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August 18, 1982

Docket No. 50-213
A02466

Director of Nuclear Reactor Regulation
Attn: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Reference: (1) D. M. Crutchfield letter to W. G. Counsil, dated April 26, 1982.

Gentlemen:

Haddam Neck Plant
SEP Topic VI-4, Containment Isolation System

Via Reference (1), the Staff forwarded the draft evaluation of SEP Topic VI-4, Containment Isolation System, for the Haddam Neck Plant. Connecticut Yankee Atomic Power Company (CYAPCO) has reviewed Reference (1) and comments are included at Attachment 1.

We trust the Staff will appropriately incorporate these comments into a revised Safety Evaluation Report for this SEP topic.

Very truly yours,

CONNECTICUT YANKEE ATOMIC POWER COMPANY

W. G. Counsil
Senior Vice President

By: R. P. Werner
Vice President Generation Engineering
and Construction

A035

Docket No. 50-213

ATTACHMENT 1

SEP TOPIC VI-4, CONTAINMENT ISOLATION SYSTEM

July, 1982

1) Staff Comment:

The containment isolation provisions for lines P-23C, P-24A, P-24B, P-24C, P-24D, P-74, P-75, P-76 and P-77 differ from the explicit requirements of GDC 55 from the standpoint of valve number. Lines P-23C, P-24A, P-24B, P-24C, and P-24D are each provided with one locked closed isolation valve outside containment; there is no isolation valve inside containment. The licensee should provide redundant isolation valves in this lines, and justify the valve type, location and actuation provisions.

CYAPCO Reply:

P-24A through P-24D. These locked closed valves are adequate for the following reasons:

1. System design pressure is 2,485 psi.

2. The valves are normally isolated by an MOV until RCS pressure decreases to the SI setpoint.

3. SIS occurs at approximately 1,700 psi, therefore system pressure is well below design pressure.

4. The valves are tested by an ISI program and covered under Appendix J testing.

5. Seismically mounted, QA Category 1 system.

Penetration 23C is seal welded shut and tested per an Appendix J, type A test.

2) Staff Comment:

The containment isolation provisions for lines P-4, P-12A, P-23A and P-64 differ from the explicit requirements of GDC 56 from the standpoint of valve location; these lines have two automatic isolation valves in series outside containment. Locating both containment isolation valves outside containment may be acceptable if the criteria used in the design of the piping between the containment and the first valves are sufficiently conservative to provide adequate assurance of integrity. This matter should be addressed in the integrated assessment of the plant.

CYAPCO Reply:

The design values for the penetrations questioned are as follows:

P-4 this is a 150 psi 500 F system, QA Category 1 valve and penetration.

P-12A this is a 150 psi system tested to 190 psi, QA Category 1 and seismically installed.

P-23A this is a 2,000 psi system, QA Category 1 valve and penetration.

P-64 this is a 150 psi system, QA Category 1 valve and penetration.

These penetrations are isolated on high containment pressure and are powered from vital sources. All valves are covered by ISI program and Appendix J leak test. The design pressure of each system is at least 3 times higher than the containment pressure for the worst case accident. The piping for the penetration is also QA Category 1.

3) Staff Comment:

The containment isolation provisions for line P-23B consist of an automatic isolation valve outside containment and sealed pressure taps inside containment. GDC 57 may apply and, therefore, the single automatic isolation valve may be acceptable, if the licensee can justify that the sealed pressure taps constitute an appropriately designed closed system inside containment. If this cannot be shown, the explicit requirements of GDC 56 must be met.

CYAPCO Reply:

For penetration 23B the draft adequately describes the operation of this sealed system The automatic isolation valve and sealed bulbs provide dual isolation of the containment.

4) Staff Comment:

Lines P-28 and P-38 are equipped with a check valve inside containment, and lines P-29 and P-34 are equipped with an air-operated, automatic isolation valve outside containment. These lines provide for the supply and discharge of reactor coolant pump oil cooler and thermal barrier cooling water. The isolation provisions differ from the explicit requirements of GDC 56 from the standpoint of valve number. Since the lines are non-essential, the isolation provisions should be upgraded to meet the explicit requirements of GDC 56. An automatic isolation valve should be added to lines P-28 and P-38 outside containment, and an automatic isolation valve should be added to lines P-29 and P-34 inside containment.

CYAPCO Reply:

As a result of CYAPCO's review of NUREG-0737 Item II.E.4.2, Containment Isolation, it was determined that post-accident reactor coolant pump operation may be desirable, and as such, these valves are classified as essential and no longer receive a containment isolation signal.

For penetrations 28 and 38, system pressure is greater than containment pressure, and an active failure would result in leakage into the containment. Additionally, ISI and the Appendix J test program cover these penetrations.

For penetrations 29 and 34, the same logic applies. Again, the ISI program and Appendix J testing are employed. For all 4 penetrations, the valve, piping and penetration are QA Category 1.

