ-09	

DRAWING: M-117 - CONTROL ROD DRIVE HYDRAULIC SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-17-083	A-6	2	A/C	1.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-10	
V-17-096	A-4	2	A/C	1.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-10	

DRAWING: M-118 - CONTROL ROD DRIVE HYDRAULIC SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-1849-HCU#	D-7	2	B	0.750	GA	AO	C/FO	BTO	RR	VR-13	RRJ-11	(5)
								FST	RR		RRJ-11	(5)
CV-1850-HCU#	D-6	2	B	0.750	GA	AO	C/FO	BTO	RR	VR-13	RRJ-11	(5)
								FST	RR		RRJ-11	(2)
CV-1859A	G-4	NC	B	1.000	GL	AO	O/FC	BTC	QR			
								FST	RR		RRJ-29	(2)
								PIT	2Y			
CV-1859B	G-4	2	B	1.000	GL	AO	O/FC	BTC	QR			
								FST	RR		RRJ-29	(2)
								PIT	2Y			
CV-1867A	D-5	NC	B	2.000	GL	AO	O/FC	BTC	QR			
								FST	RR		RRJ-29	(2)
								PIT	2Y			
CV-1867B	D-5	2	B	2.000	GL	AO	O/FC	BTC	QR			
								FST	RR		RRJ-29	(2)
								PIT	2Y			
PSE-1848-HCU#	C-8	2	C	0.750	RPD	SA	SYS			VR-04		(5)
SV-1855-HCU#	E-6	NC	B	0.500	3WY	SO	NE	BTO	RR		RRJ-11	(5)
SV-1856-HCU#	E-6	NC	B	0.500	3WY	SO	NE	BTO	RR		RRJ-11	(5)

DRAWING: M-118 - CONTROL ROD DRIVE HYDRAULIC SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-1868A	D-4	NC	B	0.500	3WY	SO	NE	BTD	RR		RRJ-12	(11)
SV-1868B	D-4	NC	B	0.500	3WY	SO	NE	BTD	RR		RRJ-12	(11)
SV-1869A	D-4	NC	B	0.500	3WY	SO	NE	BTD	RR		RRJ-12	(11)
SV-1869B	D-4	NC	B	0.500	3WY	SO	NE	BTD	RR		RRJ-12	(11)
V-18-118-HCU#	B-8	2	A	0.500	CK	SA	SYS	AT-6 CT-CC	2Y RR		RRJ-13	(5)
V-18-919	E-7	2	C	0.500	CK	SA	SYS	CT-CC	QR			(9)
V-18-1453-HCU#	D-6	2	C	0.750	CK	SA	SYS	CT-CO	RR		RRJ-14	(5)

DRAWING: M-119 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-1902	G-7	2	B	10.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1903	G-6	2	B	10.000	GL	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1904	E-6	2	B	20.000	ANG	MO	O	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1905	E-6	1	A	20.000	GA	MO	C	AT-5	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1908	E-8	1	A	18.000	GA	MO	C	AT-5	2Y			
								BTC	CS			CSJ-07
								BTO	CS			CSJ-07
								PIT	2Y			
MO-1909	E-8	1	A	18.000	GA	MO	C	AT-5	2Y			
								BTC	CS			CSJ-07
								BTO	CS			CSJ-07
								PIT	2Y			
MO-1912	C-7	2	B	14.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			

DRAWING: M-119 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-1913	C-7	2	B	14.000	GA	MO	O/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1920	C-8	2	B	14.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1921	C-7	2	B	14.000	GA	MO	O/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1932	F-5	2	B	12.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1933	F-5	2	B	4.000	GL	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1934	F-5	2	B	12.000	GL	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1935	C-5	2	B	3.000	GA	MO	O	BTC	QR			
								BTO	QR			
								PIT	2Y			

DRAWING: M-119 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-1937	D-6	2	B	4.000	GA	MO	C	BTC	QR			
								PIT	2Y			
MO-1939	D-4	2	B	12.000	GA	MO	O/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1940	D-4	2	B	18.000	GL	MO	O	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-1949B	C-4	2	B	1.000	GL	MO	C	PIT	2Y			
MO-1941	D-3	2	B	12.000	GA	MO	O/KL	PIT	2Y			(1)
MO-1989	D-7	2	B	24.000	GA	MO	O/KL	PIT	2Y			(1)
PSV-1911	D-8	2	C	1.000	RV	SA	C	CT-SP	10Y			
PSV-1919	C-6	2	C	1.000	RV	SA	C	CT-SP	10Y			
PSV-1927	C-8	2	C	1.000	RV	SA	C	CT-SP	10Y			
PSV-1952	D-4	2	C	4.000	RV	SA	C	CT-SP	10Y			
PSV-1953	C-3	2	C	0.750	RV	SA	C	CT-SP	10Y			

DRAWING: M-119 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF DEF TEST	NOTES
PSV-1975	G-3	2	C	1.000	RV	SA	C	CT-SP	10Y		
V-19-001	A-7	2	C	12.000	CK	SA	SYS	CT-CC	QR		
								CT-CO	QR		
V-19-003	A-5	2	C	12.000	CK	SA	SYS	CT-CC	QR		
								CT-CO	QR		
V-19-014	B-8	2	C	3.000	CK	SA	SYS	CT-CC	QR		
								DSBY	RR	VR-05	
V-19-016	B-5	2	C	3.000	CK	SA	SYS	CT-CC	QR		
								DSBY	RR	VR-05	
V-19-020	B-6	2	C	1.000	SCK	SA	SYS/LO	CT-CC	QR		
V-19-022	B-6	2	C	1.000	CK	SA	SYS	DSBY	RR		
V-19-023	B-6	2	C	1.000	SCK	SA	SYS/LO	CT-CC	QR		
V-19-024	B-6	2	C	1.000	CK	SA	SYS	CT-CC	QR		
V-19-048	E-4	2	B	18.000	GA	M	O	PIT	2Y		(1)
V-19-128	B-6	2	C	1.000	SCK	SA	SYS/LO	CT-CC	QR		
V-19-147	E-7	1	B	20.000	GA	M	O	PIT	2Y		(1)

DRAWING: M-119 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-19-148	E-8	1	B	18.000	GA	M	O	PIT	2Y			(1)
V-19-149	E-7	1	A/C	20.000	CK	SA	SYS	AT-5	2Y			
								CT-CC	RR		RRJ-15	
								CT-CO	RR		RRJ-15	
								CT-PO	CS		CSJ-08	
SV-1972	C-3	2	B	1.0	GL	SO	C/KL	BTC	QR			
								BTO	QR			
								FST	QR			
								PIT	2Y			
SV-1973	C-2	NC	B	1.0	GL	SO	C/KL	BTO	QR			
								PIT	2Y			

DRAWING: M-120 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-2000	F-2	2	B	10.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2001	F-4	2	B	10.000	GL	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2003	E-4	1	A	20.000	GA	MO	C	AT-5	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2004	E-4	2	B	20.000	ANG	MO	O	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2005	E-4	2	B	12.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2006	E-4	2	B	4.000	GL	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2007	E-5	2	B	12.000	GL	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			

DRAWING: M-120 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-2009	C-4	2	B	3.000	GA	MO	O	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2010	C-5	2	B	18.000	GA	MO	O	BTC	CS			
								PIT	2Y			
MO-2011	C-3	2	B	14.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2012	C-3	2	B	14.000	GA	MO	O/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2015	C-3	2	B	14.000	GA	MO	O/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2016	C-2	2	B	14.000	GA	MO	C/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2029	D-5	2	B	12.000	GA	MO	O/KL	BTC	QR			
								BTO	QR			
								PIT	2Y			

DRAWING: M-120 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-2030	E-5	2	B	18.000	GL	MO	O	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2031	E-7	2	B	12.000	GA	MO	O/KL	PIT	2Y			(1)
MO-2044B	D-6	2	B	1.000	GL	MO	C	PIT	2Y			
MO-2069	D-3	2	B	24.000	GA	MO	O/KL	PIT	2Y			(1)
PSV-2019	C-4	2	C	1.000	RV	SA	C	CT-SP	10Y			
PSV-2020	C-2	2	C	1.000	RV	SA	C	CT-SP	10Y			
PSV-2043	D-6	2	C	4.000	RV	SA	C	CT-SP	10Y			
PSV-2057	E-7	2	C	1.000	RV	SA	C	CT-SP	10Y			
SV-2051	C-7	2	B	1.000	GA	SO	C/KL	BTC	QR			
								BTO	QR			
								FST	QR			
								PIT	2Y			
SV-2052	C-8	NC	B	1.000	GA	SO	C/KL	BTO	QR			
								PIT	2Y			

DRAWING: M-120 - RESIDUAL HEAT REMOVAL (RHR) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-20-001	B-3	2	C	12.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-20-003	B-5	2	C	12.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-20-006	B-4	2	C	3.000	CK	SA	SYS	CT-CC	QR			
								DSBY	RR	VR-05		
V-20-008	B-2	2	C	3.000	CK	SA	SYS	CT-CC	QR			
								DSBY	RR			
V-20-010	D-6	2	C	12.000	CK	SA	SYS	CT-CC	QR			
V-20-081	E-2	1	B	20.000	GA	M	O	PIT	2Y			(1)
V-20-082	E-3	1	A/C	20.000	CK	SA	SYS	AT-5	2Y			
								CT-CC	RR		RRJ-15	
								CT-CO	RR		RRJ-15	
								CT-PO	CS		CSJ-08	

DRAWING: M-121 - CORE SPRAY SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF DEF TEST	NOTES
MO-2100	B-5	2	B	12.000	GA	MO	O/KL	PIT	2Y		(1)
MO-2104	D-3	2	B	2.000	GA	MO	O	BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2112	F-5	2	B	8.000	GL	MO	C	BTC	QR		
								PIT	2Y		
MO-2115	G-5	2	A	8.000	GA	MO	O	AT-1	2Y		
								BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2117	G-6	1	A	8.000	GA	MO	C	AT-1	2Y		
								AT-5	2Y		
								BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2120	C-5	2	B	12.000	GA	MO	O/KL	PIT	2Y		(1)
MO-2124	D-4	2	B	2.000	GA	MO	O	BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2132	F-5	2	B	8.000	GL	MO	C	BTC	QR		
								PIT	2Y		

DRAWING: M-121 - CORE SPRAY SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF DEF TEST	NOTES
MO-2135	E-5	2	A	8.000	GA	MO	O	AT-1	2Y		
								BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2137	E-6	1	A	8.000	GA	MO	C	AT-1	2Y		
								AT-5	2Y		
								BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2146	C-5	2	B	12.000	GA	MO	O/KL	PIT	2Y		(1)
MO-2147	B-5	2	B	12.000	GA	MO	O/KL	PIT	2Y		(1)
PSV-2102	C-3	2	C	0.750	RV	SA	SYS	CT-SP	10Y		
PSV-2109	G-4	2	C	2.000	RV	SA	SYS	CT-SP	10Y		
PSV-2122	C-4	2	C	0.750	RV	SA	SYS	CT-SP	10Y		
PSV-2129	E-4	2	C	2.000	RV	SA	SYS	CT-SP	10Y		
V-21-007	D-3	2	C	10.000	CK	SA	SYS	CT-CO	QR		
V-21-009	D-3	2	C	2.000	CK	SA	SYS	CT-PO	QR		
								DSBY	RR	VR-06	
V-21-010	D-4	2	C	10.000	CK	SA	SYS	CT-CO	QR		

DRAWING: M-121 - CORE SPRAY SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-21-012	D-4	2	C	2.000	CK	SA	SYS	CT-PO	QR			
								DSBY	RR	VR-06		
V-21-042	E-7	1	B	8.000	GA	M	O	PIT	2Y			(1)
V-21-043	D-7	1	B	8.000	GA	M	O	PIT	2Y			(1)
V-21-072	F-7	1	A/C	8.000	CK	SA	SYS	AT-5	2Y			
								CT-CC	RR		RRJ-16	
								CT-CO	RR		RRJ-17	
V-21-073	E-7	1	A/C	8.000	CK	SA	SYS	AT-5	2Y			
								CT-CC	RR		RRJ-16	
								CT-CO	RR		RRJ-17	
XFV-2119	G-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-2139	G-7	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-122 - HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF DEF TEST	NOTES
CV-2211	C-2	2	A	1.000	GA	AO	O/FC	AT-1	2Y		
								BTC	QR		
								FST	QR		(2)
								PIT	2Y		
CV-2212	C-2	NC	A	1.000	GA	AO	O/FC	AT-1	2Y		
								BTC	QR		
								FST	QR		(2)
								PIT	2Y		
CV-2234	B-5	NC	B	1.000	GA	AO	C/FC	BTC	QR		
								FST	QR		(2)
								PIT	2Y		
HV-2201	D-3	2	B	10.000	PLG	HO	C	BTC	QR		(10)
								BTO	QR		
								PIT	2Y		
MO-2202	D-3	2	B	10.000	GA	MO	C	BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2238	F-6	1	A	10.000	GA	MO	O	AT-1	2Y		
								BTC	QR		
								BTO	QR		
								PIT	2Y		

