C-E Power Systems
Combustion Engineering, Inc
1000 Prospect Hill Road
Windsor, Connecticut 06095

Tel. 203/688-1911
Telex 99297

POWER SYSTEMS

Docket No.: STN-50-470F

March 3, 1982
LD-82-028

Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Confirmatory Issue No. 2, Pump and Valve Operability

Dear Mr. Eisenhut:

The Safety Evaluation Report for CESSAR-F requested that C-E provide confirmatory information for a pump and valve operability assurance program. This information was provided informally to the Staff in draft form and was found acceptable. The information is now being provided formally, and is to be included in the next amendment to CESSAR-F.

If we can be of any additional assistance, please feel free to contact either myself or Mr. G. A. Davis of my staff at (203)688-1911, Extension 2803.

Very truly yours,

COMBUSTION ENGINEERING, INC.

G A Davis for

A. E. Scherer
Director
Nuclear Licensing

E003
s
1/1

AES:ctk

Attachment

limits for active components, consistent with the recommendations of Regulatory Guide 1.48. The specification requires that the manufacturer demonstrate operability by analysis or test (footnotes 6 and 11 of Regulatory Guide 1.48). The results are independently reviewed by the NSSS Supplier considering the effects of postulated failure modes on operability.

B. Analysis and/or test demonstrating the operability of each design under the most severe postulated loadings which are combined in a manner consistent with the recommendations of Regulatory Guide 1.48. Methods/results of operability demonstration programs are detailed in Sections 3.9.3.2.2.2 and 3.9.3.2.2.3.

C. Inspection of each component to assure compliance of critical parameters with specifications and drawings. This inspection confirms that specified materials and processes were used, that wall thicknesses met code requirements, and that fits and finishes met the manufacturer's requirements based on design clearance requirements.

D. Shop testing of each component to verify "as built" conditions as defined in Sections 3.9.3.2.2.2 and 3.9.3.2.2.3.

E. Startup and periodic inservice testing in accordance with ASME Boiler and Pressure Vessel Code, Section XI to demonstrate that the active pumps and valves are in operating condition throughout the life of the plant.

NSSS active pumps are listed below with a brief description of active safety function of each. NSSS active valves are listed in Table 3.9.3-3.

Active Components	Active Safety Function
High-pressure safety injection pumps	Operate at flowrates to runout
Low-pressure safety injection pumps	Operate at flowrates to runout
Charging pumps	Operate

3.9.3.2.2.2 Operability Assurance Program Results for Active Pumps

3.9.3.2.2.2.1 High- and Low-Pressure Safety Injection Pumps. Operability of the high- and low-pressure safety injection (HPSI and LPSI) pumps under faulted conditions has been demonstrated by analyses of the assemblies and by analyses and tests of the motors in accordance with the recommendations of Regulatory Guide 1.48.

For the HPSI pumps, the manufacturer has shown that allowable stresses are not exceeded, that clearances are acceptable and that shaft and pedestal bolt deflections do not cause stresses to exceed the normal values indicated by past experience for other pumps of the same type.

For the LPSI pumps, the manufacturer has shown that allowable stresses are not exceeded and that clearances remain acceptable under faulted loadings.

Where necessary, lumped mass models are used with the computer programs to determine the natural frequencies and displacements. The models are conservative (i.e., simplifications tend to make them more flexible).

Operability was demonstrated under the following loads;

	HPSI Pump	LPSI Pump
Horizontal seismic, g's	1.1	1.1
Vertical seismic, g's	1.1	1.1
Design pressure, $lb/in.^2$	2050	2050
Suction nozzle max, resultant force, lb	4000	4000
Suction nozzle max, resultant moment, ft-lb	12000	50000
Discharge nozzle max, resultant force, lb	2500	6500
Discharge nozzle max, resultant moment, ft-lb	2500	16000

To verify "as built" conditions the HPSI and LPSI pumps were hydrostatically tested in accordance with the ASME Boiler and Pressure Vessel Code, Section III to confirm acceptability of structural integrity of pressure retaining parts, tested for seal leakage, and tested for performance and NPSH characteristics in accordance with the Hydraulic Institute Standard to verify operation within specified parameters. The motors were built as Class IE and were tested in accordance with IEEE Standard 112A-1964 to verify operation within specified parameters. Additionally, the motors were qualified to IEEE Standard 323-1974 and IEEE Standard 344-1975 to assure operability during and following design basis events.