5) Staff Comment:

The containment isolation provisions for lines P-61 and P-67 consist of a single automatic isolation valve located outside containment. A redundant automatic isolation valve should be provided in each line inside containment, to meet the explicit requirements of GDC 56.

CYAPCO Reply:

See No. 6 in the conclusion section. Additionally the valve, pipe and penetration are QA Category 1.

6) Staff Comment:

The containment isolation provisions for lines P-60, P-66 and P-69 differ from the explicit requirements of GDC 56 from the standpoint of valve number. Each of these lines has a simple check valve inside containment, with no valve outside containment being identified as a containment isolation valve. Since these lines are non-essential, the isolation provisions should be upgraded to meet the explicit requirements of GDC 56.

CYAPCO Reply:

For penetrations P-66 and P-60, system pressure is greater than containment pressure, and an active failure would result in leakage into the containment. Also, these penetrations are covered by ISI and Appendix J testing. These penetrations, and associated valves are QA Category 1.

For penetration P-69, this penetration has an MOV and AOV in parallel which are in series with the check valve in question. The check valve is in series with 4 N.C. MOV's. This provides extremely reliable isolation. Additionally, CH-CK-296 and P-69 are covered by an ISI program and Appendix J leak testing.

7) Staff Comment:

For lines P-65 and P-70, two check valves in series, one inside and one outside containment, are identified as the containment isolation valves. This does not satisfy the explicit requirements of GDC 56 with respect to valve type. A simple check valve outside containment is not an appropriate automatic isolation valve; either a power operated automatic isolation valve or a sealed closed valve should be provided to satisfy GDC 56.

CYAPCO Reply:

Penetration P-65 is isolated by two check valves and a solenoid valve which fails closed on loss of power, and shuts on high containment pressure. It is not only two check valves as stated. This penetration is QA Category 1.

Penetration P-70 is a blank flange with leak test provisions. It also includes two locked close valves. The penetration and valves are QA Category 1.

8) Staff Comment:

Lines P-46, P-47, P-48 and P-49 are the main feedwater lines. Each line has a check valve inside containment, and a flow control valve, in series outside containment, and a remote manual valve in a bypass line around the flow control valve. There is insufficient information regarding the isolation capability of the main feedwater flow control valves and the administrative control exercised over the bypass valves, to make a judgment on their acceptability as containment isolation valves. The licensee should provide this information.

CYAPCO Reply:

For penetrations P-46 through P-49, an AOV and MOV in series are used. Both are powered from vital busses. The feed regulating valves automatically open a reactor or turbine trip to insure an adequate flow of feedwater to the steam generator. This is done to provide a larger heat sink. When T_{AVE} reduces to no load T_{ref}, the valves close. The manual bypasses are administratively closed except during start-up and shut down. During these conditions, the manual valves are used to control S/G water level. Additional back-up MOV's isolate the FWRVs. This system is seismically mounted and a single active failure would not result in a containment leak path.

9) Staff Comment:

Containment isolation provisions for lines P-11A, P-11B, P-11C, P-22D and P-23D differ from the explicit requirements of GDC 56 from the standpoint of valve number. Each of these lines has an air operated automatic isolation valve (for lines P-11A, P-11B, P-11C, P-11D) or a locked closed valve (for lines P-22 and P-23D) located outside containment, and no isolation valve identified inside containment. The isolation provisions for these non-essential lines should be upgraded to meet GDC 56.

CYAPCO Reply:

Penetrations 11A through 11D are isolated on high containment pressure; these valves also fail closed on loss of power. There is ISI and Appendix J testing on these valves and penetrations. These are seismically mounted, QA Category 1 systems.

Penetrations 22 and 23D are locked closed and administratively controlled. These penetrations are leak tested per the requirements of Appendix J, and are QA Category 1.

10) Staff Comment:

Containment isolation provisions for lines P-12B, P-13, P-14, P-33, P-41, P-71 and P-78 differ from the explicit requirements of GDC 56 from the standpoint of valve location. Redundant isolation valves are provided for these lines outside containment. The acceptability of this is contingent on the criteria used in the design of the piping between the containment and first valve; i.e., the piping design should provide adequate assurance of integrity. This matter should be addressed in the integrated assessment of the plant.

CYAPCO Reply:

Penetrations P-12B, P-13, P-14, P-33, P-41, P-71 and P-78 are, as a minimum, 150 psi systems. This provides at least a factor of 3 safety margin above containment pressure following any credible accident. Additionally for those penetrations not normally closed (P-12B, 71) or locked closed (P-33), the isolation valves close or high containment pressure from diverse signals or trains. All penetrations and valves are covered by ISI and Appendix J testing. All penetrations, valves and piping are QA Category 1.

11) Staff Comment:

Containment isolation provisions for lines P-30, P-62 and P-68 differ from the explicit requirements of GDC 56 from the standpoint of valve type. These lines are equipped with two check valves in series, one inside and one outside the containment. A simple check valve outside containment is not an appropriate automatic isolation valve; a power operated automatic valve should be provided outside containment.