DRAWING: M-122 - HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-2239	F-5	1	A	10.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2247	C-5	2	B	2.000	GL	MO	C	BTO	QR			
								PIT	2Y			
MO-2290A	B-8	NC	A	2.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								PIT	2Y			
MO-2290B	B-8	NC	A	2.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								PIT	2Y			
PSE-2213	D-6	2	C	16.000	RPD	SA	SYS	CT-RDR	5Y			
PSE-2214	D-6	NC	C	16.000	RPD	SA	SYS	CT-RDR		VR-07		(3)
PSV-2223	C-3	2	C	1.250	RV	SA	C	CT-SP	10Y	VR-14		
PSV-2228	B-5	2	C	1.000	RV	SA	C	CT-SP	10Y			
SV-2211	C-2	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		
SV-2212	C-2	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		
SV-2234	B-6	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		

DRAWING: M-122 - HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-22-016	B-7	2	A/C	16.000	CK	SA	SYS	AT-1	2Y			(6)
								CT-CC	CS		CSJ-11	
								CT-CO	QR			
V-22-017	B-7	2	A/C	16.000	SCK	MSA	SYS/LO	AT-1	2Y			(6)(7)
								CT-CC	RR		RRJ-26	
								CT-CO	QR			
V-22-021	B-7	NC	A/C	2.000	CK	SA	SYS	AT-1	2Y			(6)
								CT-CC	CS		CSJ-09	
								CT-PO	QR			
								DSBY	RR			
V-22-022	B-7	NC	A/C	2.000	SCK	MSA	SYS/LO	AT-1	2Y			(6)(7)
								CT-CC	CS		CSJ-09	
								CT-PO	QR			
								DSBY	RR			
V-22-026	B-4	2	C	1.250	CK	SA	SYS	CT-PO	QR			
								DSBY	RR	VR-21		
V-22-028	B-4	2	C	2.000	CK	SA	SYS	CT-PO	QR			
								DSBY	RR	VR-21		
V-22-029	B-5	2	C	2.000	CK	SA	SYS	CT-PO	QR			
								DSBY	RR	VR-21		

DRAWING: M-122 - HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-22-063	B-8	2	A/C	3.000	CK	SA	SYS	AT-01	2Y			
								CT-CC	CS			CSJ-10
								CT-PO	CS			
								DSBY	RR	VR-21		
V-22-064	B-8	NC	A/C	3.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	CS			CSJ-10
								CT-PO	CS			
								DSBY	RR	VR-21		
XFV-2246A	F-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-2246B	F-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-2246C	F-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-2246D	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-123 - HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF DEF TEST	NOTES
CV-2315	D-6	2	B	8.000	GL	AO	C/FC	BTC	QR		
								FST	QR		(2)
								PIT	2Y		
MO-2300	F-3	2	B	14.000	GA	MO	O	BTC	QR		
								PIT	2Y		
MO-2311	C-6	2	B	12.000	GA	MO	O	BTO	QR		
								PIT	2Y		
MO-2312	C-7	1	A	12.000	GA	MO	C	AT-1	2Y		(6)
								BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2318	C-5	2	B	4.000	GL	MO	C	BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2321	A-7	2	B	14.000	GA	MO	C	BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2322	E-4	2	B	14.000	GA	MO	C	BTC	QR		
								BTO	QR		
								PIT	2Y		
PSV-2301	E-3	2	C	1.500	RV	SA	SYS	CT-SP	10Y		

DRAWING: M-123 - HIGH PRESSURE COOLANT INJECTION (HPCI) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-2315B	D-5	NC	B	0.375	3WY	SO	ND	BTD	QR			
SV-2315C	D-5	NC	B	0.375	3WY	SO	ND	BTD	QR			
V-23-001	A-6	2	C	14.000	CK	SA	SYS	DSBY	RR			
V-23-004	E-3	2	C	14.000	CK	SA	SYS	CT-CO	QR			
V-23-014	C-4	2	C	4.000	CK	SA	SYS	DSBY	RR			
V-23-049	C-7	1	C	12.000	CK	SA	SYS	DSBY	RR			

DRAWING: M-124 - REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF REQ	DEF TEST	NOTES
CV-2410	C-3	NC	A	1.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-2411	C-3	NC	A	1.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-2435	B-5	NC	B	1.000	GA	AO	C/FC	BTC	QR			
								FST	QR			(2)
								PIT	2Y			
MO-2400	F-6	1	A	4.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2401	F-5	1	A	4.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-2404	E-3	NC	B	4.000	GL	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			

DRAWING: M-124 - REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-2405	E-3	NC	B	3.000	GA	MO	O	PIT	2Y			
MO-2426	C-5	NC	B	2.000	GL	MO	C	BTO PIT	QR 2Y			
PSE-2418	D-6	NC	C	10.000	RPD	SA	SYS	CT-RDR	5Y			
PSE-2419	E-6	NC	C	10.000	RPD	SA	SYS	CT-RDR		VR-08		(3)
PSV-2430	C-6	NC	C	2.000	RV	SA	C	CT-SP	10Y			
PSV-2474	C-3	NC	C	1.250	RV	SA	C	CT-SP	10Y	VR-15		(3)
SV-2410	C-3	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-2411	C-3	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-2435	B-5	NC	B	0.250	3WY	SO	ND	BTD	QR	VR-01		(3)
V-24-008	C-7	NC	A/C	10.000	SCK	MSA	SYS/LO	AT-1 CT-CC CT-CO	2Y RR QR		RRJ-27	(6) (7)
V-24-010	C-4	NC	C	1.250	CK	SA	SYS	DSBY CT-PO	RR QR	VR-21		
V-24-012	C-5	NC	C	2.000	CK	SA	SYS	DSBY CT-PO	RR QR	VR-21		

DRAWING: M-124 - REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-24-023	D-7	NC	A/C	10.000	CK	SA	SYS	AT-1	2Y			(6)
								CT-CC	CS		CSJ-14	
								CT-CO	QR			
V-24-046	C-7	NC	A/C	3.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	CS		CSJ-12	
								CT-PO	CS			
								DSBY	RR	VR-21		
V-24-047	C-7	NC	A/C	3.000	CK	SA	SYS	AT-1	2Y			
								CT-CC	CS		CSJ-12	
								CT-PO	CS			
								DSBY	RR	VR-21		
XFV-2443A	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-2443B	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-2443C	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		
XFV-2443[illegible]	E-6	2	A/C	1.000	XFC	SA	SYS	AT-2	RR	VR-02		
								CT-CC	RR	VR-02		
								PIT	RR	VR-02		

DRAWING: M-125 - REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF REQ	TEST NOTES
MO-2500	F-4	NC	B	6.000	GA	MO	O	BTC	QR		
								PIT	2Y		
MO-2510	C-4	NC	B	2.000	GL	MO	C	BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2511	D-5	NC	B	4.000	GA	MO	O	BTO	QR		
								PIT	2Y		
MO-2512	D-6	1	A	4.000	GA	MO	C	AT-1	2Y		(6)
								BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2515	E-5	NC	B	4.000	GL	MO	C	BTC	QR		
								PIT	2Y		
MO-2516	A-5	NC	B	6.000	GA	MO	C	BTC	QR		
								BTO	QR		
								PIT	2Y		
MO-2517	F-4	NC	B	6.000	GA	MO	C	BTC	QR		
								BTO	QR		
								PIT	2Y		
PSV-2501	E-4	NC	C	1.000	RV	SA	C	CT-SP	10Y		
V-25-001	A-5	NC	C	6.000	CK	SA	SYS	DSBY	RR		

DRAWING: M-125 - REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-25-003	F-4	NC	C	6.000	CK	SA	SYS	CT-CO	QR			
V-25-006	C-4	NC	C	2.000	CK	SA	SYS	DSBY	RR			
V-25-036	D-6	1	C	4.000	CK	SA	SYS	CTOME	CS		CSJ-13	

DRAWING: M-126 - STANDBY LIQUID CONTROL (SBLC) SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
PSV-2607	E-5	NC	C	1.000	RV	SA	SYS	CT-SP	10Y			
PSV-2609	B-5	NC	C	1.000	RV	SA	SYS	CT-SP	10Y			
V-26-004	C-5	NC	C	1.500	CK	SA	SYS	CT-CO	QR			
								DSBY	RR	VR-18		(3)
V-26-006	C-5	NC	C	1.500	CK	SA	SYS	CT-CO	QR			
								DSBY	RR	VR-18		(3)
V-26-008	F-7	1	A/C	1.500	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-20	
								CT-CO	RR		RRJ-21	
V-26-009	D-8	1	A/C	1.500	CK	SA	SYS	AT-1	2Y			
								CT-CC	RR		RRJ-20	
								CT-CO	RR		RRJ-21	
V-26-032	D-8	1	B	1.500	GA	M	O	PIT	2Y			(1)
XS-2618A	F-6	NC	D	1.500	GA	EXP	C/KL	DT-E	2Y			
								DT-REC	2Y			
XS-2618B	E-6	NC	D	1.500	GA	EXP	C/KL	DT-E	2Y			
								DT-REC	2Y			

DRAWING: M-127- REACTOR WATER CLEANUP SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-2700	E-8	1	A	4.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								PIT	2Y			
MO-2701	E-7	1	A	4.000	GA	MO	O	AT-1	2Y			
								BTC	QR			
								PIT	2Y			
MO-2740	E-4	1	A	4.000	GL	MO	O	AT-1	2Y			(6)
								BTC	QR			
								PIT	2Y			

DRAWING: M-129 - RIVER WATER SUPPLY SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
AV-2909A	D-7	NC	C	3.000	AV	SA	SYS	CT-CC	QR			
AV-2909B	D-6	NC	C	3.000	AV	SA	SYS	CT-CC	QR			
AV-2909C	D-5	NC	C	3.000	AV	SA	SYS	CT-CC	QR			
AV-2909D	D-4	NC	C	3.000	AV	SA	SYS	CT-CC	QR			
AV-2909E	G-5	NC	C	3.000	AV	SA	SYS	CT-CC	QR			
AV-2909F	F-5	NC	C	3.000	AV	SA	SYS	CT-CC	QR			
V-29-001	D-6	3	C	18.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-29-003	D-5	3	C	18.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-29-005	D-5	3	C	18.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			

DRAWING: M-129 - RIVER WATER SUPPLY SYSTEM (Cont'd)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-29-007	D-4	3	C	18.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-29-013	C-7	NC	C	3.000	CK	SA	SYS	CT-CO	QR			
V-29-021	C-3	NC	C	3.000	CK	SA	SYS	CT-CO	QR			

DRAWING: M-130 - BREATHING AIR SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-30-287	C-4	NC	A	1.000	GA	M	C/LC	AT-1	2Y			(1)

DRAWING: M-132 - DIESEL GENERATOR SYSTEMS

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF DEF TEST	NOTES
PSV-3221A	F-7	NC	C	0.500	RV	SA	C	CT-SP	10Y		
PSV-3221B	C-7	NC	C	0.500	RV	SA	C	CT-SP	10Y		
PSV-3222A	F-7	NC	C	0.500	RV	SA	C	CT-SP	10Y		
PSV-3222B	C-7	NC	C	0.500	RV	SA	C	CT-SP	10Y		
PSV-3223A	F-7	NC	C	0.500	RV	SA	C	CT-SP	10Y		
PSV-3223B	C-7	NC	C	0.500	RV	SA	C	CT-SP	10Y		
SV-3261A	F-6	NC	B	1.500	2WY	SO	C	ET-C	QR	VR-09	(3)
								ET-O	QR	VR-09	(3)
								FST	QR	VR-01	(2) (3)
SV-3261B	F-6	NC	B	1.500	2WY	SO	C	ET-C	QR	VR-09	(3)
								ET-O	QR	VR-09	(3)
								FST	QR	VR-01	(2) (3)
SV-3261C	F-6	NC	B	1.500	2WY	SO	O	ET-C	QR	VR-09	(3)
								FST	QR	VR-01	(2) (3)
SV-3262A	C-6	NC	B	1.500	2WY	SO	C	ET-C	QR	VR-09	(3)
								ET-O	QR	VR-09	(3)
								FST	QR	VR-01	(2) (3)
SV-3262B	C-6	NC	B	1.500	2WY	SO	C	ET-C	QR	VR-09	(3)
								ET-O	QR	VR-09	(3)
								FST	QR	VR-01	(2) (3)

DRAWING: M-132 - DIESEL GENERATOR SYSTEMS (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-3262C	C-6	NC	B	1.500	2WY	SO	O	ET-C	QR	VR-09		(3)
								FST	QR	VR-01		(2) (3)
V-32-005	B-3	NC	C	1.500	CK	SA	SYS	CT-CO	QR			
V-32-010	B-2	NC	C	1.500	CK	SA	SYS	CT-CO	QR			
V-32-019	C-4	NC	C	1.500	CK	SA	SYS	CT-CO	QR			
V-32-021	F-4	NC	C	1.500	CK	SA	SYS	CT-CO	QR			
V-32-032	G-7	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	QR			
V-32-034	D-7	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	QR			
V-32-036	E-7	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	QR			
V-32-039	E-7	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	QR			
V-32-043	F-7	NC	C	2.000	CK	SA	SYS	CT-CO	QR			
V-32-045	F-7	NC	C	2.000	CK	SA	SYS	CT-CO	QR			
V-32-047	B-7	NC	A/C	0.750	CK	SA	SYS	AT-6	2Y			
								CT-CC	QR			