3.9.3.2.2.2.2 Charging Pumps. The charging pumps have a relatively complex geometry, which is difficult to analyze. Therefore, a simplified analysis and type test were used to confirm the charging pump operability during and following a DBE.

A sinusoidal test with simultaneous 1.5 g horizontal and vertical accelerations was conducted. The test on the pump assembly, including its supports, showed no significant natural frequencies in the 1 to 33 Hz range. The fundamental linear natural frequency of the rotating parts of the pump was shown to be greater than 73 Hz. The base of the test pump had a fundamental natural frequency above 33 Hz. Therefore, the System 80 pumps are rigid to postulated seismic input.

The test pump was vibration tested with 2410 psig internal pressure, 1825-pound axial force and 610 ft-lb moment on the suction nozzle, and 1650-pound axial force and 550 ft-lb moment on the discharge nozzle. Simultaneous 1.5g accelerations is applied to the horizontal and vertical axes by driving the assembly in a 45 degree plane. The test was run with the horizontal input parallel to the motor axis. It was repeated with the horizontal input directed 90, 180, and then 270 degrees from the direction for the first test.

The pump was subjected to two sinusoidal sweeps at 1/2 octave per minute in each direction with 1.0g peak accelerations, limited to 12-inch double amplitude, from 1 to 35 Hz. One of the sweeps in each direction was with the pump operating and one with the pump idle. The test shows that no resonances applicable to operability are in the range of concern, and the unit is therefore rigid to the postulated seismic input. The assembly, both operating and nonoperating, was exposed to a 1.5g horizontal and vertical 30-second sinusoidal dwell at 2.5, 10, 12.25, 20, 23.8 and 33 Hz. The pump was shown to operate normally, and no evidence of damage or deterioration to critical parts exists. The 1.5g horizontal and vertical accelerations exceed the applicable response spectra. The successful test on these pumps demonstrates that the System 80 pumps operate during and following the postulated seismic event.

To verify "as built" conditions the charging pumps were hydrostatically tested in accordance with the ASME Boiler and Pressure Vessel Code, Section III to confirm acceptability of structural integrity of pressure retaining parts, tested for seal leakage, and tested for performance and NPSH characteristics in accordance with the Hydraulic Institute Standards to verify operation within specified parameters. The motors were built as Class IE and were tested in accordance with IEEE Standard 112A-1964 to verify operation within specified parameters. Additionally, the motors were qualified to IEEE Standard 323-1974 and IEEE Standard 344-1975 to assure operability during and following design basis events.

3.9.3.2.2.3 Operability Assurance Program for Active Valves

Safety related active valves must perform their mechanical motion in times of an accident. The qualification program assures that these valves will operate during a seismic event. Qualification tests and/or analyses are conducted for all active valves.

Class 1, 2 and 3 valves are designed/analyzed according to the rules of the ASME Boiler and Pressure Vessel Code, Section III, Section NB-3500, NC-3500, and ND-3500 respectively.

Procurement specifications for safety related active valves stipulate that vendor shall submit either detailed calculations and/or test data to demonstrate operability when subjected to the specification loading and stress criteria (normal through faulted conditions). The decision to accept actual or prototype test data, or analysis for operability assurance is made during the normal design and procurement process. The decision to test is based on (1) whether the component is amenable to analysis, (2) whether proven analytical methods are available, and (3) whether applicable prototype test data is available. If analysis or prototype test data is not sufficient, testing is conducted to qualify the component or to verify the analytical technique.

Where appropriate, valve stem deflection calculations are performed to determine deflections due to short term seismic and other applicable loadings. Deflections so determined are compared to allowable clearances. It must be noted that seismic events are of short duration; thus, contact (if it occurs) does not demonstrate that operability is adversely affected. Cases where contact occurs are reviewed on a case by case basis to determine acceptability.

The operability of active Code Class 1, 2 and 3 components is assured through an extensive program of design verification, qualification testing and thorough surveillance of the manufacturing, assembly and shop testing of each active component. Each aspect of the design related to pressure boundary integrity and operability is either tested or verified by calculations. Procedures for testing are developed by component manufacturers and reviewed and approved by the NSSS supplier before the tests are conducted. The design analyses of the component take into consideration environmental conditions including loadings developed from seismic, operational effects, and pipe loads. Where necessary and feasible, the conclusions of these analyses are confirmed by test.