CYAPCO Reply:

For penetrations P-30 and P-68, see comment 2 in the conclusion section. Additionally both penetrations are QA Category 1.

For penetration P-62, the two check valves are individually tested to close against reverse flow. This is a QA Category 1 penetraion. There are also two locked closed valves outside containment upstream of the check valves.

12) Staff Comment:

Line P-50, the fuel transfer tube, is equipped with a closed gate valve and a blank flange outside containment. The blank flange does not satisfy the explicit requirements of GDC 56 with respect to the type of isolation barrier. However, a blank flange is an acceptable isolation barrier in lieu of an isolation valve if it is leak

testable. The licensee should address the leak testing provisions for the blank flange.

CYAPCO Reply:

Penetration P-50 has leak test connections and both the gate valve and blank flange are covered by the ISI program and Appendix J. This penetration is also QA Category 1.

13) Staff Comment:

The containment isolation provision for line P-20, the nitrogen supply to the Pressurizer Relief Tank (PRT), differ from the explicit requirements of GDC 56 from the standpoint of valve type. A check valve inside containment and a pressure control valve (PCV 407) outside containment is provided for containment isolation. For the PCV to be an acceptable isolation valve, it must satisfy the requirements for an automatic isolation valve. PCV 407 maintains the downstream pressure at a prescribed pressure. If the downstream pressure is elevated, e.g., in the event of an accident, PCV 407 will automatically close. If the downstream pressure drops below the prescribed value, PCV 407 will open in an attempt to raise the downstream piping pressure. In light of this, the performance characteristics of the valve controls do not satisfy the requirements for an automatic isolation valve. Consequently, line P-20 should be provided with an automatic isolation valve.

CYAPCO Reply:

For penetration P-20, see #4 in the conclusion section.

14) Staff Comment:

The isolation provisions for the containment purge system exhaust (P-39) and supply lines (P-40) differ from the explicit requirements of GDC 56 from the standpoint of isolation barrier type. Locked closed isolation valves are provided inside containment, which is acceptable, but blind flanges are provided outside containment. Blind flanges are acceptable alternate isolation barriers provided they are leak testable; the licensee should address this aspect.

CYAPCO Reply:

Penetration P-39 and P-40 have leak test provisions and periodic inspection programs (see P-50). These penetrations are QA Category 1.

15) Staff Comment:

The isolation provisions for the containment fire water supply line (P-80) differ from the explicit requirements of GDC 56 from the standpoint of the number of valves. The licensee only identifies a single check valve inside containment for isolation of the line. However, a motor-operated valve (MOV 31) is shown outside containment, which may also be a suitable containment isolation valve. Since the

isolation provisions for line P-80 should be upgraded to meet GDC 56, the licensee should describe the design and operating characteristics of MOV 31, and the written procedures in effect to control its use, to justify the acceptability of the valve for containment isolation.

CYAPCO Reply:

The single MOV at P-80 provides the highest degree of reliability. This connection is used to supply containment spray from the fire system, if other sources are exhausted. Since its use is a last course of action, its reliability needs to be assured. The valve combination selected provides this assurance. The MOV is Appendix J leak tested and is normally closed. This penetration, pipe and valve are QA Category 1.

16) Staff Comments:

Containment isolation provisions for the containment fan cooler supply and discharge lines (P-51, P-52, P-53, P-54, P-55, P-56, P-57 and P-58) differ from the explicit requirements of GDC 57 from the standpoint of valve number. There is no valve identified as a containment isolation valve on either the supply or discharge lines. Each line should be equipped with a power operated remote manual isolation valve outside containment, to satisfy GDC 57. Since these lines have a post-accident safety function (containment heat removal), automatic isolation is not appropriate.

CYAPCO Reply:

These penetrations are covered in response #5 in the conclusions' section.

17) Staff Comments:

Where remote manual isolation valves are used, the capability to detect system leakage to alert the operator of the need to isolate a line should be provided. The licensee should address this issue.

CYAPCO Reply:

There is an existing leak monitoring system. System alarms provide indication of individual system leakage within the containment. Visual inspections and Technical Specifications provide assurance of systems integrity.

VI. Conclusions

The following summarizes the evaluation of the containment isolation provisions, including deviations from the review guidelines that have been identified and described in Section V of this report:

1. The penetrations listed below have two isolation valves in series outside containment: P-4, P-12A, P-12B, P-13, P-14, P-23A, P-33, P-41, P-71 and P-78. The acceptability of locating both valves outside containment is contingent on the acceptability of the piping design criteria. Also, the licensee should discuss the unique characteristics of the valve closest to the containment to terminate valve shaft or bonnet seal leakage, or the provisions in the plant for control of leakage.