DRAWING: M-132 - DIESEL GENERATOR SYSTEMS (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-32-048	B-7	NC	A/C	0.750	CK	SA	SYS	AT-6 CT-CC	2Y QR			
V-32-052	C-7	NC	C	2.000	CK	SA	SYS	CT-CO	QR			
V-32-054	C-7	NC	C	2.000	CK	SA	SYS	CT-CO	QR			

DRAWING: M-137 - RADWASTE SYSTEMS

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-3704	F-7	NC	A	3.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-3705	F-7	NC	A	3.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-3728	D-6	NC	A	3.000	GA	AO	O/FC	; -1	2Y			
								/fC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-3729	D-6	NC	A	3.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
SV-3704	E-7	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-3705	E-7	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-3728	C-6	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-3729	C-6	NC	B	1.000	3WY	SO	NE	BTD	QR	VR-01		(3)

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4300	C-7	NC	A	18.000	BTF	AO	C/FC	AT-1	2Y			(6) (7)
								AT-7	QR			
								BTC	QR			(8)
								FST	QR			(2)
								PIT	2Y			
CV-4301	C-8	NC	A	18.000	BTF	AO	C/FC	AT-1	2Y			(6)
								AT-7	QR			
								BTC	QR			(8)
								FST	QR			(2)
								PIT	2Y			
CV-4302	D-7	NC	A	18.000	BTF	AO	C/FC	AT-1	2Y			(6) (7)
								AT-7	QR			
								BTC	QR			(8)
								FST	QR			(2)
								PIT	2Y			
CV-4303	D-7	NC	A	18.000	BTF	AO	C/FC	AT-1	2Y			(6)
								AT-7	QR			
								BTC	QR			(8)
								FST	QR			(2)
								PIT	2Y			
CV-4304	B-7	NC	A	20.000	BTF	AO	C/FO	AT-1	2Y			(6) (7)
								BTC	QR			
								BTO	QR			
								BT-VOP	6M			
								FST	QR			(2)
								PIT	2Y			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4305	B-7	NC	A	20.000	BTF	AO	C/FO	AT-1	2Y			(6) (7)
								BTC	QR			
								BTO	QR			
								BT-VOP	6M			
								FST	QR			(2)
								PIT	2Y			
CV-4306	C-1	NC	A	18.000	BTF	AO	C/FC	AT-1	2Y			(6)
								AT-7	QR			
								BTC	QR			(8)
								FST	QR			(2)
								PIT	2Y			
CV-4307	C-3	NC	A	18.000	BTF	AO	C/FC	AT-1	2Y			(6) (7)
								AT-7	QR			
								BTC	QR			(8)
								FST	QR			(2)
								PIT	2Y			
CV-4308	B-3	NC	A	18.000	BTF	AO	C/FC	AT-1	2Y			(6) (7)
								AT-7	QR			
								BTC	QR			(8)
								FST	QR			(2)
								PIT	2Y			
CV-4309	C-7	NC	A	2.000	GA	AO	C/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4310	C-7	NC	A	2.000	GA	AO	C/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4311	D-3	NC	A	6.000	GA	AO	C/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4312	C-3	NC	A	6.000	GA	AO	C/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4313	C-3	NC	A	6.000	GA	AO	C/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4327A	C-7	NC	A/C	18.000	CK	SAT	SYS	AT-4	RR			
								CT-CC	QR			
								CT-CO	QR			
								CT-VSP	RR	VR-10		
								PIT	2Y			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4327B	C-7	NC	A/C	18.000	CK	SAT	SYS	AT-4	RR			
								CT-CC	QR			
								CT-CO	QR			
								CT-VSP	RR	VR-10		
								PIT	2Y			
CV-4327C	C-7	NC	A/C	18.000	CK	SAT	SYS	AT-4	RR			
								CT-CC	QR			
								CT-CO	QR			
								CT-VSP	RR	VR-10		
								PIT	2Y			
CV-4327D	C-7	NC	A/C	18.000	CK	SAT	SYS	AT-4	RR			
								CT-CC	QR			
								CT-CO	QR			
								CT-VSP	RR	VR-10		
								PIT	2Y			
CV-4327F	C-7	NC	A/C	18.000	CK	SAT	SYS	AT-4	RR			
								CT-CC	QR			
								CT-CO	QR			
								CT-VSP	RR	VR-10		
								PIT	2Y			
CV-4327G	C-7	NC	A/C	18.000	CK	SAT	SYS	AT-4	RR			
								CT-CC	QR			
								CT-CO	QR			
								CT-VSP	RR	VR-10		
								PIT	2Y			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4327H	C-7	NC	A/C	18.000	CK	SAT	SYS	AT-4	RR			
								CT-CC	QR			
								CT-CO	QR			
								CT-VSP	RR	VR-10		
								PIT	2Y			
CV-4357	B-8	NC	A	8.000	BTF	AO	C/KC	AT-1	2Y			(6)
								BTC	RR		RRJ-22	(3)
								FST	RR		RRJ-22	(2)(3)
								PIT	2Y			
CV-4371A	E-5	NC	A	2.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4371C	E-7	NC	A	2.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-4378A	D-5	NC	A	2.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4378B	D-5	NC	A	2.000	GA	AO	O/FC	AT-1	2Y			
								BTC	QR			
								FST	QR			(2)
								PIT	2Y			
MO-4320A		NC	B	2.000	GA	MO	C					
								BTO	QR			
								PIT	2Y			
MO-4320B	E-4	NC	B	2.000	GA	MO	C					
								BTO	QR			
								PIT	2Y			
MO-4323A	D-5	NC	B	2.000	GL	MO	C					
								BTO	QR			
								PIT	2Y			
MO-4323B	E-5	NC	B	2.000	GL	MO	C					
								BTO	QR			
								PIT	2Y			
PSE-4357	B-8	NC	A	8.000	RPD	SA	C	AT-1	2Y			
PSV-4336	D-5	NC	C	2.000	RV	SA	C	CT-SP	10Y			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-4300	C-7	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4301	C-8	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4302	D-7	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4303	D-7	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4304	B-7	NC	B	0.500	3WY	SO	NE	BTD BTE	QR QR	VR-01 VR-01		(3)
SV-4305	B-7	NC	B	0.500	3WY	SO	NE	BTD BTE	QR QR	VR-01 VR-01		(3)
SV-4306	E-1	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4307	E-3	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4308	E-3	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4309	C-8	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4310	D-7	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4311	F-3	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4312	F-3	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)
SV-4313	F-3	NC	B	0.500	3WY	SO	ND	BTD	QR	VR-01		(3)

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-4331A	B-4	2	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			
SV-4331B	B-4	NC	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			
SV-4332A	B-4	2	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			
SV-4332B	B-4	NC	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			
SV-4333A	C-4	2	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-4333B	C-4	NC	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			
SV-4334A	C-4	2	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			
SV-4334B	C-4	NC	A	2.000	GA	SO	C/KC	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								FST	QR			(2)
								PIT	2Y			
SV-4371A	E-4	NC	B	0.5	3WY	SO	NE	BTD	QR			(3)
SV-4371C	E-6	NC	B	0.500	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-4378A	D-5	NC	B	0.500	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-4378B	D-5	NC	B	0.500	3WY	SO	NE	BTD	QR	VR-01		
V-43-032	A-6	NC	C	0.500	CK	SA	SYS	CT-CO	QR			
V-43-035	A-8	NC	C	0.500	CK	SA	SYS	CT-CO	QR			

DRAWING: M-143 - CONTAINMENT ATMOSPHERE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-43-082	B-4	NC	C	2.000	CK	SA	SYS	CT-CO	QR			
V-43-084	B-4	NC	C	2.000	CK	SA	SYS	CT-CO	QR			
V-43-086	C-4	NC	C	2.000	CK	SA	SYS	CT-CO	QR			
V-43-088	C-4	NC	C	2.000	CK	SA	SYS	CT-CO	QR			
V-43-168	A-7	NC	A/C	20.000	CK	SA	SYS	AT-1	2Y			(6)
								CTCME	QR			
								CTOME	QR			
								CT-VSP	6M			
								PIT	2Y			
V-43-169	A-7	NC	A/C	20.000	CK	SA	SYS	AT-1	2Y			(6)
								CTCME	QR			
								CTOME	QR			
								CT-VSP	6M			
								PIT	2Y			
V-43-214	E-5	NC	A/C	2.000	SCK	MSA	C/LO	AT-1	2Y			
								CT-CC	RR		RRJ-23	
V-43-441	C-8	NC	A	1.000	CK	SA	C	AT-6	2Y			
								CT-CC	RR		RRJ-24	

DRAWING: M-146 - SERVICE WATER SYSTEM - PUMPHOUSE

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
AV-4926E	B-7	3	C	2.000	AV	SA	SYS	CT-CC	QR			
AV-4926F	B-5	3	C	2.000	AV	SA	SYS	CT-CC	QR			
AV-4929C	C-6	3	C	2.000	AV	SA	SYS	CT-CC	QR			
AV-4929D	C-6	3	C	2.000	AV	SA	SYS	CT-CC	QR			
CV-4909	F-6	3	B	24.000	BTF	AO	C/FC	BTC	QR			
								FST	QR			
								PIT	2Y			
CV-4910A	H-7	3	B	24.000	BTF	AO	O/FC	BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4910B	H-7	3	B	24.000	BTF	AO	O/FC	BTC	QR			
								FST	QR			(2)
								PIT	2Y			
CV-4914	E-6	3	B	20.000	BTF	AO	O/FO	BTO	QR			
								FST	QR			
								PIT	2Y			
CV-4915	E-7	3	B	20.000	BTF	AO	O/FO	BTO	QR			
								FST	QR			
								PIT	2Y			

DRAWING: M-146 - SERVICE WATER SYSTEM - PUMPHOUSE

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-4909	F-6	NC	B	0.250	3WY	SO	NE	BTD	QR			
								FST	QR			(2)
SV-4910A	H-7	NC	B	1.000	3WY	SO	NE	BTC	QR	VR-01		(3)
								BTD	QR	VR-01		(3)
								FST	QR			(2)
SV-4910B	H-7	NC	B	1.000	3WY	SO	NE	BTC	QR	VR-01		(3)
								BTD	QR	VR-01		(3)
								FST	QP			(2)
SV-4934	E-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
SV-4935	E-8	NC	B	0.250	3WY	SO	NE	BTD	QR	VR-01		(3)
V-46-011	B-5	3	C	12.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-46-013	B-5	3	C	12.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-46-018	B-6	3	C	8.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-46-021	B-6	3	C	8.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			

DRAWING: M-146 - SERVICE WATER SYSTEM - PUMPHOUSE

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-46-026	B-7	3	C	12.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			
V-46-030	B-7	3	C	12.000	CK	SA	SYS	CT-CC	QR			
								CT-CO	QR			

DRAWING: M-157 - DRYWELL COOLING WATER SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
CV-5704A	F-6	NC	A	4.000	GL	AO	O/FO	AT-1	2Y			(6)
								BTC	QR			
								PIT	2Y			
CV-5704B	F-6	NC	A	4.000	GL	AO	O/FO	AT-1	2Y			(6)
								BTC	QR			
								PIT	2Y			
CV-5718A	B-8	NC	A	4.000	GL	AO	O/FO	AT-1	2Y			(6)
								BTC	QR			
								PIT	2Y			
CV-5718B	A-8	NC	A	4.000	GL	AO	O/FO	AT-1	2Y			(6)
								BTC	QR			
								PIT	2Y			
SV-5704A	F-6	NC	B	0.250	3WY	SO	ND	BTE	QR			
SV-5704B	F-6	NC	B	0.250	3WY	SO	ND	BTE	QR			
SV-5718A	B-8	NC	B	0.250	3WY	SO	ND	BTE	QR			
SV-5718B	A-8	NC	B	0.250	3WY	SO	ND	BTE	QR			

DRAWING: M-157 - DRYWELL COOLING WATER SYSTEM (cont'd)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
V-57-075	F-7	NC	A	3.000	GA	M	C/LC	AT-1	2Y			(1)(6)
V-57-076	E-7	NC	A	3.000	GA	M	C/LC	AT-1	2Y			(1)(6)
V-57-077	B-7	NC	A	3.000	GA	M	C/LC	AT-1	2Y			(1)(6)
V-57-078	A-7	NC	A	3.000	GA	M	C/LC	AT-1	2Y			(1)(6)

DRAWING: M-173 - STANDBY FILTER UNIT - CONTROL BUILDING

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
PSV-7333A	A-5	NC	C	1.000	RV	SA	C	CT-SP	10Y			
PSV-7333B	A-7	NC	C	1.000	RV	SA	C	CT-SP	10Y			
V-73-006	B-6	NC	C	1.000	CK	SA	SYS	CT-CC	QR	VR-11		
V-73-007	B-6	NC	C	1.000	CK	SA	SYS	CT-CC	QR	VR-11		
V-73-016	B-7	NC	C	1.000	CK	SA	SYS	CT-CC	QR	VR-11		
V-73-017	B-7	NC	C	1.000	CK	SA	SYS	CT-CC	QR	VR-11		
V-73-032	A-7	NC	C	1.000	CK	SA	SYS	CT-CO	QR			
V-73-033	A-7	NC	C	1.000	CK	SA	SYS	CT-CO	QR			
V-73-034	A-6	NC	C	1.000	CK	SA	SYS	CT-CO	QR			
V-73-035	A-6	NC	C	1.000	CK	SA	SYS	CT-CO	QR			

