SAFETY INJECTION AND REFUELING WATER TANK DESIGN PARMETERS

Nominal Volume	285,000 Gallons
Contained Liquid	Boric Acid (1,720-2,500ppm)
Minimum During Operation	250,000 Gallons
Liquid Temperature	40°F-105°F
Diameter/Height	46 Feet/24 Feet
Material	Aluminum
Design Temperature	125°F
Design Pressure	Atmospheric

LOW PRESSURE SAFETY INJECTION PUMP DATA SUMMARY

Quantity	2
Type	Single Stage, Horizontal, Centrifugal
Design Pressure	500 psig
Design Temperature	350°F
Design Flow Rate	3,000 gpm
Design Head	350 ft
Pumped Fluid	1% Boric Acid, Nominal <15,000 ppm Boric Acid, Maximum (Design)
Temperature of Pumped Fluid	40° - 325°F
Shutoff Head	410 ft
Maximum Flow	4,500 gpm
Head at Maximum Flow	250 ft
Basic Material	316 SS (see Table 6-10)
Horsepower	400
Seals	Mechanical
Acceleration Time	4 Seconds
Minimum Flow	163 gpm
NPSH Required at 3,000 gpm	11 ft
Maximum Normal Suction Pressure	270 psia

HIGH PRESSURE SAFETY INJECTION PUMP DATA SUMMARY

Quantity	2
Type	Multistage, Horizontal, Centrifugal
Design Pressure	1,750 psig
Design Temperature	350°F
Design Flow Rate	300 gpm
Design Head	2,500 ft
Pumped Fluid	1% Boric Acid, Nominal <15,000 ppm Boric Acid, Maximum (Design)
Temperature of Pumped Fluid	40° - 300°F
Shutoff Head	2,800 ft
Maximum Flow	680 gpm
Head at Maximum Flow	850 ft
Material	Stainless Steel
Horsepower	400
Shaft Seal	Mechanical
Acceleration Time	4 Seconds
Normal/Minimum Recirc Flow	30 gpm/25 gpm
NPSH Required at 600 gpm	17 ft
Maximum Suction Pressure	250 psig

SHUTDOWN COOLING HEAT EXCHANGER DATA SUMMARY

Quantity	2
Type	Shell and Tube
Code	ASME, Section III, Class C, 1965, TEMA, Class R
Tube Side	
Fluid	Primary Coolant, 1% Boric Acid, Nominal <15,000 ppm Boric Acid, Maximum (Design)
Design Pressure	500 psig
Design Temperature	400°F
Pressure Loss, 1,500,000 lb/h	5 psi
Materials	Austenitic Stainless Steel
Shell Side	
Fluid	Component Cooling Water
Design Pressure	150 psig
Design Temperature	200°F
Pressure Loss, 2,000,000 lb/h	10 psi
Materials	Carbon Steel
Operating Parameters	(27.5 Hours After Shutdown Assuming an Infinitely Irradiated Core)
Tube Side	
Flow	1,500,000 lb/h
Inlet Temperature	130°F
Outlet Temperature	111.7°F

SHUTDOWN COOLING HEAT EXCHANGER DATA SUMMARY

Shell Side

Flow	2,000,000 lb/h
Inlet Temperature	90°F
Outlet Temperature	103.5°F
Heat Transfer	27,500,000 Btu/h

SAFETY INJECTION TANK DESIGN PARAMETERS

Quantity	4
Type	Vertical Right Cylinder
Design Pressure	250 psig
Design Temperature	200°F
Liquid Volume (min/max)	1040/1176 ft^3/Tank
Combined Liquid Discharge	30,000 Gallons
Pressuring Cover Gas	Nitrogen
Height	34 Feet 6 Inches
Outside Diameter	9 Feet 2 Inches
Material	Carbon Steel With Type 304L Stainless Steel Clad
Contained Liquid	1720 ppm Boric Acid, Nominal 15,000 ppm Boric Acid, Maximum (Design)

CONTAINMENT SPRAY SYSTEM COMPONENT DESCRIPTION

1. Containment Spray Pumps

Number of Units - 3

Type - Vertically Split, Horizontal Centrifugal With Mechanical Seals and Backup Packed Gland

Material - 316 Stainless Steel

Code - Motor, NEMA; Pump, Standards of the Hydraulics Institute, 11th Edition, 1965, ASA B31.1-1955; ASA B16.5-1961