   CYAPCO Reply:

   > "These penetrations are covered by Appendix J leak testing. The design of the piping systems is in all cases at least 3 times higher than the design pressure of the containment. An ISI program is used to determine valve leakage, and insure component integrity.
   >
   > The following penetrations have automatic isolation signals on high containment pressure; P-4, P-12A, P-13, P-14, P-23A, P-41, P-78, and are individually tested to insure their operability.
   >
   > Penetration 12B is locked closed, except when Neutron Shield Tank samples are drawn.
   >
   > Penetration 33 is locked closed and only used during cavity purification during refueling.
   >
   > Penetration 71 is a manual ball valve used to vent the RCS following refilling; it is closed at all other times. ISI inspection for this type of valve yield 0.07 lb./day of leakage at design pressure. This is well within the boundaries established during SEP XV-16 review.
   >
   > A comprehensive maintenance and inspection program is used to insure minimal valve stem leakage. Body to bonnet leakage would be cause for repair."

2. The penetrations listed below have simple check valves outside containment in series with other valve types or check valves: P-3, P-30, P-65, P-68 and P-70. A simple check valve located outside containment is not an appropriate automatic isolation valve. The judgment regarding its acceptability should be made in conjunction with the integrated assessment of the plant.

CYAPCO Reply:

"Penetration P-30 contains two check valves in series. The system does not communicate with containment atmosphere and is inspected to the requirements of Appendix J.

Penetration P-65 is isolated by a fail closed solenoid valve. Redundant pressure signals are used to close this valve. In addition, there is an ISI inspection program for this valve and penetration. Only one check valve is Appendix J tested.

Penetration 68 has two check valves in series, each is individually reverse tested. An active failure of either check valve would not result in a containment leakage path.

Penetration P-70 has a blank flange installed on it which is Appendix J tested."

4. The following penetration has manual valves serving as containment isolation valves: P-20. A local manual valve is not an acceptable containment isolation valve. The license should implement administrative controls on all manual valves used for containment.

CYAPCO Reply:

"P-20 is being modified to include an automatic isolation valve outside and a check valve inside containment. This is planned to be installed during the next refueling outage, currently scheduled for early 1983."

5. The following penetrations have no isolation valves identified: P-51, P-52, P-53, P-54, P-55, P-56, P-57 and P-58. The licensee should justify the applicability of GDC 57 and provide isolation capability which meets GDC 57 requirements.

CYAPCO Reply:

"Penetrations P-51 through P-58 are seismically designed and are part of a closed system within containment. The system is inspected for leakage on a weekly basis. An active failure would not cause these penetrations to become a leakage path from the containment. Since cooling is required for the containment, post accident, and the system is seismically designed, the lack of AOV or MOV's increases the reliability of the system to perform its post accident function."

6. The following penetrations have only one isolation valve identified: P-11A, P-11B, P-11C, P-11D, P-23C, P-23D, P-24A, P-24B, P-24C, P-24D, P-28, P-29, P-34, P-38, P-60, P-61, P-66,

P-67, P-69, and P-80. Since they are non-essential lines, the isolation provisions should be upgraded to meet GDC 55 and 56.

CYAPCO Reply:

"For penetrations P-11A through P-11D, P-34, P-67, P-69, these are automatically isolated on high containment pressure. Additionally, loss of power causes these air operated valves to close. All of them are leak tested per the requirements of Appendix J.

Administrative controls are imposed on penetrations P-22, P-24A through P-24D as these valves are locked closed. Although the valves are locked shut, they are also tested per the Appendix J requirements.

Penetrations P-23D, P-29 and P-61 are isolated by air operated valves controlled from DC power supplies. These valves are tested for leakage and integrity during the Appendix J local leak rate testing.

Penetrations P-28, P-38, P-60 and P-80 have a check valve inside containment. In all cases the system pressure is greater than the design pressure of the containment, insuring a flow into containment. These check valves are tested to insure they seal under reverse flow condition preventing them from being a credible leak path from the containment. These penetrations are covered by Appendix J testing."

7. The following penetrations have lines equipped with blind (blank) flanges: P-39, P-40, P-50 and P-70. A blind flange, either inside or outside containment, is an acceptable isolation barrier in lieu of an isolation valve. However, a blind flange without leak testing provisions is not a suitable isolation barrier.

CYAPCO Reply:

"These penetrations are all covered by ISI test procedures and the Appendix J criteria."

8. GDC 55 and 56 specify that automatic isolation valves should, upon loss of actuating power, take the position that provides greater safety. The position of an isolation valve for normal and shutdown operating conditions, and post-accident conditions, depends on the fluid system function. In the event of power failure to a valve operator, the valve position should be consistent with the line function. In this regard, separate power supplies for isolation valves in series may be required to assure the isolation of non-essential lines. Since there is no information available which discusses whether and how power operated valves change position on loss of actuating power, the licensee should provide this information.