On all active valves, an analysis of the extended structure is also performed for static equivalent seismic SSE loads supplied at the center of gravity of the extended structure. The maximum stress limits allowed in these analyses show that structural integrity is within the limits developed and accepted by the ASME Code.

The safety-related valves are subjected to a series of tests prior to service and during the plant life. Prior to installation, the following tests are performed; shell hydrostatic test to ASME Sections III requirements, backseat and main seat leakage tests, disc hydrostatic test, functional tests to verify that the valve will open and close within the specified time limits, operability qualification of motor operators for the environmental conditions over the installed life (i.e., aging, radiation, accident environment simulation, etc.) according to IEEE 382. Cold hydro qualification tests, hot functional qualification tests, periodic inservice inspections, and periodic inservices operation are performed in-situ to verify and assure the functional ability of the valves. These tests ensure the reliability of the valve for the design life of the plant. The valves are designed using either stress analyses or the pressure containing minimum wall thickness requirements.

All the active valves shall be designed to ave a first natural frequency which is greater than 33 Hz. This is shown by suitable test or analysis.

The above outlines in general the methods used to assure valve operability. Each vendor's specific program is described in the plant specific FSAR.

In addition to the above, the following specific operability assurances are provided for the various type valves:

3.9.3.2.2.3.1 <u>Pneumatically Operated Valves</u>

Pneumatic operated valves are furnished by several vendors in CE System 80 Nuclear Power Plants. Methods of operability demonstration are discussed in general but will be discussed in detail in the plant specific FSAR subject to the vendor(s) utilized. Spring actuation of the valve is the required active safety function. Loss of electric power or supply air will result in venting of the actuator and return of the valve to the safe position. Each vendor provides their own method to demonstrate valve operability. The operability for these valves is demonstrated by analysis, test or by a combination of analysis and test. The vendor considers concurrent loads including seismic, design pressure and pipe loads.

The three-way solenoid valve was qualified by test to IEEE-382-1972, IEEE-323-1974 and IEEE-344-1975. Testing included thermal aging, radiation aging, wear aging, vibration endurance, seismic event simulation, and loss of coolant accident. All test results provided satisfactory evidence of air solenoid valve operability.

Limit switches, used to determine valve position, were qualified by testing to IEEE-323-1974, IEEE-344-1975 and IEEE-382-1972. Switches were successfully performance tested for aging simulation, wear aging, radiation exposure, seismic qualification, and design basis event environmental conditions. For valves outside of containment and utilizing EA-170 limit switches, the switches were seismically qualified to IEEE-344-1975 and were tested to sustain radiation dosages up to 2×10^8 rads.

3.9.3.2.2.3.2 <u>Motor Operated Valves</u>

Motor operated valves are qualified by analysis as a minimum as described above. The analysis for each valve assembly considers the effects of seismic loads, design pressure, and piping reaction forces to provide assurance of operability.

To provide full qualification of the motor operated valve actuator, environmental and seismic qualification tests were conducted to simulate the following conditions:

A. Inside Containment (LOCA)

B. Outside Containment

C. Seismic Qualification

D. Steam Line Break Accident

Mid-size valve actuators were subjected to complete environmental qualification consisting of inside containment and outside containment. Each qualification exposed the actuator to thermal and mechanical aging, radiation aging, seismic aging, environmental transient profile test, and steam line break. For the steam line break test an actuator was subjected to a very high superheated temperature to demonstrate that the electrical components of the actuator never exceeded the saturated temperature corresponding to the ambient pressure for the short duration of the test. This short term test proves the existing qualification envelopes the steam line break for superheated temperatures as high as 492°F for a few minutes.

The qualification of the mid-size valve actuator was used to generically qualify all sizes of mid-size valve actuator operators for the environmental test conditions in accordance with IEEE-382-1972. All sizes are constructed of the same materials with components designed to equivalent stress levels, and to the same clearances and tolerances with the only differnece being in physical size which varies corresponding to the differences in unit rating.

All the qualifications were conducted per IEEE 382-1972 and meet the requirements of IEEE 323-1974 and IEEE 344-1975 as they apply to valve motor actuators. Further, since the actuators performed satisfactorily without maintenance throughout the various qualifications, the valve actuators are fully qualified for use in CE Nuclear Power Generating Plants.