	Injection	Recirculation
Design Capacity (Each)	1,340 gpm	1,800 gpm
Design Head	450 ft	405 ft
Design NPSH Required	13.2 ft	17.8 ft
Temperature Transient	40° - 300°F in 5 Seconds	
Motor	250 hp, 3 Ph, 60 Hz, 2,300 V	
Pumps Acceleration Time	4 Seconds at 70% Voltage	
Pumped Fluid	1% Boric Acid, Nominal 15,000 ppm Boric Acid, Maximum (Design)	

2. Shutdown Cooling Heat Exchangers

Number of Units - 2

Capacity (Each) - 83.5×10^6 Btu/h Based on 4,000 gpm of Cooling Water at 114°F Inlet Temperature and 1,420 gpm of Spray Water at 283°F Inlet Temperature

CONTAINMENT SPRAY SYSTEM COMPONENT DESCRIPTION

3. Piping, Fittings and Valves

A. Suction Material - Type 304 Stainless Steel

Pipe Sizes	Wall Thickness
2" and Smaller	Sch 40S
2-1/2" Through 12"	Sch 10S
14" Through 20"	0.250" Nominal Wall
24"	0.375" Nominal Wall

Design Pressure - 60 psig

Design Temperature – 300°F

Construction	2-1/2" and Larger	-	Butt-Welded Except at Flanged Equipment
	2" and Smaller	-	Socket Welded Except at Screwed Equipment
Valves	2" and Larger	-	Stainless Steel, Butt-Welded, 150 lb
	1-1/2" and Smaller	-	Stainless Steel, Socket Welded, 150 lb
Testing		-	100% Radiography of Welded Joints
Code		-	ASA B31.1-1955 and Code Cases N2 and N10

B. Discharge Material - Type 304 Stainless Steel

Pipe Sizes	Wall Thickness
8" and Smaller	Sch 40S
10" Through 14"	0.250" Nominal Wall

Design Pressure - 500 psig

Design Temperature – 350°F

Valves	2" and Larger	-	Stainless Steel, Butt-Welded, 300 lb
	1-1/2" and Smaller	-	Stainless Steel, Socket Welded, 600 lb
Testing		-	100% Radiography of Welded Joints
Code		-	ASA B31.1-1955 and Code Cases N2 and N10

CONTAINMENT SPRAY SYSTEM COMPONENT DESCRIPTION

4. Spray Nozzles

Type	- Sprayco, Model 1713A
Material	- 304 Stainless Steel
Number	- 77 Nozzles on A Spray Header - 83 Nozzles on B Spray Header
Maximum Spray Droplet Size	- 1800 microns at 16 psid (Mass Mean Diameter)
Capacity	- Refer to FSAR Figure 6-7

CONTAINMENT AIR COOLER COMPONENT DESCRIPTION

Coils (VHX-1, VHX-2 and VHX-3 Safety Related & VHX-4 Non-Safety)

Coils per Cooler Unit	4
Rows of Tubes per Coil	12
Face Area of Each Coil	20.54 ft^2
Total Coil Face Area per Cooler Unit	82.16 ft^2
Tubes per Row	36
Tube Description	5/8" OD Copper x 0.049" Wall
Tube Design Pressure	150 psig
Fin Description	3/8" High x .012 Thick Copper Plate with 9.4 Fins per Inch (Mechanical Bond)
Normal Pressure Drop Across Coil (Air Side)	1.54 in. wg
Maximum Pressure Drop Across Coil (Air Side, Accident Condition)	1.68 in. wg
Normal Pressure Drop Through Coil (Water Side)	16 ft H_2o
Maximum Pressure Drop Through Coil (Water Side, Accident Condition)	12.7 ft H_2o

Fans (V1, V2, V3 and V4)

Fan Speed	1,750 r/min
Number of Fans per Cooler Unit	2
Fan Capacity (Each)	
"A" 75 HP (accident)	30,000 ft^3/min at 4.5" H_2O
"B" 30 HP (normal)	30,000 ft^3/min at 4.0" H_2O
Total Airflow Through Cooler(Normal)	60,000 ft^3/min
Total Airflow Through Cooler(Accident)	30,000 ft^3/min (VHX-1, 2 and 3)