CYAPCO Reply:

Penetration No.	Valve No.	L.O.P. Position
P-1	RH-FCV-796	F.O.
	RH-V-803	FAI
	RH-V-34	FAI
	RH-V-23	FAI
	RH-V-872A	FAI
P-2	RH-V-781	FAI
P-4	WG-AOV-558	FC
P-7	CH-AOV-334	FC
	CH-MOV-331	FAI
P-8	CH-FCV-110	F.O.
	CH-FCV-110A	F.O.
P-10	LD-MOV-200	FAI
	LD-FCV-202	FC
	LD-FCV-203	FC
	LD-FCV-204	FC
P-11	SS-950	FC
	SS-955	FC
	SS-960	FC
	SS-965	FC
P-12A	DH-TV-1842A	F.O.
	DH-TV-1842B	FC
P-13	WD-HICV-1840	FC
P-14	DH-TV-1843	F.O.
P-15	BD-TV-1312-1	F.O.
P-16	BD-TV-1312-2	F.O.
P-17	BD-TV-1312-3	F.O.
P-18	BD-TV-1312-4	F.O.
P-23	LM-TV-1812	F.O.
	LM-TV-1811A	F.O.
P-29	CC-TV-1411	F.O.
P-34	CC-FCV-608	FC
P-41	TV-1841	FC
	MOV-310	FAI
P-46	FW-MOV-14	FAI
P-47	FW-MOV-13	FAI
P-48	FW-MOV-12	FAI
P-49	FW-MOV-11	FAI
P-61	CC-TV-1831	F.O.
P-64	RM-TV-1848	F.O.
P-65	SOV-12-1	FC
P-67	CC-FCV-611	FC
P-69	CH-344	FAI
	CH-295	FC
P-78	AOV-554	FC
P-80	MOV-31	FAI

"The isolation valves are powered from vital busses. The MOV's fail "as-is," the containment isolation valves powered from the 120 VAC busses fail close on loss of

power. The balance of the air operated containment valves are powered from D.C. busses. In the unlikely event that all D.C. power is lost, these valves fail open."

9. It is noted that many lines have branch lines, serving as vent, drain, test or sample lines, containing local manual valves. These valves are typically not accounted for (but should be) in the compilation of containment isolation valves. Nevertheless, for these valves to be effective containment isolation valves, they must be administratively controlled closed, and, as the case may be, there must be written procedures in effect governing their use during normal plant operation. The licensee should address this matter.

CYAPCO Reply:

"The valves used as test connections, etc., are administratively controlled. Each containment penetration has an individual surveillance procedure. Within the body of each procedure is a valve line-up. Upon completion of testing, the valves are closed and checked by two individuals. Additional paperwork reviews are conducted prior to completion of testing. This diverse review reduces the probability of any unaccounted for containment leak path."

10. In order to assure that the containment isolation system review is accurate and complete, the licensee should provide the following information for all containment penetrations in tabular form:

a. Containment penetration number;

b. System affiliation/line function;

c. Fluid contained;

d. Line size (inches);

e. Essential or non-essential;

f. Reference to P&ID showing arrangement of containment isolation barriers (include updated P&IDs, if available);

g. Isolation valve number;

h. Location of valve (inside or outside containment);

i. Valve type and operator;

j. Primary mode of valve actuation;

k. Secondary mode of valve actuation;

l. Normal valve position;

m. Shutdown valve position;

n. Post-accident valve position;

o. Power failure valve position;

p. Containment isolation signals (including parameters sensed);

q. Valve closure time; and

r. Power source.

CYAPCO Reply:

The requested information is provided in the attached table.

