

TABLE 9.1-1

## SPENT FUEL POOL COOLING SYSTEM CODE REQUIREMENTS

Spent fuel pool heat exchanger, Tube Side	ASME III, Class C
Shell Side	ASME VIII
Spent fuel pool filter	ASME III, Class C
Spent fuel pool demineralizer	ASME III, Class C
Refueling water purification filter	ASME III, Class C
Spent fuel pool piping	ANSI B31.1.0* ANSI B31.7**
Spent fuel pool cooling pump	ASME III, Class C
Spent fuel pool valves	ASA B16.5 or MSS-SP-66

\* Used for design

\*\* 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 9.1-2

## SPENT FUEL POOL COOLING SYSTEM COMPONENT DESIGN DATA

<u>Spent fuel pool heat exchanger</u>		
Number		1
Design heat transfer, Btu/hr		$11.94 \times 10^6$
	<u>Shell</u>	<u>Tube</u>
Design pressure, psig	150	150
Design temperature, °F	200	200
Design flow rate, lb/hr	$1.49 \times 10^6$	$1.25 \times 10^6$
Design inlet temperature, °F	99	124
Design outlet temperature, °F	107	113.5
Fluid	Component cooling water	Spent fuel pool water (borated demineralized water)
Material	Carbon Steel	Stainless steel
<u>Spent fuel pool pump</u>		
Number		2
Design pressure, psig		150
Design temperature, °F		200
Design flow rate, gpm		2500
Minimum developed head, ft		125
Temperature of pumped fluid, °F		80 - 180
Fluid		Spent fuel pool water (borated demin. water)
NPSH, ft		15
Material		Austenitic Stainless Steel
<u>Spent fuel pool skimmer pump</u>		
Number		1
Design pressure, psig		50
Design temperature, °F		200
Design flow rate, gpm		100
Minimum developed head, ft		50
Temperature of pumped fluid, °F		75 - 180
Fluid		Spent fuel pool water
NPSH, ft		15
Material		Austenitic Stainless Steel

TABLE 9.1-2 (Cont)

Refueling water purification pump	
Number	1
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm	100
Minimum developed head, ft	200
Temperature of pumped fluid, °F	40 - 140
Fluid	Borated reactor coolant
NPSH, ft	15
Material	Austenitic Stainless Steel
Spent fuel pool demineralizer	
Number	1
Type	Flushable
Vessel design pressure, psig	200
Internal - psig	15
External - psig	15
Vessel design temperature, °F	250
Design flow rate, gpm maximum	100
Normal flow, gpm	100
Normal operating temperature, °F	120
Normal operating pressure, psig	Approximately 50
Resin type	Approved nuclear grade
Spent fuel pool filter	
Number	1
Type	Replaceable Assembly
Internal design pressure, psig	200
Design temperature, °F	250
Rated flow, gpm	Nom. 100, Max. 150
Filtration requirement	98 percent retention of particles above 5 micron
Spent fuel pool skimmer filter	
Number	1
Type	Replaceable Assembly
Internal design pressure, psig	200
Design temperature, °F	250
Rated flow, gpm	150
Filtration requirement	98 percent retention of particles above 5 micron

TABLE 9.1-2 (Cont)

Refueling water purification filter	
Number	1
Type	Replaceable Assembly
Internal design pressure, psig	200
Design temperature, °F	250
Rated flow, gpm	150
Filtration requirement	98 percent retention of particles above 5 micron
Spent fuel pool strainer	
Number	1
Design flow, gpm	2300
Fluid	Borated demineralized water
Spent fuel pool skimmer strainer	
Number	1
Type	Basket
Rated flow, gpm	100
Design pressure, psig	50
Design temperature, °F	200
Spent fuel pool skimmers	
Number	2
Flow per unit, gpm	50
Manual adjustment, ft	2