DRAWING: M-181 - CONTAINMENT ATMOSPHERE MONITORING SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-8101A	F-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8101B	F-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8102A	F-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8102B	F-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8103A	E-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8103B	E-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8104A	E-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)

DRAWING: M-181 - CONTAINMENT ATMOSPHERE MONITORING SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-8104B	E-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8105A	E-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8105B	E-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8106A	E-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8106B	E-6	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8107A	D-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8107B	D-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)

DRAWING: M-181 - CONTAINMENT ATMOSPHERE MONITORING SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-8108A	D-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8108B	D-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8109A	D-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8109B	D-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8110A	D-5	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)
SV-8110B	D-4	NC	A	1.000	GL	SO	O/FC	AT-1	2Y			
								ET-C	QR	VR-12		(3)
								FST	QR			(2)

DRAWING: M-184 - MAIN STEAM ISOLATION VALVE (MSIV) LEAKAGE CONTROL SYSTEM

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
MO-8401A	F-3	1	A	1.000	GA	MO	C	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-8401B	F-3	1	A	1.000	GA	MO	C	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-8401C	F-3	1	A	1.000	GA	MO	C	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-8401D	F-3	1	A	1.000	GA	MO	C	AT-1	2Y			
								BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-8402A	F-3	NC	B	1.000	GA	MO	C	BTO	QR			
								PIT	2Y			
MO-8402B	F-3	NC	B	1.000	GA	MO	C	BTO	QR			
								PIT	2Y			
MO-8402C	F-3	NC	B	1.000	GA	MO	C	BTO	QR			
								PIT	2Y			

DRAWING: M-184 - MAIN STEAM ISOLATION VALVE (MSIV) LEAKAGE CONTROL SYSTEM (cont.)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF REQ	DEF TEST	NOTES
MO-8402D	F-3	NC	B	1.000	GA	MO	C	BTO	QR			
								PIT	2Y			
MO-8403A	F-4	NC	B	1.000	GA	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-8403B	F-4	NC	B	1.000	GA	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-8403C	F-4	NC	B	1.000	GA	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			
MO-8403D	F-4	NC	B	1.000	GA	MO	C	BTC	QR			
								BTO	QR			
								PIT	2Y			

DRAWING: M-187 - POST-ACCIDENT SAMPLING SYSTEM (PASS)

VALVE IDENT	COORD	CLASS	CAT	SIZE	TYPE	ACT.	POS	TEST REQ	FREQ	RELIEF	DEF TEST	NOTES
SV-8772A	B-8	NC	A	1.000	GL	SO	C/FC	AT-1	2Y			(1)
								BTC	QR			
								PIT	2Y			
SV-8772B	B-8	NC	A	1.000	GL	SO	C/FC	AT-1	2Y			(1)
								BTC	QR			
								PIT	2Y			

NOTES

Note 1 — Passive valve - obturator need not move to fulfill its safety function.

Note 2 — Normal stroke to safety position satisfies fail safe testing requirement.

Note 3 — Valve is not within the ISI-code boundaries and regulatory approval of relief request is not required. The relief request is provided for documentation purposes only.

Note 4 — All main steam safety/relief valves are tested every two fuel cycles per DAEC Technical Specification 4.6.D.

Note 5 — There are 89 individual CRD hydraulic control units (HCU's) with each unit provided with one of these valves. The valve number listed is typical of all 89 like valves. All 89 valves will be tested as specified for the typical valve.

Note 6 — Due to a restrictive plant configuration, the DAEC Type C leaktest procedures for these valves that are designed to satisfy the requirements of 10CFR50, Appendix J, yield test results related to the combined leakage of several valves tested as a group and not a valve-specific seat leakage. The leakrate acceptance criteria assigned to these valves is the limit for the entire group of valves being tested.

Note 7

Note 8 — The "full" stroke of this 1/4-turn butterfly valve is restricted by physical modifications to a range from fully closed to 30 degrees open.

Note 9 — These valves are exercised (tested) during normal control rod exercising routines.

Note 10 — Closure test (exercise) is performed during turbine trip test.

Note 11 — This solenoid valve operates under accident or emergency conditions. During exercise of this valve the stroke time of the associated main valve is measured and evaluated.

APPENDIX D

RELIEF REQUESTS - VALVES

RELIEF REQUEST NO. VR-01

SYSTEM:

Various

COMPONENTS:

All solenoid valves

CATEGORIES:

A and B

FUNCTION:

Various

TEST REQUIREMENTS:

Valves with fail-safe actuators shall be tested by observing the operation of the actuator upon loss of valve actuating power. (Part 10, Para. 4.2.1.6)

The stroke time of all power-operated valves shall be measured to at least the nearest second.
(Part 10, Para. 4.2.1.4(b)

BASIS FOR RELIEF:

Solenoid valves which control the air supply to air-operated valves typically stroke to their fail-safe position upon interruption of their electric power. De-energizing the solenoid valve has the same effect as a loss of electrical power or control air, therefore, the normal stroke constitutes a fail-safe test. In addition, these pilot valves have no position indication making stroke time measurements impractical.

ALTERNATE TESTING:

For these valves, normal stroking (BTO, BTC) of it or the associated valve to its safety position constitutes a fail-safe test as required. Furthermore, proper operation of the main valve (stroke time) will be used to assure that the associated solenoid pilot valve is also operating satisfactorily. No additional testing of these valves will be performed.

RELIEF REQUEST NO. VR-02

SYSTEM:

Nuclear Boiler, Reactor Recirculation, Reactor Core Isolation Cooling, Core Spray, High Pressure Coolant Injection, and Reactor Vessel Instrumentation

COMPONENTS:

Excess flow check valves

CATEGORY:

A/C

FUNCTION:

Excess flow check valves limit leakage from the reactor coolant system in the event of an instrumentation piping failure outside containment. They also perform a containment isolation function if an instrument line were to fail inside and outside of the containment vessel.

TEST REQUIREMENT:

Valves with remote position indication shall be observed locally at least once every 2 years to verify that valve operation is accurately indicated. (Part 10, Para. 4.1)

Category A valves shall be seat leakage rate tested at least once every 2 years. (Part 10, Para. 4.2.2.3(a))

Check valves shall be exercised nominally every 3 months. (Part 10, Para. 4.3.2.1)

RELIEF REQUEST NO. VR-02 (cont.)

BASIS FOR RELIEF

Exercising of these valves during normal plant operation is impractical since it requires isolating instrumentation downstream of the excess flow check valves. Much of this instrumentation is related to safety functions and isolation is thereby undesirable due to the potential for creating a plant transient or trip. Normally, testing of these valves is performed during the shutdown evolution period when the cooldown is halted and an elevated reactor pressure is available to close the valves. If this were done at each cold shutdown per Part 10, Para. 4.3.2.2 it would result in a severe negative impact on outage time and plant availability.

It should be noted that these valves see little or no flow and function essentially only during the exercise testing. Also, the significant internal components are fabricated from corrosion-resistant materials that are not expected to degrade during the plant lifetime. For these reasons, general seat degradation is highly unlikely.

The testing required per the DAEC Technical Specifications is inclusive of exercising, leakage testing and position indication verification; thus it is not practical to perform the various tests at different frequencies (2 years vs. refueling outage)

ALTERNATE TESTING:

These valves will be exercised during each reactor refueling outage in accordance with DAEC Technical Specifications, Section 4.7.D. During these tests, downstream tubing will be vented and drained and valve performance monitored by individual valve position indication and the cessation of flow from the instrument tubing. Following testing, each valve is opened by actuating a solenoid-operated bypass valve that equalizes pressure and allows the valve to reset (open).

RELIEF REQUEST NO. VR-03

SYSTEM:

Nuclear Boiler System

COMPONENTS:

V-14-001 and V-14-003 - Reactor Feedwater Check Valves

CATEGORY:

A/C

FUNCTION:

These valves open to provide flowpaths for HPCI (V-14-003)and RCIC (V-14-001) injection to the reactor vessel and close for reactor vessel and containment isolation.

TEST REQUIREMENTS:

Check valves shall be exercised nominally every 3 months. (Part 10, Para. 4.3.2.1)

A retest showing acceptable performance shall be run following any required corrective action before the valve is returned to service. (Part 10, Para. 4.3.2.6)

BASIS FOR RELIEF:

These valves are simple check valves and, thus, the only method of exercising these valves to their open position and confirming full open operation per the requirements of NRC Generic Letter 89-04 is with flow from the feedwater system or from the HPCI or RCIC systems. Injecting water directly from either the HPCI or RCIC systems to the reactor is impractical during plant operation due to the possibility of creating an unacceptable reactor vessel water level transient upsetting reactor water chemistry. At shutdown conditions steam is normally unavailable to operate the turbines. Thus the only practical way of exercising these valves is with reactor feedwater flow during power operation.

RELIEF REQUEST NO. VR-03 (cont.)

BASIS FOR RELIEF (cont.):

The configuration of the feedwater system prevents using feedwater flow during normal power operation to verify the full-stroke capability of the feedwater check valves in accordance with GL 89-04. A cross tie, pipe exists between the feedwater headers, downstream of installed flow instrumentation and upstream of the check valves. Indicated flow may not be representative of actual flow through the valves.

At low reactor pressures (150 psig), the subject check valves support HPCI/RCIC injection. Feedwater flow rates at these pressures do not demonstrate technical specification injection flow requirements of Part 10, Para. 4.3.2.6. These valves are subject to disassembly as a result of LLRT test failures.

ALTERNATE TESTING:

Quantitative criteria (Calculation M93-12) has been developed to verify the full-stroke capability of check valves V-14-001 and V-14-003. At reactor power levels greater than or equal to 90 percent, the calculation can be used to verify that the feedwater injection check valves meet the HPCI/RCIC flow requirements. The alternate exercise frequency for these valves is in accordance with the intent of OMa-1988, paragraph 4.3.2.2. The test frequencies of paragraph 4.3.2.2 are conditional, tied to plant operating conditions which allow testing. The maximum allowed test frequency is refueling, or once per operating cycle, for performance of full-stroke exercise. If cycling is achievable during normal plant operation (above 90% power and pressure instruments available), then the valves are to be tested quarterly. The test cycle for the feedwater injection check valves, utilizing calculation M93-12 to verify full-stroke open exercising, will be at least once per cycle, and quarterly when possible.

Operability subsequent to post-maintenance will be verified by manually exercising the obtuator prior to bonnet installation. Bonnet installation does not affect the functionality of these tilting disk check valves. The alternate test methods and schedule for V-14-001 and V-14-003 is pre-approved in accordance with GL 89-04, Position 1.

RELIEF REQUEST NO. VR-04

SYSTEM:

Control Rod Drive Hydraulic System

COMPONENTS:

PSE-1848-HCU# - CRD Accumulator Rupture Disks

CATEGORY:

C

FUNCTION:

These rupture discs protect the CRD accumulators from bursting thereby creating a personnel hazard. There is no specific reactor safety function associated with these components.

TEST REQUIREMENTS:

Classes 2 and 3 non-reclosing pressure relief devices shall be replaced every 5 years. (Part 1, Para. 1.3.4.2)

BASIS FOR RELIEF:

Each of the 89 CRD accumulators is provided with a rupture disk to ensure that a tank is protected from shattering and becoming a personnel hazard. The failure of a rupture disc to relieve or to rupture prematurely is not expected to impact reactor plant safety in any manner since it is unlikely that

* more than one disc would fail simultaneously; or
* a disc would fail coincidentally with a reactor accident.

There is no history of failure of these rupture discs throughout the industry, thus there is little gain in expending the significant plant resources that would be required for wholesale replacement of these discs. In addition, there is the possibility that the disturbance of the components may ultimately result in leakage and future maintenance problems.

ALTERNATE TESTING:

None

RELIEF REQUEST NO. VR-05

SYSTEM:

Residual Heat Removal

COMPONENTS:

V-19-014, V-19-016, and V-20-006

CATEGORY:

C

FUNCTION:

These 3-inch swing check valves open during RHR pump operation to provide recirculation flowpaths to the torus in order to prevent pump damage due to heatup as a result of operation under shutoff or minimal flow conditions. They close to ensure that LPCI flow to the reactor vessel is not bypassed through an idle or failed pump via the minimum flow recirculation lines.

TEST REQUIREMENTS:

Check valves shall be exercised to the positions in which they perform their safety functions or examined at least once every reactor refueling outage. (Part 10, Para. 4.3.2.2 and 4.3.2.4(c))

BASIS FOR RELIEF:

These are simple check valves with no means of mechanical exercising or positive indication of disc position, thus the only practical method of exercising them is with system flow. Due to the lack of appropriate flow instrumentation in the associated lines, verification of accident flow, as specified by GL 89-04, is not practical.

Since these valves are identical and see essentially identical service, they qualify for sample disassembly as set forth in Position 2 of Generic Letter 89-04.

RELIEF REQUEST NO. VR-05 (cont.)

ALTERNATE TESTING:

Each of these valves will be partial stroke exercised (actually full stroked without flow measurement) by performance of the respective quarterly system surveillance testing.