CONTAINMENT AIR COOLER COMPONENT DESCRIPTION

Motor Design	Totally Enclosed Air Overcooled
Insulation	NEMA Class H for Fans Rated for the Post-DBA Condition
	NEMA Class B for Fans Rated for Normal Duty
Rating	75 hp for Fans Rated for the Post-DBA Condition
	30 hp for Fans Rated for Normal Duty
Filters (VF-1, VF-2, VF-3, VF-4)	
Capacity 60,000	ft^3/min at 0.33" H_2O
Differential Pressure Drop (Clean)	0.33" H_2O
Size of Each Filter Module	19.25" x 19.25" x 1.75" Thick
Number of Filter Modules per Cooler Unit 32	
Efficiency 65%	
Type	Stainless Steel Mesh, Framed

CONTAINMENT AIR COOLERS PERFORMANCE DATA FOR NORMAL OPERATION

VHX-1, VHX-2, and VHX-3 Coolers in Operation

Total Heat Removal Capacity		5.94×10^6 Btu/h
Total Airflow	180,000	ft^3/min
Total Motor hp (6 Fans)		315 bhp (nameplate)
Total Cooling Water Flow (Modulated)		1500-6000 gpm
Air Temperature, Inlet/Outlet		115°F/83.5°F
Water Temperature, Inlet	81.5°F	
Each Cooler, Capacity		1.98×10^6 Btu/h
Airflow, Each Cooler	60,000	ft^3/min (2 Fan Operation)
Cooling Water Flow, Each		500 gpm to 2000 gpm

NOTE: The values above are for three coolers at assumed conditions only. Initial conditions for accident analyses are contained in Chapter 14.

VHX-4 Cooler in Operation

Total Heat Removal Capacity		1.98×10^6 Btu/h
Total Airflow	60,000	ft^3/min
Total Motor hp (2 Fans)		105 bhp (Nameplate)
Total Cooling Water Flow		up to 2000 gpm (Nominal)
Air Temperature, Inlet/Outlet		115°F/84°F (Design)
Water Temperature, Inlet		81.5°F (Design)

NOTE: Although VHX-4's temperature control valve is failed closed, the cooler can be used for cooling during normal operation by opening its high-capacity outlet valve.

CONTAINMENT AIR COOLERS PERFORMANCE DATA FOR POST-DBA CONDITIONS

3 Coolers Operating	
Total Heat Removal Capacity at 283°F, 55 psig	261.6 x 10^6 Btu/h
Total Airflow (Cooler Design)	90,000 ft^3/min
Total Fan hp (3 Fans)	225 bhp (Nameplate)
Total Cooling Water Flow (3 Coolers)	Set per RO-216
Air Temperature, Inlet/Outlet	283°F/276°F
Req. Water Temperature, Inlet/Outlet	Based on Flow from RO-216
Each Cooler (VHX 1, 2, 3)	
Capacity at 283°F, 55 psig	87.2 x 10^6 Btu/hr
Airflow (Cooler Design)	30,000 ft^3/min
Coil Differential Pressure Drop (Air Side)	1.45" H_2O
Fan Differential Pressure	6.15" H_2O TP
Water Flow	Set per RO-216
Water Side Differential Pressure Drop	5.5 psi
Total Fan hp (1 Fan)	75 bhp (Nameplate)

ECCS COMPONENT SYSTEMS

Piping - Stainless Steel-304
Valves - Stainless Steel or other equivalent corrosion resistant material
Gaskets - Asbestos or Grafoil Grade GT^{TMB} (eg, Flexitallic or Flexicarb) with 300 Series SS

Component	LP Pump	HP Pump	Spray Pump
Casing	ASTM A351 SS, Mod CF8A	ASTM A351 SS, Mod CF8	SS, CF8M
Impeller	ASTM A217 SS, CF8	ASME SA 351, Grade CA15 SS	SS, CF8M
Casing Wear Ring	ASTM A479, Gr S21800	17-4 PH	SS, CF8M
Shaft	A479, 316 SS	AISI 416	316 SS
Shaft Sleeve	ASTM A479, 316 SS	-	316 SS
Gland Seal	-	-	316 SS
Pumping Ring	P-67A - Internal to Seal Cartridge P-67B - 18-8 SS on Shaft Sleeve	-	18-8 SS
Seal Cartridge	316 SS	316 SS	316 SS
Face Seal Rotating Element	Carbon	316 SS with Tungsten Carbide	Carbon
Face Seal Stationary Element	P-67A - Silicon Carbide P-67B - Tungsten Carbide	Carbon	Tungsten Carbide
Throttle Bushing	P-67A - Bronze P-67B - Carbon	-	Carbon
Backup Ring	-	Viton	-
Valves and Piping	304 SS	304 SS	304 SS
Gaskets	Asbestos or Grafoil Grade GT^{TMB} (eg, Flexitallic Flexicarb) with 300 Series SS	Asbestos or Grafoil Grade GT^{TMB} (eg, Flexitallic Flexicarb) with 300 Series SS	Flexitallic with 300 Series SS