Pen. No.	System	Fluid	Size (in.)	Essential (E) Non-Essential (N)	P/ID 16103-	Isol. Valve No.	Location In. Cont. (IC) Out. Cont. (OC)	Valve Type and Oper.	Pri. Mode of Oper.	Sec. Mode	Normal Posit.	Shut Down Posit.	Post-Acc. Posit.	L.O.P. Posit.	Closure Time	Cont. Isol. Signal	Power Source
1	RHR	H_2O	10"	E	26008	RH-FCV-796	OC	AOV	AIR	-	C	O	O	FO	-	SIS	120 VAC
						RH-V-803	IC	MOV	ELEC.	-	C	O	O	FAI			MCC 5-1, Bus 5-6
						RH-V-34	IC	MOV	ELEC.	-	C	O	O	FAI			MCC 5-1, Bus 5-5
						RH-V-23	IC	MOV	ELEC.	-	C	O	O	FAI			MCC 5-1, Bus 5-6
						RH-872A	IC	MOV	ELEC.	-	C	O	O	FAI			MCC 5-1, Bus 5-5
						RH-872B	IC	MOV	ELEC.	-	C	O	O	FAI			MCC 5-1, Bus 5-6
2	RHR	H_2O	10"	E	26008	RH-V-781	IC	MOV	ELEC.	-	C	O	O	FAI			MCC 5-1, Bus 5-6
3	HPSI	H_2O	12"	E	26019	SI-CV-862A, B C, D	IC	CHECK	-	-	-	-	-	-	-	-	-
4	PRT VENT	GAS	1-1/2"	N	26005	WG-AOV-558	OC	AOV	AIR	-	O	O	C	FC	60S	Cont. Hi-Press.	120VAC
						SS-V-984A	OC	MAN			O	O	O	FAI			
						WG-TV-1845	OC	MAN			O	O	O	FAI			
5	S P A R E																
6	H_2 MON.	GAS	1/2"	N	26009										-	-	-
						SS-SOV-150A	OC	SOLE-NOID	ELEC.		NC	NC	O	C			
						SS-SOV-150B	OC		ELEC.		NC	NC	O	C			
						SS-SOV-150C	OC		ELEC.		NC	NC	O	C			
						SS-SOV-150D	CC		ELEC.		NC	NC	O	C			
7	CH-RCPS	H_2O	4"	N	26018	CH-AOV-334	OC	AOV	AIR	-	O	O	C	FC		Cont. Hi-Press.	
						CH-331	IC	MOV	ELEC.	-	O	O	O	FAI	60		MCC 5-1, Bus 5-5
8	CH-CHGING	H_2O	3"	N	26018	CH-CV-399	IC	CHK									
						CH-FCV-110	OC	AOV	AIR	-	T	C	O	FO			120 VAC
						FCV-110A	OC	AOV	AIR	-	C	C	C	FO			120 VAC
9	H_2 SMPL	AIR H_2	1/2	E	26009												
						SS-SOV-151A	OC	SOLE-NOID	ELEC.		NC	NC	O	C			
						SS-SOV-151B	OC				NC	NC	O	C			
						SS-SOV-151C	OC				NC	NC	O	C			
						SS-SOV-151D	OC				NC	NC	O	C			
10	CH-LD	H_2O	3"	N	26018	LD-MOV-200	IC	MOV	ELEC.		O	O	C	FAI		SIS	MCC 5-1, Bus 5-6
						LD-FCV-202	OC	AOV	AIR		O	O	C	FC			
						203	OC	AOV	AIR		VARIES		C	FC	60S	Cont. Hi-Press.	120 VAC
						204	OC	AOV	AIR		VARIES		C	FC			
11	SAM-PLE	H_2O	3/8" x 4	NE	26009	SS-950	OC	AOV	AIR		NC	NC	C	FC	60	Cont. Hi-Press.	120 VAC
						SS-955	OC	AOV	AIR		NC	NC	C	FC	60		
						SS-960	OC	AOV	AIR		NC	NC	C	FC	60		
						SS-965	OC	AOV	AIR		NC	NC	C	FC	60		

Pen. No.	System	Fluid	Size (in.)	Essential (E) Non-Essential (N)	P/ID 16103-	Isol. Valve No.	Location In. Cont. (IC) Out. Cont. (OC)	Valve Type and Oper.	Pri. Mode of Oper.	Sec. Mode	Normal Posit.	Shut Down Posit.	Post-Acc. Posit.	L.O.P. Posit.	Closure Time	Cont. Isol. Signal	Power Source
12A	VLv. STEM LK	H_2O	1/2"	NE	26005	DH-TV-1842A	OC	AOV	AIR		O	O	C	FO	60	Cont. Hi-Press.	125 VDC Isolated by DH-TV-1842B
						DH-TV-1842B	OC	AOV	AIR		O	O	O	FAI			
12B	NST SMPL	H_2O	1/2"	NE	26003	SS-V-999	OC	DIAPH.	MAN		C	C	C	C			
					26009	SS-V-999A	OC	DIAPH.	MAN		C	C	C	C			
13	RC SUMP DISCH.	H_2O	2"	NE	26005	WD-HICV-1840	OC	AOV	AIR		O	O	C	FC	60	Cont. Hi-Press. A & B	125 VDC
						WD-TV-1846	OC	AOV	AIR		O	O	O	FC			
14	SEAL LEAK-OFF	H_2O	4"	NE	26005	DH-TV-1843	OC	AOV	AIR		O	O	C	FO	60	Cont. Hi-Press.	125 VDC
15	S/G BLOW-DOWN	H_2O	2"	NE	26015	BD-V-504	IC	GATE	-		O	O	O	O			
						BD-TV-1312-1	OC	AOV	AIR		O	O	C	FO	60	Cont. Hi-Press.	125 VDC
						BD-V-506	OC	GLOBE	MAN		O	O	O	O			
16	S/G BD	H_2O	2"	N	26015	BD-V-512	IC	MAN GATE	-		O	O	O	O			
						BD-TV-1312-2	OC	AOV	AIR		O	C	C	FO	60S	HCP	125 VDC
						BD-V-515	OC	GLOBE	MAN		O	O	C	O			
17	S/G BD	H_2O	2"	N	26015	BD-V-519	IC	MAN GATE	-		O	O	O	O			
						BD-V-522											
						BD-TV-1312-3	OC	AOV	AIR		O	C	C	FO	60S	HCP	125 VDC
18	S/G BD	H_2O	2"	N	26015	BD-V-526	IC	MAN GATE			O	O	O	O			
						BD-V-529											
						BD-TV-1312-4	OC	AOV	AIR		O	C	C	FO	60S	HCP	125 VDC
19	S P A R E																
20	N_2	N_2	3/4"	N	26055	NG-CU-557	OC IC	REGU-LATOR CK			O	O	O	O			
21	S P A R E																
22	HTG	H_2O	3"	N		HCV-212	OC	LC GATE			LC	LC	LC	LC			
						HCV-212A		GATE			O	O	O	O			
23	LEAK DET.	AIR	4-3/8"	N	26051	LM-TV-1812	OC	AOV	AIR		O	O	O	FO	60S	HCP	125 VDC
						LM-TV-1811A	OC	AOV	AIR		O	O	O	FO	60S	HCP	125 VDC
						LM-TV-1811B	OC	AOV	AIR		O	O	O	FO	60S	HCP	125 VDC
24	HPSI RECIR.	H_2O	4-1/2"	N	26019	SI-V-863A	OC	MAN			LC	LC	LC	LC			
						863B	OC	MAN			LC	LC	LC	LC			
						863C	OC	MAN			LC	LC	LC	LC			
						863D	OC	MAN			LC	LC	LC	LC			
25																	
26	S P A R E S																
27																	