During each reactor refueling outage at least one valve will be disassembled and inspected (in rotation) such that, assuming an 18-month refueling cycle, all three valves will inspected approximately every five years. Disassembled valves will be part-stroke exercised/tested prior to returning them to service following reassembly. Should a disassembled valve show signs of damage that indicates that it could not perform its safety function to fully open, then the remaining three valves will be disassembled and inspected prior to startup.

The use of non-intrusive testing equipment is under evaluation and, if satisfactory, the current disassembly and inspection program may be replaced by one using non-intrusive testing methods.

RELIEF REQUEST NO. VR-06

SYSTEM:

Core Spray

COMPONENTS:

V-21-009 and V-21-012

CATEGORY:

C

FUNCTION:

These swing check valves open during core spray pump operation to provide recirculation flowpaths to the torus in order to prevent pump damage due to heatup as a result of operation under shutoff or minimal flow conditions.

TEST REQUIREMENTS:

Check valves shall be exercised to the positions in which they perform their safety functions or examined at least once every reactor refueling outage. (Part 10, Para. 4.3.2.2 and 4.3.2.4(c))

BASIS FOR RELIEF:

These are simple check valves with no means of mechanical exercising or positive indication of disc position, thus the only practical method of exercising them is with system flow. Due to the lack of appropriate flow instrumentation in the associated lines, verification of accident flow as specified by GL 89-04 is not practical.

Since these valves are identical seeing essentially identical service, they qualify for sample disassembly as set forth in Position 2 of Generic Letter 89-04.

RELIEF REQUEST NO. VR-06 (cont.)

ALTERNATE TESTING

Each of these valves will be partial stroke exercised (actually full stroke exercised without flow measurement) by performance of the respective quarterly system surveillance testing.

During each reactor refueling outage at least one valve will be disassembled and inspected (in rotation) such that, assuming an 18-month refueling cycle, both valves will be inspected approximately every four years. Disassembled valves will be part-stroke exercised/tested prior to returning them to service following reassembly. Should a disassembled valve show signs of damage that indicates that it could not perform is safety function to fully open, then the other valve will be disassembled and inspected prior to startup.

The use of non-intrusive testing equipment is under evaluation and, if satisfactory, the current disassembly and inspection program may be replaced by one using non-intrusive testing methods.

RELIEF REQUEST NO. VR-07

SYSTEM:

High Pressure Coolant Injection (HPCI)

COMPONENTS:

PSE-2214 - HPCI Turbine Steam Exhaust Rupture Disk

CATEGORY:

C

FUNCTION:

This rupture disk retains the integrity of the HPCI steam exhaust piping in the event that the inboard rupture disk opens prematurely. In the event that the exhaust line is subjected to an over-pressure condition, it will open to protect the line and turbine from damage.

TEST REQUIREMENTS:

Class 2 and 3 non-reclosing pressure relief devices shall be replaced every 5 years. (Part 10, Para. 1.3.4.2)

BASIS FOR RELIEF:

This rupture disk is the outboard of two identical disks in series, thus it does not normally see system conditions and is not subject to operational degradation. In addition, there is no history of failure of either (inboard or outboard) of these rupture discs.

Since there is no history of failure of these rupture discs throughout the industry, there is little gain in expending the plant resources that would be required for replacement of this disc.

Note: This component is not located within the ISI-code boundaries and, as such, approval of this relief request is not required.

ALTERNATE TESTING:

This rupture disc will be subjected to periodic replacement under a preventative maintenance program at an appropriate frequency.

RELIEF REQUEST NO. VR-08

SYSTEM:

Reactor Core Isolation Cooling (RCIC)

COMPONENTS:

PSE-2419 - RCIC Turbine Steam Exhaust Rupture Disk

CATEGORY:

C

FUNCTION:

This rupture disk retains the integrity of the RCIC steam exhaust piping in the event that the inboard rupture disk opens prematurely. In the event that the exhaust line is subjected to an over-pressure condition, it will open to protect the line and turbine from damage.

TEST REQUIREMENTS:

Class 2 and 3 non-reclosing pressure relief devices shall be replaced every 5 years. (Part 10, Para. 1.3.4.2)

BASIS FOR RELIEF:

This rupture disk is the outboard of two identical disks in series, thus it does not normally see system conditions and is not subject to operational degradation. In addition, there is no history of failure of either (inboard or outboard) of these rupture discs.

Since there is no history of failure of these rupture discs throughout the industry, there is little gain in expending the plant resources that would be required for replacement of this disc.

Note: This component is not located within the ISI-code boundaries and, as such, approval of this relief request is not required.

ALTERNATE TESTING:

This rupture disc will be subjected to periodic replacement under a preventative maintenance program at an appropriate frequency.

RELIEF REQUEST NO. VR-09

SYSTEM:

Standby Diesel Generator

COMPONENTS:

SV-3261A, SV-3261B, SV-3261C
SV-3262A, SV-3262B, SV-3262C

CATEGORY:

B

FUNCTION:

SV-3261A, SV-3261B, SV-3262A, and SV-3262B are the air start solenoid valves for the standby diesel generators. When the starting sequence for the diesel generators is initiated, these valves open to allow pressurized air stored in air receivers to charge the diesel generator air start headers thereby starting the emergency diesel generators.

SV-3261C and SV-3262C are the air start line vent valves for the standby diesel generators. When the starting sequence for the diesel generators is initiated, these valves close to allow pressurized air stored in air receivers to charge the diesel generator air start headers thereby starting the generators.

TEST REQUIREMENT:

The stroke time of all power-operated valves shall be measured to at least the nearest second. (Part 10, Para. 4.2.1.4(b))

BASIS FOR RELIEF:

These valves have no visible stem movement and no position indication, thus it is impractical to measure the stroke time of the air start valves directly.

Note: These components are not located within the ISI-code boundaries and, as such, approval of this relief request is not required.

ALTERNATE TESTING:

Starting the associated standby emergency diesel generators using the air start system will be considered demonstration of proper operation of the air start and vent valve solenoids. Therefore, the air start solenoid valves and vent valves will be tested when the diesel generators are tested in accordance with Technical Specification 4.8.A.1.a.1. Technical Specification section 4.8.A.1.a.1 states that the diesel generators shall be manually started once each month.

RELIEF REQUEST NO. VR-09 (cont.)

Each diesel air start system consists of two air compressors, one driven by an AC electric motor and the other driven by a diesel engine. During monthly testing, the diesel engine-powered compressor train is isolated and the diesel generator is started using the AC motor-driven compressor train only; however, no starting times are measured during this test. The quarterly diesel testing isolates the motor-driven train and the diesel-driven compressor train is used for diesel start. Once every six (6) months each diesel generator is "cold-fast" started, during which test the diesel-driven compressor train is used and verified to start the diesel generator within the technical specification time limit. The acceptance criteria and corrective action requirements of Part 10, Para. 4.2.1 are not applicable to this test as well.

Additionally, these valves will be periodically replaced or refurbished under DAEC's solenoid valve maintenance program.

RELIEF REQUEST NO. VR-10

SYSTEM:

Containment Atmosphere Control

COMPONENTS:

CV-4327A	CV-4327F
CV-4327B	CV-4327G
CV-4327C	CV-4327H
CV-4327D	

CATEGORY:

A/C

FUNCTION:

These are the pressure suppression chamber to drywell vacuum breaker valves which equalize the pressure between the two volumes should the suppression chamber pressure exceed that in the drywell.

TEST REQUIREMENT:

Primary containment vacuum breaker valves shall be tested for operability within every 6-month period. (Part 1, Para. 1.3.4.3)

BASIS FOR RELIEF:

In order to test these valves for operability with respect to their non-powered operation and set points, test personnel must have access to each valve to allow mechanical exercising. Since these valves are located inside the torus this is impractical during plant operation and cold shutdown conditions since torus access is normally limited to refueling periods.

Note: These components are not located within the ISI-code boundaries and, as such, approval of this relief request in not required.

ALTERNATE TESTING:

On a quarterly basis each of these valves will be exercised using the installed pneumatic operators.

During each reactor refueling each valve will be mechanically exercised and the set point of each measured and valve operability evaluated.

RELIEF REQUEST NO. VR-11

SYSTEM:

Control Building HVAC Instrument Air Supply

COMPONENTS:

V-73-006, V-73-007
V-73-016, V-73-017

CATEGORY:

C

FUNCTION:

To isolate the normal instrument air supply line from the back-up emergency air supply line, on a loss of normal instrument air.

TEST REQUIREMENTS:

The necessary valve obturator movement shall be demonstrated by exercising the valve and observing that the obturator travels to the seat on cessation or reversal of flow. (Part 10, Para. 4.3.2.4)

BASIS FOR RELIEF:

These two valves are installed in series with no test connections between the valves so that a pressure decay or leak rate test on an individual valve is not possible. Since the design of the system is such that only one valve is required to function, testing the combination is an acceptable method of verifying system function.

Note: These components are not located within the ISI-code boundaries and, as such, approval of this relief request is not required.

ALTERNATE TESTING:

These valves will be back flow tested as a single unit every three months. A pressure decay test will be performed on the system to verify back leakage through these two valves in combination does not exceed a specific maximum amount. Both valves shall be repaired or replaced if total backleakage through the pair of valves exceeds maximum allowable.

RELIEF REQUEST NO. VR-12

SYSTEM:

Containment Atmosphere Monitoring System

COMPONENTS:

SV-8101A	SV-8106A
SV-8101B	SV-8106B
SV-8102A	SV-8107A
SV-8102B	SV-8107B
SV-8103A	SV-8108A
SV-8103B	SV-8108B
SV-8104A	SV-8109A
SV-8104B	SV-8109B
SV-8105A	SV-8110A
SV-8105B	SV-8110B

CATEGORY:

A

FUNCTION:

These valves provide containment isolation for the containment atmosphere monitoring system.

TEST REQUIREMENTS:

The stroke time of all power-operated valves shall be measured to at least the nearest second. Part 10, Para. 4.2.1.4.(b)

BASIS FOR RELIEF:

These valves are not provided with individual position indicators and meaningful stroke time measurements cannot be taken.

Note: These components are not located within the ISI-code boundaries and, as such, approval of this relief request is not required.

ALTERNATE TESTING:

These valves will be exercised and their positions verified every three months. Stroke times will not be measured.

RELIEF REQUEST NO. VR-13

SYSTEM:

Control Rod Drive Hydraulic System

COMPONENTS:

CV-1849 and CV-1850

CATEGORY:

B

FUNCTION:

These valves open with a scram signal to pressurize the lower side of the CRD piston and vent the top of the piston to the scram discharge header, thus effecting rod movement into the core.

TEST REQUIREMENTS:

The stroke time of all power-operated valves shall be measured. (Part 10, Para. 4.2.1.4(b))

BASIS FOR RELIEF:

These valves are rapid-acting valves with a stroke times of a fraction of a second and they are not provided with indications of both open and closed positions. For these reasons and the fact that they are only exercised during CRD scram testing, documenting individual stroke time measurements for each valve is not practical.

ALTERNATE TESTING:

These valves will be exercised in conjunction with CRD scram testing. Proper operation of each valve will be verified by the satisfactory operation of the associated CRD and control rod as determined by the evaluation of rod scram time and other CRD operational characteristics. The proposed alternate test is approved by Generic Letter 89-04, Position 7.

RELIEF REQUEST NO. VR-14

SYSTEM:

High Pressure Coolant Injection (HPCI)

COMPONENTS:

PSV-2223

CATEGORY:

C

FUNCTION:

This valve provides over-pressure protection for the barometric condenser.

TEST REQUIREMENTS:

The limiting as found set pressure for safety/relief valves shall be equal to 3 percent of the stamped set pressure. (Part 1, Para. 1.3.4.1(d) and 1.3.4.1(e))

BASIS FOR RELIEF:

For this valve the stamped set pressure is 15 psig which requires that the limiting set point would be 15 times 1.03 or 15.45 psig. Meeting this requirement on a consistent basis would not be practical and, as a result, this valve would be subjected to repeated unnecessary adjustments and maintenance.

Assigning an upper limit for this valve's set point of 17 psig will not significantly affect the reliability of the HPCI system nor endanger any equipment.

ALTERNATE TESTING:

The upper limit for this valve's set point as it applies to Paragraph 1.3.4.1 will be established at 17 psig.

RELIEF REQUEST NO. VR-15

SYSTEM:

Reactor Core Isolation Cooling (RCIC)

COMPONENTS:

PSV 2474

CATEGORY:

C

FUNCTION:

This valve provides over-pressure protection for the barometric condenser.

TEST REQUIREMENTS:

The limiting as found set pressure for safety/relief valves shall be equal to 3 percent of the stamped set pressure. (Part 1, Para. 1.3.4.1(d) and 1.3.4.1(e))

BASIS FOR RELIEF:

For this valve the stamped set pressure is 15 psig which requires that the limiting setpoint would be 15 times 1.03 or 15.45 psig. Meeting this requirement on a consistent basis would not be practical and, as a result, this valve would be subjected to repeated unnecessary adjustments and maintenance.

Assigning an upper limit for this valve's set point of 17 psig will not significantly affect the reliability of the RCIC system nor endanger any equipment.

Note: This valve is not within the ISI-class boundaries (not Class 1,2, or 3), thus approval of this relief request is not required.

ALTERNATE TESTING:

The upper limit for this valve's set point as it applies to Paragraph 1.3.4.1 will be established at 17 psig.