ECCS COMPONENT SYSTEMS

SHUTDOWN HEAT EXCHANGERS

Component	Material
Head Gasket	304 SS Jacket Asbestos
Tubes	ASME SA 249, Grade TP-304
Tube Sheet Cladding	304 SS
Channel Cover	304 SS
Channel Partition	ASME SA 240, Type 304 SS

Deleted

ISI MAJOR COMPONENTS AND/OR SYSTEMS LIST

ASME CLASS 1

Components

- Reactor Pressure Vessel, N-50
- Reactor Pressure Vessel Closure Head, N-50
- Steam Generators - Primary Side, E-50A and E-50B
- Pressurizer, T-72
- Regenerative Heat Exchangers, E-56A and E-56B

Piping

- Primary Coolant System
- Engineering Safeguards System
- Chemical and Volume Control System

Pumps

- Primary Coolant Pumps, P-50A, B, C, D

Valves

ASME CLASS 2

Components

- Safety Injection and Refueling Water Tank, T-58
- Safety Injection Tanks, T-82A, B, C, D
- Steam Generators - Secondary Side, E-50A, B
- Regenerative Heat Exchangers, E-56A, B
- Shutdown Cooling Heat Exchangers, E-60A, B

ISI MAJOR COMPONENTS AND/OR SYSTEMS LIST

Piping

Main Steam System

Feedwater System

Engineered Safeguards System

Chemical and Volume Control System

Component Cooling System

Pumps

Containment Spray Pumps, P-54A, B, C

High-Pressure Safety Injection Pumps, P-66A, B

Low-Pressure Safety Injection Pumps, P-67A, B

SIRW Recirculation Pump, P-74

ASME CLASS 3

Components

Letdown Heat Exchanger, E-58

Condensate Storage Tank, T-2

Component Cooling Surge Tank, T-3

Spent Fuel Pool Heat Exchangers, E-53A, B

Component Cooling Heat Exchangers, E-54A, B

Shutdown Cooling Heat Exchangers, E-60A, B

Engineered Safeguards Room Coolers, VHX-27A, B

Control Room Air Conditioning Units, VC-10, VC-11

Containment Air Coolers, VHX-1, 2, 3, 4

Condensate Storage Tank Heat Exchanger, E-27

ISI MAJOR COMPONENTS AND/OR SYSTEMS LIST

Piping

Main Steam System

Feedwater System

Chemical and Volume Control System

Service Water System

Component Cooling System

Spent Fuel Pool System

Condensate System

Diesel Jacket Water Cooling System

Pumps

Service Water Pumps, P-7A, B, C

Auxiliary Feedwater Pumps, P-8A, B, C

Fuel Pool Cooling Pumps, P-51A, B

Component Cooling Pumps, P-52A, B, C

Diesel Generator Cooling Pumps P-211A, B

INSERVICE PUMP TEST PROGRAM SUMMARY

PUMP	ASME SAFETY CLASS	P&ID	TEST PROCEDURES
P-7A, B, and C - Service Water	3	M-213	QO-14
P-8A - AFW (Constant Speed)	3	M-207	QO-21
P-8B - AFW (Variable Speed)	3	M-205	QO-21
P-8C - AFW (Constant Speed)	3	M-205	QO-21
P-52A, B, and C - Component Cooling	3	M-209	QO-15
P-54A, B, and C - Containment Spray	2	M-204	QO-16
P-67A and B - LPSI & Shutdown Cooling	2	M-204	QO-20/RO-98
P-66A and B - HPSI	2	M-204	QO-19
P-211A and B - Diesel Jacket Water Cooling	3	M-214	MO-7A

NOTE: See Site Engineering Program SEP-PLP-IST-102, "Inservice Testing of Selected Safety-Related Pumps," for more detail on the pump test program.