3.9.3.2.2.3.3 Pressurizer Safety Valves

Pressurizer Safety valves are 6 x 8 valves. Operability has been successfully demonstrated by a combination of dynamic testing and analysis or by static testing. Operability was successfully demonstrated with a 6g seismic load by one vendor or with a 7.1g seismic load by another vendor. Dynamic testing has demonstrated that the natural frequency of both valves was greater than 33 Hz. A summary of the test programs follows:

A. Vendor A Safety Valves

1. Natural Frequency Demonstration

Vibration input was in a single, horizontal direction. It was established by previous experience that the horizontal direction was more significant than the vertical direction, and that there was no material difference between teh various horizontal directions. The frequency of vibration was increased from 5 to 75 Hz at a rate of 1 octave per minute. Accelerometers were mounted on the valve assembly. The actual natural frequency under test conditions was 38 Hz.

2. Operability Demonstration

A series of tests demonstrated that the valve would fully open and reseat during and after a seismic acceleration. Vibration input ranged from 3 to 6g and 10 to 33 Hz. The tests were performed using saturated steam. In addition, analysis was used to establish the significance of nozzle loading. The results indicated that deformation was significantly less than the internal clearances. This loading was therefore neglected in the seismic operability tests.

B. Vendor B Safety Valves

1. Natural Frequency Demonstration

A resonance survey was performed along three orthogonal axes with one axis being the centerline of the outlet port. (Valve mounted on inlet port.) No resonant frequencies were detected in the range of 1-50 Hz on any axis.

2. Operability Demonstration

A series of tests demonstrated that the valve would fully open and reseat during and after applying the following loading combinations: Static seismic loads up to 7.1g were applied to the valve in the direction of least bending stiffness. In addition the maximum permissable piping loads were applied concurrently. The tests were performed using saturated steam. Valve operation was satisfactory.

C. EPRI Testing of Safety Valves

One manufacturer's valve was tested in the EPRI Test Program under full pressure and full flow conditions. This testing has demonstrated that stable valve operation under these conditions is dependent upon the inlet pipe configuration, built up back pressure range and blowdown setting. Prior to plant startup the inlet pipe configuration and built up back pressure range for each specific plant will be examined by CE and the applicable valve vendor. If necessary, the valves will be adjusted to provide blowdown settings which will result in stable valve operation. These blowdown settings will be recommended by the vendor and approved by CE. These adjustments will be based on the results obtained in the EPRI Test Program. Required adjustments to the valve to assure operability will be documented in the plant specific FSAR.

3.9.3.2.2.3.4 Check Valves. The check valves are characteristically simple in design and their operation will not be affected by seismic accelerations or the maximum applied nozzle loads. The check valve design is compact and there are no extended structures or masses whose motion could cause distortions which could restrict operation of the valve. The nozzle loads due to maximum seismic excitation will not affect the functional ability of the valve since the valve disc is designed to be isolated from the casing wall. The clearance supplied by the design around the disc will prevent the disc from becoming bound or restricted due to any casing distrotions caused by nozzle load. Therefore, the design of these valves is such that once the structural integrity of the valve is assured using standard design or analysis methods, the ability of the valve to operate is assured by the design features. In addition to these design considerations, the valve will also undergo, (1) stress analysis including the SSE loads, (2) in-shop hydrostatic tests, (3) in-shop seat leakage test, and (4) periodic in-situ valve exercising and inspection to assure the functional ability of the valve.

TABLE 3.9.3-3

NSSS SEISMIC I ACTIVE VALVES

(Sheet 1 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
SI 134	Safety Injection Sys. (Operate)	12	Swing Check	1	None
SI 143	Safety Injection Sys. (Operate)	4	Swing Check	1	None
SI 144	Safety Injection Sys. (Operate)	12	Swing Check	1	None
SI 164	Safety Injection Sys. (Operate)	10	Swing Check	2	None
SI 165	Safety Injection Sys. (Operate)	10	Swing Check	2	None
SI 179	Shutdown Cooling Suction Relief	6 x 10	Relief	2	None
SI 189	(Operate)	6 x 10	Relief	2	None
SI 215	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 217	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 225	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 227	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 235	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 237	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 245	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 247	Safety Injection Sys. (Operate)	14	Swing Check	1	None
SI 321	Safety Injection Sys. (Operate)	3	Globe	2	Motor
SI 322	Safety Injection Sys. (Close)	1	Globe	1	Pneumatic
SI 331	Safety Injection Sys. (Operate)	3	Globe	2	Motor
SI 332	Safety Injection Sys. (Close)	1	Globe	1	Pneumatic
SI 522	Safety Injection Sys. (Operate)	3	Swing Check	1	None
SI 523	Safety Injection Sys. (Operate)	3	Swing Check	1	None
SI 532	Safety Injection Sys. (Operate)	3	Swing Check	1	None
SI 533	Safety Injection Sys. (Operate)	3	Swing Check	1	None