RELIEF REQUEST NO. VR-16

SYSTEM:

Nuclear Boiler

COMPONENTS:

Vacuum Breakers - PSV-4439A, PSV-4439B, PSV-4439C, PSV-4439D
PSV-4439E, PSV-4439F

CATEGORY:

C

FUNCTION:

These valves provide vacuum relief.

TEST REQUIREMENTS:

The limiting as found set pressure for safety/relief valves shall be equal to 3 percent of the stamped set pressure. (Part 1, Para. 1.3.4.1(d) and 1.3.4.1(e))

BASIS FOR RELIEF:

For these vacuum breakers with .5 psig setpoints, compliance with this requirement is beyond the capability of test equipment. Meeting this requirement on a consistent basis would not be practical and, as a result, these valves would be subjected to repeated unnecessary adjustments and maintenance.

Assigning upper limits for these valves' set points based on system design and functional requirements will not significantly affect the reliability of the affected systems nor endanger any equipment.

ALTERNATE TESTING:

The upper limits for determining the operability of vacuum breakers will be established and based on system and component functional requirements.

RELIEF REQUEST NO. VR-17

(DELETED)

RELIEF REQUEST NO. VR-18

SYSTEM:

Standby Liquid Control (SBLC)

COMPONENTS:

V-26-004
V-26-006

CATEGORY:

C

FUNCTION:

These check valves open durir standby liquid control pump operation to provide flowpaths to the SBLC header and thence to the reactor vessel. They close to prevent backleakage through an idle pump or failed safety valve.

TEST REQUIREMENTS:

Check valves shall be exercised to the positions in which they perform their safety functions or examined at least once every reactor refueling outage. (Part 10, Para. 4.3.2.2 and 4.3.2.4(c))

BASIS FOR RELIEF:

These are simple check valves with no means of mechanical exercising or positive indication of disc position, thus the only practical method of verifying closure is by performing a backleakage test. Performance of such a backleakage test is not practical due to the lack of appropriate test connections.

Since these valves are identical seeing essentially identical service, they qualify for sample disassembly as set forth in Position 2 of Generic Letter 89-04.

RELIEF REQUEST NO. VR-18 (cont.)

ALTERNATE TESTING:

Each of these valves will be full stroke exercised open during quarterly system surveillance testing.

During each reactor refueling outage at least one valve will be disassembled and inspected (in rotation) such that, assuming an 18-month refueling cycle, both valves will be inspected approximately every four (4) years. Disassembled valves will be exercised/tested prior to returning them to service following reassembly. Should a disassembled valve show signs of damage that indicates that it could not perform is safety function to close, then the other valve will be disassembled and inspected prior to startup.

The use of non-intrusive testing equipment is under evaluation and, if satisfactory, the current disassembly and inspection program may be replaced by one using non-intrusive testing methods.

RELIEF REQUEST NO. VR-19

SYSTEM:

Emergency Service Water (ESW)

COMPONENTS:

V-13-121, V-13-126, and V-13-140

CATEGORY:

C

FUNCTION:

These check valves open to provide flowpaths for emergency service water to and from the HVAC instrument air compressors.

TEST REQUIREMENTS:

Check valves shall be exercised to the positions in which they perform their safety functions or examined at least once every reactor refueling outage. (Part 10, Para. 4.3.2.2 and 4.3.2.4(c))

BASIS FOR RELIEF:

These are simple check valves with no means of mechanical exercising or positive indication of disc position, the only practical method of verifying full stroke (open) is by measuring full accident flow through the line (Reference NRC Generic Letter 89-04). There is no installed flow instrumentation on the associated branch lines thus flow measurements are not practical.

Since these valves are identical seeing essentially identical service, they qualify for sample disassembly as set forth in Position 2 of NRC Generic Letter 89-04.

RELIEF REQUEST NO. VR-19 (cont.)

ALTERNATE TESTING:

Each of these valves will be part stroke exercised open during quarterly system surveillance testing (full stroke with no flow measurements).

During each reactor refueling outage at least one valve will be disassembled and inspected (in rotation) such that, assuming an 13-month refueling cycle, each valve will be inspected approximately every five (5) years. Disassembled valves will be exercised/tested prior to returning them to service following reassembly. Should a disassembled valve show signs of damage that indicates that it could not perform its safety function to close, then the other two valves will be disassembled and inspected prior to startup.

The use of non-intrusive testing equipment is under evaluation and, if proven satisfactory, the current disassembly and inspection program may be replaced by one using non-intrusive testing methods.

RELIEF REQUEST NO. VR-20

(DELETED)

RELIEF REQUEST NO. VR-21

SYSTEM:

High Pressure Coolant Injection (HPCI)
Reactor Core Isolation Cooling (RCIC)

COMPONENTS:

Miscellaneous check valves - see below.

CATEGORIES:

A/C and C

FUNCTIONS:

* V-22-0064, V-22-0063, V-24-0046, V-24-0047
These HPCI/RCIC Vacuum Breaker Check Valves open to prevent siphoning of torus water into the HPCI/RCIC exhaust lines.

V-22-0026, V-24-0010
Barometric condenser condensate pump discharge check valves, support operation of HPCI/RCIC in the open and closed positions.

V-22-0028, V-22-0029, V-24-0012
These check valves open to provide a flow path for HPCI/RCIC lube oil cooling and/or Gland Seal condensate pump discharge. With the pumps in standby, these check valves prevent barometric condenser in-leakage.

TEST REQUIREMENTS:

Check valves shall be exercised to the positions in which they program their safety functions or examined at least once every reactor refueling outage. (Part 10, Para. 4.3.2.2 and 4.3.2.4 (c))

BASIS FOR RELIEF:

These are simple check valves with no means of mechanical exercising or positive indication of disc position; thus the only practical method of exercising them is with system flow. Due to the lack of appropriate flow instrumentation in the associated lines, verification of accident flow, as specified by GL 89-04, is not practical.

Since these valves, grouped above, are identical and see essentially identical service, they qualify for sample disassembly as set forth in Position 2 of Generic letter 89-04.

ALTERNATE TESTING:

All valves, except those indicated by an asterisk (*), will be partial stroke tested by performance of the respective quarterly system surveillance. The asterisked valves have no means to verify partial stroking during performance of quarterly system surveillance testing. The group of valves, indicated by an asterisk, are sized for maintaining a specific differential pressure rather than a specified flow so that full flow testing is not possible.

During each reactor refueling outage at least one valve will be disassembled and inspected (in rotation). Disassembled valves will be part-stroke exercised/tested prior to returning them to service following reassembly. Should a disassembled valve show signs of damage that indicates that it could not perform its safety function, then the remaining valves in the same group will be disassembled and inspected prior to start-up.

RELIEF REQUEST NO. VR-22

SYSTEM:

Nuclear Boiler

COMPONENTS:

CV-4412, CV-4413, CV-4415, CV-4416
CV-4418, CV-4419, CV-4420, CV-4421

CATEGORY:

A

FUNCTIONS:

The Main Steam Isolation Valves are 20" spring-loaded globe valves that close to isolate the reactor vessel and containment.

TEST REQUIREMENTS:

Other power-operated valves with reference stroke times less than or equal to 10 seconds shall exhibit no more than ±50 percent change in stroke time when compared to the reference value. (Part 10, Para. 4.2.1.8(d))

BASIS FOR RELIEF:

The stroke times of these valves are adjusted within an acceptable band of 3-5 seconds by adjusting orifices associated with hydraulic dashpots attached to each operator. Thus, the stroke time performance of each valve operator is more a function of the dashpot setting than the material condition of the valve.

The strict acceptable band of ±1 second is restrictive enough to ensure that each of the valves remains operable within the established limits of the plant safety analyses.

Elimination of the ±50 percent limit on deviation will have no significant impact on the reliability of these valves nor on the health and safety of the public.

ALTERNATE TESTING:

The acceptance criteria for these valves will be as established by the DAEC Technical Specifications, 3-5 seconds. No reference values will be established nor will the acceptance criteria of Part 10, Para. 4.2.1.8(d) be applied to the test results.

RELIEF REQUEST NO. VR-023

SYSTEM:

Emergency Service Water (ESW)

COMPONENTS:

CV-1956A	CV-2080
CV-1956B	CV-2081

CATEGORY:

B

FUNCTIONS:

CV-1956 A & B open to provide a return path for ESW cooling water from the control building chillers. CV-2080 and CV-2081 are ESW supply valves to the emergency diesel generators.

TEST REQUIREMENTS:

Other power-operated valves with reference stroke times less than or equal to 10 seconds shall exhibit no more than ±50 percent change in stroke time when compared to the reference value. (Part 10, Para. 4.2.1.8 (d))

BASIS FOR RELIEF:

CV-1956A & B are actuated by the starting logic of the associated emergency service water pump, with no individual control handswitch. Also, there are no position indicators for these valves. The test sequence requires an operator to be stationed at the valves, which are physically separated from the pumps, to measure the stroke time of the valve. The operator starts timing upon announcement of the ESW pump start and stops timing based upon the cessation of valve stem movement. For these reasons, precise stroke time measurements are impractical. CV-2080 and CV-2081 do not have position indication. To measure the stroke times of these valves the operator starts timing upon operation of the handswitch for the valve and stops timing based upon cessation of valve stem movement. Thus precise stroke time measurements are impractical.

RELIEF REQUEST NO. VR-023 (cont'd)

ALTERNATE TESTING:

These valves will be exercised every three months. During this testing, valve operation will be observed, and a stroke time estimated based on valve stem movement. Because the stroke time is estimated, the results of this test will be evaluated with expect to the maximum allowable stroke time of Part 10, Para. 4.2.1.4 (a). The acceptance criteria of Part 10, Para. 4.2.1.8.(d) will not be applied to the test results.

APPENDIX E

COLD SHUTDOWN TEST JUSTIFICATIONS - VALVES

APPENDIX E: COLD SHUTDOWN TEST JUSTIFICATIONS

NUMBER: CSJ-01
SYSTEM: **NUCLEAR BOILER**
COMPONENTS: **CV-4428, CV-4429 - Reactor Vessel Head Vent Valves**

SAFETY FUNCTION: Reactor coolant pressure boundary

BASIS: These valves cannot be cycled during reactor operation. To do so would cause an unnecessary reactor transient which would affect continued reactor operation.

NUMBER: CSJ-02
SYSTEM: **REACTOR BUILDING CLOSED COOLING WATER (RBCCW)**
COMPONENTS: **MO-4841A and MO-4841B - Reactor Building Closed Cooling Water System (RBCCW) Drywell Isolation Valves**

SAFETY FUNCTION: These valves close for containment isolation.

BASIS: During plant operation, these valves are open to supply (and return) cooling water to (and from) reactor recirculation pump components inside the drywell. These include the pump motor windings, seal water coolers and lube oil coolers. Closing these valves interrupts cooling water flow and could result in damage to pump and motor components.

NUMBER: CSJ-03
SYSTEM: **REACTOR FEEDWATER**
COMPONENTS: **MO-4441 and MO-4442 - Reactor Feedwater Outboard Containment Isolation Valves**

SAFETY FUNCTION: These valves close for reactor vessel and containment isolation and to prevent diversion of HPCI and RCIC flow to the main feedwater system.

BASIS: During plant operation at power, reactor feedwater must be supplied through both these valves to maintain reactor coolant inventory and reactor vessel water level. Closing either of these valves will isolate two of the four supplies of feedwater into the reactor vessel. This could result in thermal shock to the reactor vessel feedwater nozzles and spargers upon resumption of flow and a plant trip due to the potential for severe reactor vessel water level and power transients.

NUMBER: **CSJ-04**
SYSTEM: **REACTOR RECIRCULATION**
COMPONENTS: **MO-4627 and MO-4628 - Reactor Recirculation Pump Discharge Valves**

SAFETY FUNCTION: These valves close to isolate the faulted loop during a LOCA to ensure LPCI flow is directed into the reactor vessel.

BASIS: Closing either of these valves during plant operation places the recirculation system in a "single loop" configuration. Although single-loop operation is possible, routinely entering into this configuration is undesirable and contrary to the prudent a safe operation of the reactor plant. In addition, operati in a single loop configuration requires a severe power reduction.

NUMBER: **CSJ-05**
SYSTEM: **REACTOR RECIRCULATION**
COMPONENTS: **MO-4629 and MO-4630 - Reactor Recirculation Pump Discharge Bypass Valves**

SAFETY FUNCTION: These valves close to isolate the faulted loop during a LOCA to ensure LPCI flow is directed into the reactor vessel.

BASIS: During normal plant operation, these valves remain open to eliminate undesirable thermal stresses across the valves. (Reference General Electric SIL No. 104). If during testing, either of these valves were to fail in the closed position, prudency would require a plant shutdown to correct the problem and reopen the valve(s).

NUMBER: **CSJ-06**
SYSTEM:
COMPONENTS:

SAFETY FUNCTION:

BASIS: (RESERVED)

NUMBER: **CSJ-07**
SYSTEM: **RESIDUAL HEAT REMOVAL (RHR)**
COMPONENTS: **MO-1908 and MO-1909 - Residual Heat Removal Shutdown Cooling Supply Valves**

SAFETY FUNCTION: During power operation these normally-closed valves protect the RHR system piping from the high pressure recirculation system. They open to provide a flowpath to the RHR pumps during shutdown cooling operation.

