TABLE 9.2-1

SERVICE WATER SYSTEM FLOWS AND HEAT LOADS (PER UNIT)(7)

			Mode of Operation			
	Start-up	Normal	Normal Shutdown	Blackout No Accident	Injection Phase	Recirculation Phase
No. of pumps required	4	4	3	2(4)	2(4)	3(6)
Flow required for services, gpm						
Service Water Intake	1,230	1,230	1,115	1,000	1,000	1,115
Turbine Services	15,184	26,084	3,737	0	0	0
Nuclear Services	23,730(1)	14,200	23,782	12,453	10,137(2)	31,027(2)
Total Flow (5)	40,144	41,514	28,634	13,453	11,137	32,142
Estimated Heat Loads, Btu/hr x 10^6						
Turbine Services	67.24	114.14	17.00	0	0	0
Nuclear Services	77.45	78.74	325.27(3)	39.44	271.9	536.82
Total Estimated Heat Load	144.69	192.88	342.27	39.44	271.9	536.82

Notes:

(1) Remove one of two component cooling heat exchangers from service prior to feeding service water to second Turbine Auxiliaries Cooling System heat exchanger.

(2) Westinghouse transmittal PSE-94-568 defines a minimum flow of 8,000 gpm at 90°F for one CCHX in service.

(3) First four hours following shutdown.

(4) Assume only two diesel generators running.

(5) At service water temperature of 90°F.

(6) LOCA + LOOP - Maximum Safeguards Condition

(7) The flows listed in this table are based upon the design flows associated with the equipment and components required for various plant operating modes. The actual flows available for these plant operating modes may vary from the above flows and are documented in the Service Water System calculations.

TABLE 9.2-2

COMPONENT COOLING SYSTEM CODE REQUIREMENTS

Component Cooling Heat Exchangers (Shell/Tube Type)	ASME Sect VIII
Component Cooling Heat Exchangers (Plate Type)	ASME Sect III Class 3
Component Cooling Surge Tank	ASME Sect VIII
Component Cooling Loop Piping	ANSI B31.1.0[1]
Component Cooling Valves	ANSI B31.7[2]

[1] Used for design

[2] For piping not supplied by the NSSS supplier, material inspection, fabrication, and quality control conform to ANSI B31.7. Where not possible to comply with ANSI B31.7, the requirements of ASME III-1971, which incorporated ANSI B31.7, were adhered to.

TABLE 9.2-3

COMPONENT COOLING SYSTEM
FLOW REQUIREMENTS - ONE UNIT

(gpm)

	Normal	Loss of Coolant Accident (Recirculation Phase) (1)
Residual heat exchangers	-	4,000
Reactor coolant pumps	760 (min)	-
Seal water heat exchanger	210	-
Sample heat exchangers (both units)	308 (max)	-
Letdown heat exchanger	1,000 (4)	-
Spent fuel pool heat exchanger	3,000 (4)	-
Residual heat removal pumps	20	10
Safety injection pumps	20	10
Charging pump (Reciprocating)	100 (7)	100 (2)(7)
Charging pumps (Centrifugal)	28 (max)(9)	14 (max)(9)
Waste evap package	780 (5)	-
Boric acid evap package	1,896 (5)	-
Waste gas compressors	85 (6)	-
Excess letdown heat exchanger	230 (5)	-
TOTAL	8,437	4,134 (3)
Number of pumps required	2	1
Number of pumps in service	2	1
Number of pumps installed	3	
Pump capacity (ea) - 4,600 gpm(8)		
Pump head - 200 ft TDH(8)		

(1) The data is for each component cooling loop
(2) This load is only for loop B
(3) Loop A total is 4034 gpm and for loop B total is 4134 gmp
(4) Varies with heat load
(5) May be out of service
(6) Maximum flow for two waste gas compressors heat exchangers. Components in service may vary with load.
(7) Varies with CCW temperature and/or CC heat load. May be throttled.
(8) Design Point. Not maximum value.
(9) Component Cooling Flow to 21 and 22 Centrifugal Charging Pumps eliminated.

TABLE 9.2-4

COMPONENT COOLING SYSTEM
COMPONENT DESIGN DATA

Component Cooling Pumps

Quantity	3
Type	Horizontal Centrifugal
Rated capacity, gpm (Design Point)	4600
Rated head, ft H_2O (Design Point)	200
Design pressure, psig	150
Design temperature, °F	200
Available NPSH, ft	25
Material (1)	Carbon steel

Component Cooling Heat Exchangers (Shell and Tube Type)

Number		2
Design heat transfer, Btu/hr		44.2×10^6
	Shell	Tube
Design pressure, psig	150	180
Design temperature, °F	200	200
Design flow rate, lb/hr	3.41×10^6	4.99×10^6 (1)
Design inlet temperature, °F	113.0	90
Design outlet temperature, °F	100.0	99.3
Fouling Factor, hr-ft^2-°F/BTU	0.0005	0.00091 (11 & 21 CCHXs) 0.00097 (22 CCHX)
Fluid	Component cooling water	Service Water
Material	Carbon steel	Titanium

Component Cooling Heat Exchanger (Plate Type)

Number		1(2)
Design heat transfer, Btu/hr		44.2×10^6
Fouling factor (total), hr-ft^2-°F/BTU		0.001
	Component Cooling Water Side	Service Water Side
Design pressure, psig	150	180
Design temperature, °F	200	200
Design flow rate, lb/hr	3.41×10^6	4.99×10^6(1)
Design inlet temperature, °F	113.0	90.0
Design outlet temperature, °F	100.0	99.3
Material	Titanium	Titanium

Component Cooling Surge Tank

Number	1
Type	Horizontal, with divider plate
Design pressure: Internal, psig	100
External, psig	Vacuum breaker provided
Design temperature, °F	200
Normal operating pressure, psig	Atmospheric
Total volume, gal	2000
Normal water volume, gal	1000
Fluid	Component cooling water
Material	Carbon Steel

(1) Westinghouse transmittal PSE-94-568 defines a minimum flow of 8000 gpm (4.00×10^6 lbs/hr) for accident conditions.

(2) Unit 1 has one shell and tube-type and one plate-type heat exchanger. Unit 2 has two shell and tube-type heat exchangers.

TABLE 9.2-5

COMPONENT COOLING SYSTEM - MALFUNCTION ANALYSIS

	Component	Malfunction	Comments and Consequences
1.	Component cooling water pumps	Rupture of pump casing	The casing and shell are designed for 150 psi and 200°F which exceeds maximum operating conditions. Pump is inspectable and protected against credible missiles. Rupture is not considered credible.
2.	Component cooling water pumps	Pump fails to start	One operating pump will supply sufficient flow. Redundancy is sufficient to provide ample flow for any condition.
3.	Component cooling water pumps	Manual valve on a pump suction line closed	This will be prevented by prestartup and operational checks. Further, during normal operation, each pump will be checked on a periodic basis which would show that a valve was closed.
4.	Component cooling water pump	Stop valve on discharge line closed or check valve sticks closed	Stop valve will be checked open by prestartup and operational checks. The stop valve and the check valve will be checked by periodic operation of the pumps during normal operation.
5.	Component cooling heat exchanger	Tube or shell rupture	Rupture is considered incredible because of low operating pressures.
6.	Component cooling heat exchanger vent or drain valve	Left open	This will be prevented by prestartup and operational checks. During normal operation such a situation would be readily assessed by observation of level in the component cooling surge tank.