TABLE 3.9.3-3

NSSS SEISMIC I ACTIVE VALVES

(Sheet 2 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
SI 605	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 606	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 607	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 608	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 611	Safety Injection Tank Fill Valve (Close)	2	Globe	2	Pneumatic
SI 613	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 614	Safety Injection Tank Isolation (Operate)	14	Gate	1	Motor
SI 615	LPSI Header Isolation Valve (Operate)	12	Globe	2	Motor
SI 616	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 617	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 618	Leakage Return to RWT (Close)	1	Globe	1	Pneumatic
SI 621	Safety Injection Tank Fill Valve (Close)	2	Globe	2	Pneumatic
SI 623	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 624	Safety Injection Tank Isolation (Operate)	14	Gate	1	Motor
SI 625	LPSI Header Isolation Valve (Operate)	12	Globe	2	Motor
SI 626	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 627	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 628	Leakage Return to RWT (Close)	1	Globe	1	Pneumatic
SI 631	Safety Injection Tank Fill Valve (Close)	2	Globe	1	Pneumatic
SI 633	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 634	Safety Injection Tank Isolation (Operate)	14	Gate	1	Motor
SI 635	LPSI Header Isolation Valve (Operate)	12	Globe	2	Motor

TABLE 3.9.3-3

NSSS SEISMIC I ACTIVE VALVES

(Sheet 3 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
SI 636	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 637	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 638	Leakage Return to RWT (Close)	1	Globe	1	Pneumatic
SI 641	Safety Injection Tank Fill Valve (Close)	2	Globe	2	Pneumatic
SI 643	Safety Injection Tank Vent (Operate)	1	Globe	2	Solenoid
SI 644	Safety Injection Tank Isolation (Operate)	14	Gate	1	Motor
SI 645	LPSI Header Isolation Valve (Operate)	12	Globe	2	Motor
SI 646	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 647	HPSI Header Valve (Operate)	2	Globe	2	Motor
SI 648	Leakage Return to RWT (Close)	1	Globe	1	Pneumatic
SI 651	Shutdown Cooling Suction (Operate)	16	Gate	1	Motor
SI 652	Shutdown Cooling Suction (Operate)	16	Gate	1	Motor
SI 653	Shutdown Cooling Suction (Operate)	16	Gate	1	Motor
SI 654	Shutdown Cooling Suction (Operate)	16	Gate	1	Motor
SI 655	Shutdown Cooling Suction (Operate)	16	Gate	2	Motor
SI 656	Shutdown Cooling Suction (Operate)	16	Gate	2	Motor
SI 690	Safety Injection Sys. (Operate)	10	Globe	2	Motor
SI 691	Safety Injection Sys. (Operate)	10	Globe	2	Motor
SI 157	Safety Injection Sys. (Operate)	18	Swing Check	2	None
SI 158	Safety Injection Sys. (Operate)	18	Swing Check	2	None

TABLE 3.9.3-3

NSSS SEISMIC I ACTIVE VALVES

(Sheet 4 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
SI 200	Safety Injection Sys. (Operate)	20	Swing Check	2	None
SI 201	Safety Injection Sys. (Operate)	20	Swing Check	2	None
SI 205	Safety Injection Sys. (Operate)	24	Swing Check	2	None
SI 206	Safety Injection Sys. (Operate)	24	Swing Check	2	None
SI 306	Safety Injection Sys. (Operate)	10	Globe	2	Motor
SI 307	Shutdown Cooling Sys. (Operate)	10	Globe	2	Motor
SI 404	Safety Injection Sys. (Operate)	4	Swing Check	2	None
SI 405	Safety Injection Sys. (Operate)	4	Swing Check	2	None
SI 424	Safety Injection Sys. (Operate)	2	Lift Check	2	None
SI 426	Safety Injection Sys. (Operate)	2	Lift Check	2	None
SI 434	Safety Injection Sys. (Operate)	10	Swing Check	2	None
SI 446	Safety Injection Sys. (Operate)	10	Swing Check	2	None
SI 448	Safety Injection Sys. (Operate)	2	Lift Check	2	None
SI 451	Safety Injection Sys. (Operate)	2	Lift Check	2	None
SI 484	Safety Injection Sys. (Operate)	10	Swing Check	2	None
SI 485	Safety Injection Sys. (Operate)	10	Swing Check	2	None
SI 486	Safety Injection Sys. (Operate)	2	Lift Check	2	None
SI 487	Safety Injection Sys. (Operate)	2	Lift Check	2	None
SI 604	HPSI Hot Leg Isolation (Operate)	3	Gate	2	Motor
SI 609	HPSI Hot Leg Isolation (Operate)	3	Gate	2	Motor
SI 657	Shutdown Cooling (Operate)	16	Butterfly	2	Motor
SI 658	Shutdown Cooling (Operate)	16	Butterfly	2	Motor