Pen. No.	System	Fluid	Size (in.)	Essential (E) Non-Essential (N)	P/ID 16103-	Isol. Valve No.	Location In. Cont. (IC) Out. Cont. (OC)	Valve Type and Oper.	Pri. Mode of Oper.	Sec. Mode	Normal Posit.	Shut Down Posit.	Post-Acc. Posit.	L.O.P. Posit.	Closure Time	Cont. Isol. Signal	Power Source
28	CC	H_2O	8"	E(N)	26017	CC-V-852 CC-CV-853	OC IC	GATE CHECK			O	O	O	O			
29	CC	H_2O	8"		26017	CC-TV-1411	OC	AOV GLOBE			T	T	C	FO	60S	Hi Cont. Press.	125 VDC
30	HTG	H_2O	6"	N		VCF-12B FCW-15A CV-295 CV-295A	OC IC OC IC	CHK CHK CHK CHK									
31 32	S P A R E																
33	CAV-ITY PURIF.	H_2O	3"	N	26005	VDS-15Y PV-V-242 PV-V-242A	OC OC OC	GATE GATE			LC LC LC	LC LC LC	LC LC LC	LC LC LC	Refueling Use Only Refueling Use Only Refueling Use Only		
34	CCW FRM RCP's	H_2O	3"	N	26008	CC-FCV-608	OC	AOV	Air		T	T	C	FC	60S	Cont. Hi-Press.	120 VAC
35 36 37	S P A R E																
38	CCW TO RCP's	H_2O	3"	N	26008	CC-V-721	IC	CHK									
39	PURGE EXH.	AIR	42"	N	26024	BV-1-1B HC-V-1011	OC OC	BUTTER-FLY	MAN		C C	O C	C C	C C			
40	PURGE INLET	AIR	42"	N	26004	BV-1-1A	OC	BUTTER-FLY	MAN		C	O	C	C			
41	LOOP DRN	H_2O	4"	NE	26005	RV-1847 TV-1841 MOV-310	OC OC IC	RELIEF AOV MOV	 AIR ELEC.		S O O	S O O	S S S	S FC FAI	 60S	 Cont. Hi-Press.	 120 VAC MCC 5-1, Bus 5-5
42 43 44 45	MN. STM	STM	24"	N	26015	MS-TV-1211-1 1211-2 1211-3, 4	OC	MAN WITH AIR ASSIT.			O O O O	C C C C	C C C C	C C C C	10S	Close on Excess Flow	
46	FEED WTR	H_2O	12"	N	26016	FW-MOV-14 HOV-1312-4 143-4	OC IC	MOV MAN. CHECK	ELEC.		O C	C C	C C	FAI C			MCC 5-1, Bus 5-6
47	FEED WTR	H_2O	12"	N	26016	MOV-13 HCV-1312-3 143-3	OC OC IC	MOV MAN CHECK	ELEC.		O C	C C	C C	FAI C			MCC 5-1, Bus 5-6
48	FW	H_2O	12"	N	26016	FW-MOV-12 HCIV-1312-2 143-2	OC OC IC	MOV MAN CHK	ELEC.		O C	C C	C C	FAI C			MCC 5-1, Bus 5-5
49	FW					MOV-11 HCIV-1312-11 143-1	OC OC IC	MOV MAN CHK	ELEC.		O C	C C	C C	FAI C			MCC 5-1, Bus 5-5