TABLE 9.1-3

## SPENT FUEL POOL COOLING SYSTEM MALFUNCTION ANALYSIS

<u>Component</u>	<u>Malfunction</u>	<u>Comments and Consequences</u>
1. Spent fuel pool pump	Rupture of a pump casing	The casing and shell are designed for 150 psi and 200°F which exceeds maximum operating conditions. The pump is inspectable and is located in the auxiliary building protected against credible accidents. Rupture is not considered credible. (Also see no. 2 below).
2. Spent fuel pool pump	Pump stops running and cannot be restarted	The remaining full capacity pump can be brought into operation.
3. Spent fuel pool pump	Manual valve on pump suction or discharge is closed	This is prevented by prestartup and operational checks.
4. Spent fuel pool pump	Suction strainer plugs	Strainer is cleaned and flow restored.
5. Spent fuel pool heat exchanger	Tube or shell rupture	Rupture is considered incredible because of low operating pressure.
6. Spent fuel pool skimmer pump	Pump stops running and cannot be restarted	Spent fuel assemblies continue to be cooled by spent fuel pool pump. Pool water may become slightly murky possibly decreasing visual observations until pump is restored to service. Fuel pool water is clarified to some extent by bypassing spent fuel pool water through spent fuel pool demineralizer.

TABLE 9.1-4  
OVERHEAD HANDLING SYSTEMS

Description	OVERHEAD HANDLING SYSTEMS		Description	HEAVY LOAD		Safety Related Equipment/ Components Involved in Dropped Lift
	Rated Capacity (ton)	Location (ft)		Weight (lb)	Drop Height (ft)	
Polar Gantry Cranes with Equipment Hatch Jib	230 Main (each) 35 Aux (each)	Containment Building Elevation 130	Upper Internals w/Lifting Rig & Load Block	161,000	30	Reactor Vessel, Primary System Piping, Fuel in Reactor Vessel, RHR piping, RCP, etc.
		Containment Building Elevation 130	Lower Internals w/Lifting Rig & Load Block	339,500	N/A	
		Containment Building Elevation 130	Reactor Vessel Head / IHA	369,900	39	
		Containment Building Elevation 130	Stud Rack with 9 RPV Head studs	7,000	60	
		Containment Building Elevation 130	Removable Walkway and Stairway	4,000	60	

TABLE 9.1-4 (Cont)

Description	OVERHEAD HANDLING SYSTEMS		HEAVY LOAD			Safety Related Equipment/ Components Involved in Dropped Lift
	Rated Capacity (ton)	Location (ft)	Description	Weight (lb)	Drop Height (ft)	
		Containment Building Elevation 130	RCP Motor Access Plugs	30,000	60	
		Containment Building Elevation 130	RCP Motor	77,000	60	
		Containment Building Elevation 130	RCP Motor Flywheel	14,250	60	
Polar Crane Jib		Containment Building Elevation 130	Equipment Hatch	14,000	N/A	
Mobile Cherry Pickers (2)	12.5 15	Containment Building Elevation 130	Stud Rack with 9 RPV Head Studs	7,000	N/A	
Demineralizer & Ion Exchanger Service Monorail	6	Auxiliary Building Elevation 122	Lead Filled Plugs	10,000	22 above El. 102' 1½ above El. 122'	CVC system control cables running in Trays 1A418, 1A420, 2A418, 2A420, Drawing 205841.
			Concrete Floor Plugs	5,000	2	

TABLE 9.1-4 (Cont)

Description	OVERHEAD HANDLING SYSTEMS		Description	HEAVY LOAD		Safety Related Equipment/ Components Involved in Dropped Lift
	Rated Capacity (ton)	Location (ft)		Weight (lb)	Drop Height (ft)	
Filter Handling Systems						
1. Spent Fuel Pit Filter Handling Monorail	4	Auxiliary Building	Filter & Filter Bell Elevation 100	3,500	7	Component Cooling water heat exchanger & associated piping, some nearby safety-related cables (not directly below the dropped lift).
2. Reactor Coolant Ion Exchanger & Filter Underhung Bridge Crane	4	Auxiliary	Filter & Filter Bell	3,500	12	1B & 2B motor control center & associated cable trays, filters inside the bell.
3. Refueling Water Purification & Concentrate Filter Monorails	4	Auxiliary Building	Filter & Filter Bell Elevation 100	3,500	7	Possible load swing into liquid waste. Component cooling heat exchanger and piping on the elevation below.
4. Seal Water Injection & Return Filter Monorails	4	Auxiliary Building	Filter & Filter Bell Elevation 84	3,500	9 1/3	Waste gas compressor package, cable trays on the elevation below.
Solid Radwaste Overhead Crane	20	Auxiliary Building Elevation 100	Large Casks	25,000 max	14 Area B 1/2 Area A	Numerous pieces of safe shut down equipment at Elevation 84', such as containment spray pumps 12 & 22, charging pump 23, associated piping and electric cables. See Note 4.