TABLE 3.9.3-3

NSSS SEISMIC I ACTIVE VALVES

(Sheet 5 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
SI 659	Mini Flow Isolation (Operate)	4	Globe	2	Solenoid
SI 660	Mini Flow Isolation (Operate)	4	Globe	2	Solenoid
SI 664	CSP Mini Flow Isolation (Operate)	2	Globe	2	Motor
SI 665	CSP Mini Flow Isolation (Operate)	2	Globe	2	Motor
SI 666	HPSI Pump Mini Flow Isolation (Operate)	2	Globe	2	Motor
SI 667	HPSI Pump Mini Flow Isolation (Operate)	2	Globe	2	Motor
SI 668	LPSI Pump Mini Flow Isolation (Operate)	2	Globe	2	Motor
SI 669	LPSI Pump Mini Flow Isolation (Operate)	2	Globe	2	Motor
SI 671	Containment Spray Isolation Valve (Operate)	8	Gate	2	Motor
SI 672	Containment Spray Isolation Valve (Operate)	8	Gate	2	Motor
SI 673	Sump Suction Isolation (Operate)	24	Butterfly	2	Motor
SI 674	Sump Suction Isolation (Operate)	24	Butterfly	2	Motor
SI 675	Sump Suction Isolation (Operate)	24	Butterfly	2	Motor
SI 676	Sump Suction Isolation (Operate)	24	Butterfly	2	Motor
SI 678	CSP Flow Control Valve (Operate)	10	Butterfly	2	Motor
SI 679	CSP Flow Control Valve (Operate)	10	Butterfly	2	Motor
SI 682	SIT Fill Line (Close)	2	Globe	2	Pneumatic
SI 683	LPSI Pump Suction (Operate)	20	Gate	2	Motor
SI 684	CSP Discharge (Operate)	10	Gate	2	Motor
SI 685	LPSI Discharge (Operate)	10	Gate	2	Motor
SI 686	SDCHX Discharge (Operate)	20	Gate	2	Motor
SI 687	SDCHX Discharge (Operate)	10	Gate	2	Motor

TABLE 3.9.3-3

NSSS SEISMIC I ACTIVE VALVES

(Sheet 6 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
SI 688	SDCHX Spray Bypass (Operate)	10	Gate	2	Motor
SI 689	CSP Discharge (Operate)	10	Gate	2	Motor
SI 692	LPSI Pump Suction (Operate)	20	Gate	2	Motor
SI 693	SDCHX Spray Bypass (Operate)	10	Gate	2	Motor
SI 694	LPSI Discharge (Operate)	10	Gate	2	Motor
SI 695	SDCHX Discharge (Operate)	10	Gate	2	Motor
SI 696	SDCHX Discharge (Operate)	20	Gate	2	Motor
SI 698	HPSI Pump Orifice Bypass (Operate)	4	Gate	2	Motor
SI 699	HPSI Pump Orifice Bypass (Operate)	4	Gate	2	Motor
SI 113	Safety Injection Sys. (Operate)	4	Check	1	None
SI 114	Safety Injection Sys. (Operate)	12	Check	1	None
SI 123	Safety Injection Sys. (Operate)	4	Check	1	None
SI 124	Safety Injection Sys. (Operate)	12	Check	1	None
SI 133	Safety Injection Sys. (Operate)	4	Check	1	None
CH 118	VCT Outlet Check (Operate)	4	Swing Check	2	None
CH 190	Gravity Feedline Check (Operate)	3	Swing Check	2	None
CH 203	Auxiliary Spray (Operate)	2	Globe	1	Solenoid
CH 205	Auxiliary Spray (Operate)	2	Globe	1	Solenoid
CH 240	Charging Line Backpressure (Close)	2-1/2	Globe	1	Pneumatic
CH 255	Seal Inj. Containment Isolation (Open)	1-1/2	Globe	2	Motor
CH 305	RWT Suction Check (Operate)	20	Swing Check	2	None
CH 306	RWT Suction Check (Operate)	20	Swing Check	2	None