Pen. No.	System	Fluid	Size (in.)	Essential (E) Non-Essential (N)	P/ID 16103-	Isol. Valve No.	Location In. Cont. (IC) Out. Cont. (OC)	Valve Type and Oper.	Pri. Mode of Oper.	Sec. Mode	Normal Posit.	Shut Down Posit.	Post-Acc. Posit.	L.O.P. Posit.	Closure Time	Cont. Isol. Signal	Power Source
50	FUEL X-FER	H_2O	20"	NE			IC	GATE	MAN		C	C	C	C			
						SW-V-											
51						264	OC	GATE	M		O	O	O	O			
52						266	OC	GATE	M		O	O	O	O			
53						268	OC	GATE	M		O	O	O	O			
54						270	OC	GATE	M		O	O	O	O			
	CC	H_2O	6"	E	26017												
55						CV-271A	IC	CHK									
56						271B	IC	CHK									
57						272C	IC	CHK									
58						272D	IC	CHK									
59	S P A R E																
60	SHLD TNK CLG	H_2O	3"	NE	26005	CC-VCS 60A CC-V-885	IC	CHK									
61	SHLD TNK CLG	H_2O	3"	N	26005	CC-TV-1831	OC	AOV	-		O	O	C	FO	60S	Hi-Cont. Press.	125 VDC
62	S. AIR	AIR	2"	N	26051	SA-CV 417	IC	CHK									
						CV-415	OC	CHK									
						SA-V-411	OC	MAN			LC	LC	LC	LC			
						SA-V-410	OC	MAN			LC	LC	LC	LC			
						SA-V-413	OC	MAN			LC	LC	LC	LC			
63	SHLD TNK FILL	H_2O	2"	N	26005	VCS-60A	IC	CHK									
						CC-V-884	OC	MAN			LC	LC	LC	LC			
64	AIR	AIR	2"	N		RM-TV-1848	OC	AOV			O	O	C	FO	60S	HCP	125 VDC
						SOV-12-1	OC	SOLENOID			O	O	C	FC			
65	AIR	AIR	2"	N		VS-CV-1104 VS-CV-1105		SOLE-NOID	ELEC.		O	O	C	FC	60S	HCP	120 VAC
66	DRN CLR CLNG	H_2O	3"	NE	26008	CC-CV-731	IC	CHK									
67	DRN CLR CLNG	H_2O	3"	NE	26008	CC-FCV-611	OC	AOV	AIR		O	O	C	FC	60S	Hi-Cont. Press.	120 VAC
68	PGW S	H_2O	2"	NE	26046	PW-CV-139	OC	CHK									
						CV-140	IC	CHK									
69	CH	H_2O	2"	N	26018	CH-344	OC	MOV	ELEC.		C	C	C	FAI			MCC 5-1, Bus 5-5
						295	OC	AOV	AIR		C	C	C	FC			
						296	IC	CHK									
70	IA	AIR	2"	N	B L A N K F L A N G E												
71	VENT POT	H_2O	2"	N	26005	VH-V-507	OC	BALL	MAN		C	C	C	C			
72	PS-18165														Cont. Press. Monitor & Switch		
73	N O S U C H P E N E T R A T I O N																

Pen. No.	System	Fluid	Size (in.)	Essential (E) Non-Essential (N)	P/ID 16103-	Isol. Valve No.	Location In. Cont. (IC, Out. Cont. (OC)	Valve Type and Oper.	Pri. Mode of Oper.	Sec. Mode	Normal Posit.	Shut Down Posit.	Post-Acc. Posit.	L.O.P. Posit.	Closure Time	Cont. Isol. Signal	Power Source
74	CH	H_2O	2-1/2"	N	26018	CH-302D -305D	OC IC	GLOBE CHK	MAN		T	T	T	T			
75	CH	H_2O	2-1/2"	N	26018	302C 305C	OC IC	GLOBE CHK	MAN		T	T	T	T			
76	CH	H_2O	2-1/2"	N	26018	CH-302B 305B	OC IC	GLOBE CHK	MAN		T	T	T	T			
77	CH	H_2O	2-1/2"	N	26018	CH-302A 305A	OC IC	GLOBE CHK	MAN		T	T	T	T			
78	PRT DRN	H_2O	2	N	26005	AOV-554	OC	AOV	AIR		O	O	C	FC	60S	Hi-Cont. Press.	120 VAC
79	S P A R E																
80	AUX SPRAY FROM FIRE HDR	H_2O	8"	E	26005	MOV-31 VC-W-15A	OC IC	MOV CHK			S	S	S	FAI			MCC 5-1, Bus 5-5
81	AUX FEED	H_2O	4"	E	26016	FW-CV-182 FW-CV-192 FW-CV-194 FW-CV-196 FW-CV-198	OC IC IC IC IC	CHK CHK CHK CHK CHK									