TABLE 9.1-4 (Cont)

Description	OVERHEAD HANDLING SYSTEMS		Description	Weight (lb)	HEAVY LOAD		Safety Related Equipment/ Components Involved in Dropped Lift
	Rated Capacity (ton)	Location (ft)			Drop Height (ft)		
			Hittman Casks Lid	9,500		2½ Area A	
			Portable Demin	9,000		14 Area B	
Auxiliary Feedwater Pumps Monorails	1.65	Auxiliary Building Elevation 84	Motor Driven Pump	4,400		3	Redundant air supply
			Turbine Driven Pump	3,300		3	
Charging Pump Monorails	2.45	Auxiliary Building Elevation 84	Upper Centr. Charging Pump Casing	4,900		3 1/2	Associated CVC piping and waste decon. tanks on the elevation below.
			Recip. Charging Pump Motor	1,500		3 1/2	
			Recip. Charging Pump Coupling	2,500		3 1/2	
Component Cooling Pump Monorails	1.6	Auxiliary Building Elevation 84	Component Cooling Pump Motor	2,650		8	There may be occasion to lift over operable component cooling pump in the case of pumps 12 & 13. Waste holdup tanks, monitor tanks, vital cable trays, and service water piping on elevation below.
Safety Injection Pump Monorails	1.3	Auxiliary Building Elevation 84	Safety Injection Pump Motor	2,450		4	Safety injection pump & piping.

TABLE 9.1-4 (Cont)

Description	OVERHEAD HANDLING SYSTEMS		HEAVY LOAD			Safety Related Equipment/ Components Involved in Dropped Lift
	Rated Capacity (ton)	Location (ft)	Description	Weight (lb)	Drop Height (ft)	
Containment Spray Pump Monorails	2.15	Auxiliary Building Elevation 84	Containment Spray Pump Motor	4,000	3 1/4	Associated containment spray piping. Chemical Volume Control (CVC) System and service water piping and vital cable trays on the elevation below.
Monorail Serving Elevation 55' and Elevation 45'	2.15	Auxiliary  Elevation 55	Residual Heat Building Motor	3,950 Removal Pump	2 1/2 above el. 55'	Residual heat removal pump and piping.
			Access Plug	12,400	1 above El. 55'	
Temporary Crane	18*	Roof Auxiliary Building el. 140'	Misc.			Safety related equipment on the floors below.
Cask Handling Overhead Crane	115 Main 10 Aux	Fuel Handling Building Elevation 130	Spent Fuel Cask w/Spent Fuel	200,000		See Notes 1 & 2 Spent fuel in racks Transfer Pool liner
			Bottom Block	4,200		
Service Water Strainers Monorails	5	Service Water Intake Structure above Service Water Strainer El. 90'	Service Water Strainer	7,000	12	Service water piping and header. Intake bays pump suctions on elevation below.
Mobile Crane	130	Service Water Intake Structure	Service Water Concrete Cover	12,000 & 13,500	1 Area A	Service Water intake structure Service Water piping and header & intake bay pump suction on the elevation below see Note 4.
Crawler Crane	275	El. 112'	Plugs (hatch MKPC-1 and MKPC-2)			

Note 1: Because the crane is single failure proof as per ASME NOG-1-2004, a load drop is not credible.

Note 2: The cask handling overhead crane can be load tested for a lower capacity and used to lift lower loads.

Note 3: Deleted.

\* Original crane is 18 ton Grove crane.

TABLE 9.1-4 (Cont)

Description	OVERHEAD HANDLING SYSTEMS		Description	HEAVY LOAD		Safety Related Equipment/ Components Involved in Dropped Lift
	Rated Capacity (ton)	Location (ft)		Weight (lb)	Drop Height (ft)	
			Service Water Pump	12,000		
			Service Water Pump Motor	13,200		
Crawler Crane	275	Service Water Intake Structure El. 112 & 122	Traveling Screens	17,325	12	
			Fish Gate	3,000	12 Area A&B 2 Area C	Service Water intake structure - service water piping and header & intake bay pump sections on the elevation below, see Note 4.

Note 4: For Area locations see VTD 315130 Sheet 2 "Nine-Month Response for Control of Heavy Loads for Salem Nuclear Station Units 1 & 2" figure B-10, A20 and A21.