TECHNICAL SPECIFICATION 3.6.3, "CONTAINMENT ISOLATION VALVES," APPLICABILITY

Penetration Number	Equipment ID
MZ-1A	CV-1805
	CV-1806
	MV-VA506
MZ-IB	MV-VA100
	MV-VA101
	MV-VA507
MZ-1C	CV-1807
	CV-1808
	MV-VA508
MZ-10	MV-CA122
	MV-CA142
	MV-CA728
MZ-11	CV-0939
	CK-CD401
	MV-CD536
MZ-14	CK-CC910
	MV-CC507
MZ-15	CV-0911
MZ-17	MV-VA1802B
	MV-VA1802C
	MV-VA1804B
	MV-VA1804C
	MV-VA1812A
	MV-VA1812C
	MV-VA1814A
	MV-VA1814B
MZ-17A	MV-VA1814F
	MV-VA1814G

Penetration Number	Equipment ID
MZ-18	MZ-18
	MZ-18A
MZ-21	SV-2415A
	SV-2415B
	MV-WG531B
MZ-21A	SV-2413A
	SV-2413B
	MV-WG531A
MZ-25	CV-1064
	CV-1065
	MV-CRW512
MZ-26	CV-1358
	CK-N2/400
	MV-N2/581
MZ-27	MO-P1
	MV-VA604
	MZ-27-1
MZ-33	MV-ES3234
	MV-ES3234A
	MV-ES3348A
MZ-36	CV-2009
MZ-37	CV-1001
	CK-CRW403
	MV-CRW503
MZ-40	CV-1910
	CV-1911
	MV-PC1170A

SEP-APJ-PLP-101, "Mechanical Containment Penetrations Basis Program Section," identifies bases for all penetrations. See FSAR Figure 6-5 (P&ID M-232), "Containment Penetrations", for piping diagrams.

TECHNICAL SPECIFICATION 3.6.3, "CONTAINMENT ISOLATION VALVES," APPLICABILITY

Penetration Number	Equipment ID
MZ-40A	SV-2414A
	SV-2414B
	MV-WG530B
MZ-40B	SV-2412A
	SV-2412B
	MV-WG530A
MZ-41	CV-1004
	CK-CRW407
	MV-CRW506
MZ-42	CV-0155
	CK-PC155B
	MV-PC1126
MZ-44	CV-2083
	CV-2099
	MV-CVC2083
MZ-46	CV-1101
	CV-1102
	MV-WG511
MZ-47	CV-1002
	CV-1007
	MV-CRW502
MZ-48	MV-VA1801B
	MV-VA1801C
	MV-VA1803B
	MV-VA1803C
	MV-VA1805A
	MV-VA1805C
	MV-VA1815A
	MV-VA1815B

Penetration Number	Equipment ID
MZ-49	CV-1036
	CV-1038
	MV-CRW513
MZ-52	CV-1103
	CV-1104
	MV-DRW500
MZ-52A	MV-DRW618C
	MV-DRW618D
	MV-DRW618E
	MV-DRW618F
	MV-DRW618G
	MV-DRW618H
MZ-52B	MV-DRW619C
	MV-DRW619D
	MV-DRW619E
	MV-DRW619F
	MV-DRW619G
	MV-DRW619H
MZ-56	MV-VA606B
	MV-VA606C
MZ-64	MV-SFP120
	MV-SFP121
	MV-SFP514
MZ-65	CK-CA400
	MV-CA612
MZ-66	MV-VA-L-6
	MV-VA601
	MV-VA602
	MV-VA603

SEP-APJ-PLP-101, "Mechanical Containment Penetrations Basis Program Section," identifies bases for all penetrations. See FSAR Figure 6-5 (P&ID M-232), "Containment Penetrations", for piping diagrams.

TECHNICAL SPECIFICATION 3.6.3, "CONTAINMENT ISOLATION VALVES," APPLICABILITY

Penetration Number	Equipment ID
MZ-67	CV-1037 CK-CRW408 MV-CRW515
MZ-68	CV-1813 CV-1814 MV-VA505
MZ-69	CV-1044 CV-1045 MV-CRW518
MZ-72	MV-SFP117 MV-SFP118 MV-SFP515

SEP-APJ-PLP-101, "Mechanical Containment Penetrations Basis Program Section," identifies bases for all penetrations. See FSAR Figure 6-5 (P&ID M-232), "Containment Penetrations", for piping diagrams.