TABLE 3.9.3-3

NSSS SEISMIC I ACTIVE VALVES

(Sheet 7 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
CH 328	Charging Line Check (Operate)	2	Lift Check	2	None
CH 331	Charging Line Check (Operate)	2	Lift Check	2	None
CH 334	Charging Line Check (Operate)	2	Lift Check	2	None
CH 431	Auxiliary Spray Check (Operate)	2	Lift Check	1	None
CH 433	Charging Line Check (Operate)	2-1/2	Lift Check	1	None
CH 440	HPSI Header Check (Operate)	2	Lift Check	2	None
CH 494	RMW Supply Line to RDT Check (Operate)	1-1/2	Lift Check	2	None
CH 505	RCP Controlled Bleed-Off Containment Isolation (Close)	1	Globe	2	Pneumatic
CH 506		1	Globe	2	Pneumatic
CH 515	Letdown Isolation Valve (Close)	2	Globe	1	Pneumatic
CH 516		2	Globe	1	Pneumatic
CH 523		2	Globe	2	Pneumatic
CH 524	Charging Line Isolation Valve (Open)	2-1/2	Globe	2	Motor
CH 530	RWT Suction Isolation (Operate)	20	Gate	2	Motor
CH 531		20	Gate	2	Motor
CH 560	RDT Suction Isolation (Close)	3	Globe	2	Pneumatic
CH 561	RDT Suction Isolation (Close)	3	Globe	2	Pneumatic
CH 580	RMW Supply Isolation to RDT Iso. (Close)	1-1/2	Globe	2	Pneumatic
CH 639	Charging Line Check Valve (Operate)	2-1/2	Lift Check	2	None
CH 787	Seal Injection Check (Operate)	1	Lift Check	1	None
CH 802	Seal Injection Check (Operate)	1	Lift Check	1	None
CH 807	Seal Injection Check (Operate)	1	Lift Check	1	None

TABLE 3.9.3-3

NSSS SEISMIC ACTIVE VALVES

(Sheet 8 of 8)

VALVE NO.	SYSTEM NAME (safety function)	LINE SIZE	VALVE TYPE	ASME SECTION III CODE CLASS	ACTUATOR TYPE
CH 812	Seal Injection Check (Operate)	1	Lift Check	1	None
CH 835	Seal Injection Check (Operate)	1-1/2	Lift Check	2	None
CH 866	Seal Injection Check (Operate)	1	Lift Check	1	None
CH 867	Seal Injection Check (Operate)	1	Lift Check	1	None
CH 868	Seal Injection Check (Operate)	1	Lift Check	1	None
CH-869	Seal Injection Check (Operate)	1	Lift Check	1	None
RC 200	RCS (Operate)	6 x 8	Safety	1	None
RC 201	RCS (Operate)	6 x 8	Safety	1	None
RC 202	RCS (Operate)	6 x 8	Safety	1	None
RC 203	RCS (Operate)	6 x 8	Safety	1	None
RC 244	RCS (Operate)	4	Check	1	None
IR 100	Iodine Removal Sys. (Operate)	1	Vacuum Breaker	2	None
IR 118	Iodine Removal Sys. (Operate)	1	Vacuum Breaker	2	None
IR 120	Iodine Removal Sys. (Operate)	1/2	Check	2	None
IR 130	Iodine Removal Sys. (Operate)	1/2	Check	2	None
IR 680	Iodine Removal Sys. (Operate)	1/2	Globe	2	Solenoid
IR 681	Iodine Removal Sys. (Operate)	1/2	Globe	2	Solenoid
IR 682	Iodine Removal Sys. (Operate)	1/2	Globe	2	Solenoid
IR 683	Iodine Removal Sys. (Operate)	1/2	Globe	2	Solenoid

NOTE:

1. (Operate) is defined as valve being capable of both opening and closing.
2. (Close) is defined as valve being capable of moving to or maintaining a closed position.
3. (Open is defined as valve being capable of moving to or maintaining an open position.