BASIS: Under normal conditions these valves could experience a differential pressure of 900 psid. Exercising these valves under these conditions could result in valve or actuator damage. In addition, with one of these valves in the open position, pressure isolation protection for the RHR system is limited to a single valve. Note also that these valves are electrically interlocked to prevent opening with reactor pressure greater than 135 psig.

NUMBER: **CSJ-08**
SYSTEM: **RESIDUAL HEAT REMOVAL (RHR)**
COMPONENTS: **V-19-149 and V-20-082 - Residual Heat Removal/LPCI Injection Check Valves**

SAFETY FUNCTION: During power operation these normally-closed valves protect the RHR piping from the high pressure recirculation system. They open to provide a flowpath for LPCI and shutdown cooling from the RHR headers to the reactor vessel via the recirculation piping.

BASIS: These are simple check valves with no means of operation except other than system flow. With the reactor at operating pressures the RHR pumps cannot develop sufficient discharge pressure to open these valves.

NUMBER: **CSJ-09**
SYSTEM: **HIGH PRESSURE COOLANT INJECTION (HPCI)**
COMPONENTS: **V-22-021 and V-22-022 - HPCI Condensate Drain Valves**

SAFETY FUNCTION: During HPCI operation these valves open to provide a flowpath for discharging condensate from the HPCI turbine exhaust drain pot to the torus. They close for containment isolation.

BASIS: Exercising these valves to their closed position requires closing V-22-022 and performance of a seat leakage test. If HPCI were to initiate while this testing was in progress, condensate could backup into the turbine exhaust piping and casing resulting in potential damage to critical components or adverse affects with respect to system performance.

NUMBER: **CSJ-10**
SYSTEM: **HIGH PRESSURE COOLANT INJECTION (HPCI)**
COMPONENTS: **V-22-063 and V-22-064- HPCI Exhaust Line Vacuum Breakers**

SAFETY FUNCTION: Following HPCI operation these valves open to prevent a vacuum buildup in the exhaust line and subsequent filling of the turbine exhaust piping from the torus. They close for containment isolation.

BASIS: If HPCI should initiate during the period when these valves are isolated for testing they would not function and the operation of the HPCI system could be adversely impacted.

NUMBER: **CSJ-11**
SYSTEM: **HIGH PRESSURE COOLANT INJECTION (HPCI)**
COMPONENTS: **V-22-016 - HPCI Turbine Exhaust Check Valve**

SAFETY FUNCTION: This check valve provides a flow path for exhaust steam from the HPCI turbine to the torus. It closes for containment isolation.

BASIS: During plant operation this valve must be capable of opening to allow turbine exhaust steam to exit into the suppression chamber. Testing of this valve to the closed position requires downstream valves to be closed when air used to verify valve closure. While the tests are in progress, the respective pump is inoperable since there is no path for turbine exhaust steam.

NUMBER: **CSJ-12**
SYSTEM: **REACTOR CORE ISOLATION (RCIC)**
COMPONENTS: **V-24-046 and V-24-047 - RCIC Exhaust Line Vacuum Breakers**

SAFETY FUNCTION: Following RCIC operation these valves open to prevent a vacuum buildup in the exhaust line and subsequent filling of the turbine exhaust piping from the torus. They close for containment isolation.

BASIS: If RCIC should initiate during the period when these valves are isolated for testing they would not function and the operation of the RCIC system could be adversely impacted.

NUMBER: **CSJ-13**
SYSTEM: **REACTOR CORE ISOLATION (RCIC)**
COMPONENTS: **V-25-036 - RCIC Pump Discharge Check Valve**

SAFETY FUNCTION: This valve opens to provide a flowpath for RCIC to the reactor vessel via the reactor feedwater piping.

BASIS: Opening this valve with RCIC system flow is not practical during plant operation due to the potential for severe reactor vessel water level and temperature transients as well as possible contamination of the reactor feedwater. For these reasons the valve is provided with a local mechanical exercise capability; however, the location of the valve in the steam tunnel makes it inaccessible during power operation.

NUMBER: **CSJ-14**
SYSTEM: **REACTOR CORE ISOLATION (RCIC)**
COMPONENTS: **V-25-023 - RCIC Turbine Exhaust Check Valve**

SAFETY FUNCTION: This check valve provides a flowpath for exhaust steam from the RCIC turbine to the torus. It closes for containment isolation.

BASIS: During plant operation this valve must be capable of opening to allow turbine exhaust steam to exit into the suppression chamber. Testing of this valve to the closed position requires downstream valves to be closed when air pressure is used to verify valve closure. While the tests are in progress, the respective pump is inoperable since there is no path for turbine exhaust steam.

APPENDIX F

REFUELING OUTAGE TEST JUSTIFICATIONS - VALVES

APPENDIX F: REFUELING TEST JUSTIFICATIONS

NUMBER: **RRJ-01**
SYSTEM: **NEUTRON MONITORING**
COMPONENT: **V-43-503 - Tip System Purge Check Valve**

SAFETY FUNCTION: This valve provides containment isolation for the TIP system nitrogen purge line.

BASIS: This is a simple check valve with no disk position indication and the only practical method of verifying closure is by performing a leak test. The method of leaktesting for this valve requires separation of the containment penetration flange which constitutes a breach of primary containment integrity and thus not practical during plant operation. Furthermore, the testing requires approximately 20 manhours to complete. Taking into account the typical general area radiation dose rate in the vicinity of these valves at cold shutdown of 200 Mr/hour, the estimated total exposure per test is approximately 4 man-Rem. Based on the foregoing discussion, the costs and burden on the plant staff associated with cold shutdown testing of this valve is not justified by the little potential gain in plant safety afforded by the test.

NUMBER: **RRJ-02**
SYSTEM: **NUCLEAR BOILER**
COMPONENTS: **CV-4412, CV-4413, CV-4415, CV-4416,CV-4418, CV-4419, CV-4420, CV-4421 - Main Steam Isolation Valves**

SAFETY FUNCTION: These valves close for reactor vessel and containment isolation.

BASIS: These valves have two fail-safe modes. One is loss of electric power. This mode is tested on- line (quarterly) by normal closure of each valve where the closure signal de-energizes the solenoid valves which control the actuator pilot valves.

The second mode is loss of nitrogen gas pressure to the actuator. In this case the nitrogen pressure on the underside of the actuator piston, which keeps the valve open, is exhausted to atmosphere upon the failure of the supply system. The closure time is 3 to 5 seconds, after the nitrogen pressure has decayed to the point at which the air-valves reposition (internal spring force overcomes the pneumatic force). Exercising the MSIV's by closing utilizing spring force only, complies with the recommendations of General Electric Service Information Letter 477. During refueling shutdowns, the MSIV's are also cycled utilizing the accumulators only (non-safety grade nitrogen makeup is isolated) in accordance with NRC Information Notice 85-84, Inadequate Inservice Testing of Main Steam Isolation Valves. Both of these tests requires access to the drywell and a considerable expenditure of plant staff resources. Thus, the scope of these tests precludes testing during cold shutdown periods.

NUMBER:
SYSTEM:
COMPONENTS:

SAFETY FUNCTION:

BASIS:

Revision 13
09/20/94

NUMBER: **RRJ-04**
SYSTEM: **NUCLEAR BOILER**
COMPONENTS:

Reactor Relief Valves PIS No.	**Solenoid Valves** PIS No.
PSV-4400*	**SV-4400**
PSV-4401	**SV-4401**
PSV-4402*	**SV-4402**
PSV-4405*	**SV-4405**
PSV-4406*	**SV-4406**
PSV-4407	**SV-4407**

***Automatic De-pressurization System (ADS)**

SAFETY FUNCTION: The functions of the relief valves are to (1) open upon receipt of an ADS signal to blowdown the reactor vessel (for the ADS valves only), (2) act as primary system safety valves actuating on high system pressure or by manual actuation from the Control Room, and (3) to close to maintain the primary system pressure boundary and prevent uncontrolled de-pressurization of the reactor (stuck open relief valve). The function of the solenoid valves is to energize upon receipt of a manual or ADS actuation signal and, in so doing, vent the poppet valve assembly causing the associated main valves to open.

BASIS: Due to the obvious potential for plant transients these valves can only be tested at very low reactor power levels with primary system pressure greater than 50 psig. The test sequence requires:

a. Opening at least one turbine bypass valve discharging main steam in to the main condenser;

b. Actuating the relief valve while observing the corresponding closure of the turbine bypass valve (pressure control on the turbine bypass valve is fairly quick to respond, 1-1/2 seconds), and the response of pressure switches and thermocouples downstream of the relief valve.

c. Closing the relief valve while observing the corresponding opening of the turbine bypass valve and the response of pressure switches and thermocouples downstream of the relief valves.

Each relief valve actuation transmits hydrodynamic loading to the torus. The Duane Arnold Mark I Containment Plant Unique Analysis Report (PUAR) fatigue evaluation is based on 740 relief valve actuations with normal operating conditions (i.e., 740 actuations for testing purposes). Quarterly testing of each of these valves would result in 960 test actuations over plant life, which could exceed the approved design basis.

Finally, the failure of any relief valve to close would cause an uncontrolled rapid de-pressurization of the primary system and plant shutdown.

Testing during cold shutdowns contradicts the policy of reducing the number of challenges to safety/relief valves as recommended by NUREG-0737 and the BWR Owners Group Evaluation of NUREG-0737 Item II.K.3.16, Reduction of Challenges and Failures of Relief Valves.

NUMBER: **RRJ-05**

SYSTEM: **NUCLEAR BOILER**

COMPONENTS: **V-14-001 and V-14-003 - Reactor Feedwater Inboard Check Valves**

SAFETY FUNCTION: These valves close for reactor vessel and containment isolation. They open to provide flowpaths for HPCI and RCIC flow into the reactor vessel.

BASIS: These are simple swing check valves with no positive indication of disk position, thus the only means of determining closure of these valves is by performing a leak test. Such a test requires drywell and steam tunnel entry plus extensive preparations of the feedwater system including draining approximately 2000 gallons of water. Furthermore, testing of V-14-001 requires shutdown of the cleanup system which is undesirable during operations or cold shutdown.

Performance of these leaktests is impossible during plant operation and impractical at cold shutdown due to the unreasonable burden on the plant staff.

NUMBER: **RRJ-06**
SYSTEM: **NUCLEAR BOILER**
COMPONENTS: **V-14-009, V-14-014, V-14-015, V-14-016, V-14-032, V-14-100, V-14-104, V-14-108, V-14-112, V-14-116, V-14-120, V-14-124 - ADS and MSIV Accumulator Check Valves**

SAFETY FUNCTION: These valves close upon loss of normal air or nitrogen supply to the ADS relief valve and main steam isolation valve accumulators to ensure a reliable supply of operating air or nitrogen to the components.

BASIS: The position of these valves cannot be verified during normal operation since they are simple check valves and have no position indicators. The location of these valves and test isolation valves in the drywell and steam tunnel precludes testing at other than cold shutdown conditions. Due to containment and steam tunnel access limitations and the complexity of performing leaktests of these valves, testing at cold shutdowns would result in an unreasonable burden on the plant staff and is not justified by the little apparent gain from such testing.

NUMBER: **RRJ-07**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **SV-1840A and SV-1840B - Backup Scram Valves**

SAFETY FUNCTION: These valves bleed down the scram air header upon receiving a SCRAM signal from the Reactor Protection System.

BASIS: Individual testing of the backup scram valves SV-1840A and SV-1840B requires modifying the electrical configuration of the reactor protection system by jumpers, etc. and inserting a scram signal to each valve. Furthermore, testing of these valves also

requires de-pressurization of the SCRAM air header and initiation of a full SCRAM signal. This is impractical to accomplish on a quarterly basis since testing would result in a plant trip. During cold shutdown periods the complexity and resources required to perform this testing would result in an unreasonable burden on the plant staff that is not justified by the little gain in plant safety provided by the testing. Note that per DAEC Letter NG-84-0825 the commitment to test these valves was on a refueling frequency.

NUMBER: **RRJ-08**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **V-17-052 and V-17-053 - CRD Return To Reactor Vessel Check Valves**

SAFETY FUNCTION: These valves close for containment isolation.

BASIS: These are simple check valves with no positive indication of disk position thus the only means of determining closure of these valves is by performing leak tests. Such testing requires dry well entry plus extensive system preparations. Performance of these leaktests is impossible during plant operation and impractical at cold shutdown due to the unreasonable burden on the plant staff. Note that this line is normally isolated and valve degradation during operation is unlikely.

NUMBER: **RRJ-09**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **V-17-062 - Backup Scram Bypass Check Valve**

SAFETY FUNCTION: This valve provides independence for the backup scram valves which bleed down the scram air header upon receiving a SCRAM signal from the Reactor Protection System.

BASIS: Testing of this valve is incorporated in the testing for the individual backup scram valves, SV-1840A and SV-1840B. (See discussion of RRJ-07 for detailed justification)

NUMBER: **RRJ-10**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **V-17-083 and V-17-096 - Reactor Recirculation Mini Purge Check Valves**

SAFETY FUNCTION: These valves close for containment isolation.

BASIS: These are simple check valves with no positive means of determining valve disk position, thus the only means of determining closure of these valves is by performing leak tests. Such testing requires drywell entry plus extensive system preparations. Performance of these leaktests is impossible during plant operation due to the inaccessibility of the drywell and impractical at cold shutdown due to the unreasonable burden on the plant staff resulting from such testing .

NUMBER: **RRJ-11**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **CV-1849, CV-1850, SV-1855, and SV-1856 - CRD SCRAM Inlet and Exhaust Valves w/ Pilot Valves**

SAFETY FUNCTION: CV-1849 and CV-1850 open with a SCRAM signal to pressurize lower side of CRD piston and vent the top of the piston to the scram discharge header, thus effecting rod movement into the core.
SV-1855 and SV-1856 are the air pilot valves associated with CV-1849 and CV-1850, respectively.

BASIS: These valves can only be tested by verifying control rod drive performance while scramming each individual control rod. Due to the obvious operational restraints and extensive effort associated with scram testing, this is impractical to accomplish other than on a refueling outage frequency. Control rod scram testing is a normal routine test performed during each reactor refueling outage.

NUMBER: **RRJ-12**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **SV-1868A, SV-1868B, SV-1869A, and SV-1869B - Air Pilot Valves for CV-1859 A&B and CV-1867 A&B, SCRAM Discharge Volume Vent and Drain Valve Pilot Valves**

SAFETY FUNCTION: These valves open on a SCRAM signal to vent and de-pressurize the air supply to the vent and drain valves to effect their closure.

BASIS: Testing these valves requires a considerable set-up time and initiation of a full reactor scram. During plant operation this would result in a plant trip. At cold shutdown, the expenditure of the resources and time required to test these valves is not justified by the little apparent gain in plant safety afforded by the testing.

NUMBER: **RRJ-13**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **V-18-0118-HCU# - Charging Water Header Check Valves**

SAFETY FUNCTION: These valves close to retain pressure in the HCU accumulators in the event that the charging water header should de-pressurize.

BASIS: Verifying closure of these valves requires shutdown of the CRD pumps and de-pressurization of the charging header. During plant operation this is not possible as it would result in securing cooling water to the CRD's. During cold shutdown a CRD pump normally remains in operation (headers pressurized) to ensure flushing of the CRD's and prevent deposits of foreign matter in the drive mechanisms.

NUMBER: **RRJ-14**
SYSTEM: **CONTROL ROD DRIVE**
COMPONENTS: **V-18-1453-HCU# - SCRAM Exhaust Check Valves**

SAFETY FUNCTION: These valves open to provide flowpaths from each of the CRD's to the scram discharge header in the event of a SCRAM.

BASIS: These valves can only be tested by verifying control rod drive performance while scramming each individual control rod. Due to the obvious operational restraints and extensive effort associated with scram testing, this is impractical to accomplish other than on a refueling outage frequency. Control rod scram testing is a normal routine test performed during each reactor refueling outage.

NUMBER: **RRJ-15**
SYSTEM: **RESIDUAL HEAT REMOVAL (RHR)**
COMPONENTS: **V-19-149 and V-20-082 - RHR LPCI Injection Check Valves**

SAFETY FUNCTION: These valves open to provide flowpaths to the reactor vessel via the recirculation piping for LPCI and shutdown cooling.

BASIS: These valves cannot be opened with system flow during power operation because the RHR pumps cannot develop sufficient head to overcome recirculation system pressure. They also cannot be manually stroked during operation due to their location in the drywell.

In-situ testing has determined that these check valves fully open at approximately 10,000 gpm. To ensure compliance with Part 10, Paragraph 4.3.2.4, positive verification of valve operation is required. To achieve this verification, a mechanical indicator is attached to the rotating disk pin (shaft). This testing cannot be conducted at cold shutdown because the containment is inerted with nitrogen and thus inaccessible. In order to gain personnel access to the drywell, the nitrogen must be de-inerted (normally a 16 - 24 hour operation) and subsequently re-inerted before the plant is restarted (another 16 - 24 hour operation). Inerting and de-inerting the drywell solely for the purpose of valve testing is excessively burdensome. Additionally, a full stroke test of these valves cannot be performed with flow at cold shutdown because it would be necessary to test two channels/ loops of a safety system (RHR) at the same time.

Current guidance only allows the operation of one train of a safety system for surveillance purposes.

One of these valves is partially stroked during cold shutdown during operation of the RHR system in the shutdown cooling mode. This is only a partial stroke test since the normal flowrate in this mode is only 4000 gpm versus the required accident flowrate of 14,400 gpm. Exercising (partial) both valves requires shifting the cold shutdown RHR system lineup. While shifting system operation to the idle loop is possible, it is a time consuming operation involving more than 8 hours of preparation and lineup work by operations personnel. This would result in an unreasonable burden on the plant staff that is not commensurate with any gain in plant safety provided by such testing.

NUMBER: **RRJ-16**
SYSTEM: **CORE SPRAY**
COMPONENTS: **V-21-072 and V-21-073 - Core Spray Injection Check Valves**

SAFETY FUNCTION: These check valves provide a flow path for core spray to the reactor vessel and prevent backflow from the reactor vessel to the core spray system.

BASIS: The only means of determining closure of these valves is by performing a leak test. Such a test requires drywell entry plus extensive preparations. Performance of these leaktests is impossible during plant operation and impractical at cold shutdown due to the unreasonable burden on the plant staff.

NUMBER: **RRJ-17**
SYSTEM: **CORE SPRAY**
COMPONENTS: **V-21-072 and V-21-073 - Core Spray Injection Check Valves**

SAFETY FUNCTION: These check valves provide a flow path for core spray to the reactor vessel and prevent backflow from the reactor vessel to the core spray system.

BASIS: In order to open these valves, the core spray pumps must be operated at rated flow discharging directly into the reactor vessel. This cannot be done during normal operation because the core spray pumps are not capable of overcoming reactor pressure. Core spray injection during cold shutdown with the reactor head in place is impractical due to the difficulty of controlling reactor vessel water level. Core spray injection at rated flow would result in a vessel level increase of approximately 30" per minute. With the injection going into the vessel shroud region and high rate of change in water level and a possible difference in level between the shroud region and the main vessel, it would very easily be possible to flood the main steam lines or over-pressurize the reactor vessel if this test were performed at cold shutdown with the head in place. In addition, the extensive scope of preparations required to inject water via the core spray pumps (approximately 24 hours) would result in a significant burden on the plant operating staff.

NUMBER: **RRJ-18**
SYSTEM:
COMPONENTS:

SAFETY FUNCTION:

BASIS: (RESERVED)

NUMBER: **RRJ-19**
SYSTEM:
COMPONENTS:

SAFETY FUNCTION:

BASIS: (RESERVED)

NUMBER: **RRJ-20**
SYSTEM: **STANDBY LIQUID CONTROL (SLIC)**
COMPONENTS: **V-26-008 and V-24-009 - Standby Liquid Control Injection Valves**

SAFETY FUNCTION: These check valves provide a flow path for exhaust steam from the standby liquid control injection header to the reactor vessel. They close for containment isolation.

BASIS: These are simple check valves with no positive means of determining disk position, thus the only means of verifying closure of these valves is by performing a leak test. Such a test requires drywell access and extensive preparations and is impractical during plant operations or at cold shutdown due to the unreasonable burden on the plant staff.

NUMBER: **RRJ-21**
SYSTEM: **STANDBY LIQUID CONTROL (SBLC)**
COMPONENTS: **V-26-008 and V-24-009 - Standby Liquid Control Injection Check Valves**

SAFETY FUNCTION: These check valves provide a flowpath for borated water from the standby liquid control injection header to the reactor vessel. They close for containment isolation.

BASIS: The only practical means of exercising these valves to the open position requires operation of the SBLC pumps discharging into the reactor vessel. This cannot be done during normal operation or cold shutdown since the SBLC system must be drained and flushed to prevent contamination of the reactor coolant with sodium pentaborate. In addition, extensive testing and maintenance is required to replace the explosive charges in the isolation valves.

NUMBER: **RRJ-22**
SYSTEM: **CONTAINMENT ATMOSPHERE CONTROL**
COMPONENTS: **CV-4357 - Containment Hard Vent Valve**

SAFETY FUNCTION: The containment hard vent system was installed as requested in Generic Letter 89-16 to provide a means of venting primary containment irrespective of the release of radioactivity to the environment. This system will be utilized only when plant conditions have degraded beyond design conditions considered in the DAEC Final Safety Analysis Report.

BASIS: Because the hard vent system is not intended to be used to mitigate events considered in the Final Safety Analysis Report, components other than those provided for primary containment isolation are not within the scope of the Inservice Test (IST) Program, as discussed in Part 10, Para. 1.1. These components have been added to the IST Program for testing on an augmented basis. The intent of including these components in the Program is to provide a reasonable level of operational readiness for the hard vent system and this is satisfied by testing at a refueling frequency.

NUMBER: **RRJ-23**
SYSTEM: **CONTAINMENT ATMOSPHERE CONTROL**
COMPONENT: **V-43-214 - Drywell Instrument Nitrogen Header Supply Stop check valve**

SAFETY FUNCTION: This check valve closes for containment isolation.

BASIS: This is a simple check valve, thus the only practical means of determining closure is by performing a leak test.

Performing a leaktest of this valves requires containment access, isolation of nitrogen to the containment, and an extensive valve re-alignment. The resources and time required to complete such a test places an undue burden on the plant staff and is not justified by the little gain in plant safety afforded by the test.

NUMBER: **RRJ-24**
SYSTEM: **CONTAINMENT ATMOSPHERE CONTROL**
COMPONENT: **V-43-441 - CV-4357 Air Accumulator Check Valve**

SAFETY FUNCTION: This check valve closes to ensure a reliable supply of compressed air is available to operate containment hard vent valve CV-4357 in the event that the normal air supply fails.

BASIS: This is a simple check valve, thus the only practical means of determining closure of these valves is by performing a leak test.

Because the hard vent system is not intended to be used to mitigate events considered in the Final Safety Analysis Report, components other than those provided for primary containment isolation are not within the scope of the Inservice Test (IST) Program, as discussed in Part 10, Para. 1.1. These components have been added to the IST Program for testing on an augmented basis. The intent of including these components in the Program is to provide a reasonable level of operational readiness for the hard vent system and this is satisfied by testing at a refueling frequency.

NUMBER: **RRJ-25**
SYSTEM:
COMPONENT:

SAFETY FUNCTION:

BASIS: (RESERVED)

NUMBER: **RRJ-26**
SYSTEM: **HIGH PRESSURE COOLANT INJECTION (HPCI)**
COMPONENTS: **V-22-017- HPCI Turbine Steam Exhaust Stop-Check Valve**

SAFETY FUNCTION: This check valve provides a flowpath for exhaust steam from the HPCI turbine to the torus. It closes for containment isolation.

BASIS: This is a lift stop check valve with no positive means of determining disk position. Determining closure by performing a leak test is not practical since there is no means of isolating the torus from the downstream piping and reverse flow testing would merely lift the valve and relieve pressure to the torus. Non-obtrusive acoustical methods would probably result in inconclusive results. Thus, the only available method of verifying disk position is radiography. Radiography of these valves requires extensive preparations including system draining and scaffold erection. During cold shutdown conditions, performance of this testing is impractical due to the extensive resources and time needed to complete testing.

NUMBER: **RRJ-27**
SYSTEM: **REACTOR CORE ISOLATION COOLING (RCIC)**
COMPONENTS: **V-24-023 - RCIC Turbine Steam Exhaust Check Valve**

SAFETY FUNCTION: This check valve provides a flowpath for exhaust steam from the RCIC turbine to the torus. It closes for containment isolation.

BASIS: This is a lift stop check valve with no positive means of determining disk position. Determining closure by performing a leak test is not practical since there is no means of isolating the torus from the downstream piping and reverse flow testing would merely lift the valve and relieve pressure to the torus. Non-obtrusive acoustical methods would probably result in inconclusive results. Thus, the only available method of verifying disk position is radiography. Radiography of these valves requires extensive preparations including system draining and scaffold erection. During cold shutdown conditions, performance of this testing is impractical due to the extensive resources and time needed to complete testing.

NUMBER: **RRJ-28**
SYSTEM: **RHR SERVICE WATER (RHRSW)**
COMPONENTS: **V-13-037 and V-13-052 - Emergency Service Water/Well Water isolation Check Valves**

SAFETY FUNCTION: These check valves close to prevent diversion of ESW flow to the non-safety grade (non-critical) well water system.

BASIS: These are simple check valves with no positive means of determining disk position. Determining closure by performing a backleakage test requires de-pressurization and draining of the associated well water train as well as realignment of the ESW train. The extensive preparations and operational impact on the plant precludes performing the backleakage test during operation or cold shutdown periods.

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NUMBER:	**RRJ-29**
SYSTEM:	**CONTROL ROD DRIVE (CRD)**
COMPONENTS:	**CV-1859 A&B and CV-1867 A&B - CRD Scram Discharge Header Vent and Drain Valves**
SAFETY FUNCTION:	In the event of a scram these valves close to isolate the scram discharge headers and hot reactor coolant from the reactor building.
BASIS:	Fail safe testing of these valves is typically performed with the testing of the associated reactor protection system. During operation this is not practical since such testing could result in a scram and plant trip. Testing of the reactor protective system is normally beyond the scope of work normally performed during short duration outages.