Appendix 12A. Tables

Table 12-1. Design Radiation Zones

Zone	Dose Rate Limit[1] (mem/hr)	Occupancy	Examples
I	.05	Continuous	1. Offsite areas
II	0.5	Continuous	1. Control Room
			2. Yard
			3. Service Building
			4. Turbine Building
III	1.0	Extended	1. Cable Room
			2. Battery Room
			3. Electrical Penetrations
IV	2.5	Periodic	1. Aux. Building Corridors
			2. Spent Fuel Pool Surface
V	15.	Intermittent	1. Incore Instrument Room
			2. Pipe Tunnel Cover
VI	>15.	Infrequent	1. Demineralizer Rooms
			2. Filter rooms

Note:

1. For anticipated operational occurrences

Table 12-2. Minimum Shield Thicknesses

Component	Location (Typical) Elevation/Columns		Source: Dimension (Note 11) R(in.)	Source: Dimension (Note 11) H(in.)	Source: Table/Flag	Shield (ft) (Note 10)
Reactor Coolant System						
Vessel	716	FF-49	86.5	488	(Note 1)	6.0
Pump	733	GG-47	72	72	12-6, SA,SB	3.0
Steam Generator	750	EE-47	56.3	180	12-6, SA,SB	3.0 (Note 2)
Pressurizer	767	DD-49	40	610	12-6, SC,SB	3.0 (Note 2)
Pressurizer Relief Tank	733	EE-49	60	222	12-6, SC	3.0
Safety Injection System Pump	716	HH-54	18	12	(Note 3)	2.0
Residual Heat Removal System						
Pump	695	GG-54	17.4	12	12-6, SK	3.0
Heat Exchanger	750	LL-52	18.4	354	12-6, SK	2.5
Containment Spray System						
Pump	695	GG-55	8	12	(Note 3)	2.5
Heat Exchanger	750	LL-52	28	485	(Note 3)	2.5
Chemical & Volume Control System						
Regenerative Heat Exchanger	733	DD-50	5.2	146	12-6, SA,SG	2.5
Excess Letdown Heat Exchanger	733	CC-50	4	160	12-6, SD	3.0 (Note 4)
Reciprocating Charging Pump	716	JJ-54	20.25	34	12-6, SG	2.0
Centrifugal Charging Pump	716	JJ-55	9	55	12-6, SG	2.0

Component	Location (Typical) Elevation	Columns	Source Dimension (Note 11) R(in.)	H(in.)	Source Table/Flag	Shield (ft) (Note 10)
Boric Acid Transfer Pump	733	NN-53	3.5	10	(Note 5)	3.0
Letdown Heat Exchanger	750	KK-53	11	215.5	12-6, SD	2.5
Seal Water Heat Exchanger	733	GG-54	7	165.5	12-6, SG	2.0
Volume Control Tank	733	KK-50	45	108.6	12-6, SF	3.0
Boric Acid Tank	733	PP-52	192	104	(Note 5)	3.0
Mixed Bed Demineralizer	733	LL-53	16.25	42	12-7	4.0
Cation Bed Demineralizer	733	MM-53	13.24	41.4	12-7	4.0
Reactor Coolant Filter	733	KK-52	3.375	19	12-8	2.5
Seal Water Return Filter	733	HH-52	3.375	19	12-8	2.0
Seal Water Injection Filter	7733	JJ-51	1.3	20	12-8	2.0
Boric Acid Filter	733	NN-51	3.375	19	12-8	3.0
Boronometer	733	GG-53	6.65	18.7	12-6, SF	1.0
Boron Recycle System						
Holdup Tank	716	PP-58	180	283	12-6, SE	3.0
Evaporator-Gas Stripper	695	NN-56	21	119	12-6, SL	3.0
Feed Pump	716	QQ-56	5.5	15	12-6, SE	3.0
Feed Demineralizer	733	QQ-56	16	100	12-7	4.0
Feed Filter	733	PP-56	3.375	19	12-8	2.0
Condensate Demineralizer	733	PP-56	13.15	65	12-7	2.0

Component	Location (Typical) Elevation/Columns		Source Dimension (Note 11) R(in.)	H(in.)	Source Table/Flag	Shield (ft) (Note 10)
Condensate Filter	733	NN-56	1.25	19	12-8	2.0
Concentrate Filter	733	NN-56	1.25	19	12-8	2.5
Boron Thermal Regeneration System						
Moderating Heat Exchanger	750	KK-54	10	215	(Note 6)	2.5
Letdown Chiller Heat Exchang.	750	LL-54	10	203.5	12-6, SF	2.5
Letdown Reheat Heat Exchang.	750	LL-54	4.3	86.9	12-6, SD,SF	2.5
Therm. Reg. Ion Exchanger	733	LL-54	21.25	28	12-7	4.0
Liquid Waste Recycle System						
Evaporator Feed Tank	716	LL-59	54	120	12-6, SH	2.5
Waste Drain Tank	716	LL-59	66	108	12-6, SD	2.5
Evaporator Feed Pump	716	MM-59	5.625	15	12-6, SH	2.0
Evaporator Feed Filter	733	MM-59	2	17	12-8	2.0
Waste Drain Tank Pump	716	MM-58	4	18	12-6, SD	2.0
Evaporator	695	LL-51	21	119	12-6, SL	3.0
Evaporator Condensate Dem.	733	KK-57	16.2	90	12-7	1.5
Evaporator Condensate Filter	733	KK-57	1.25	19	12-8	1.0
Reactor Coolant Drain Tank	733	HH-49	18	80	12-6, SD	3.0
RCDT Heat Exchanger	733	GG-49	7	175	12-6, SD	3.0
RCDT Pump	733	HH-49	5.5	15	12-6, SD	3.0

Component	Location (Typical) Elevation/Columns		Source: Dimension (Note 11) R(in.)	Source: Dimension (Note 11) H(in.)	Source: Table/Flag	Shield (ft) (Note 10)
Aux Waste Evap Feed Tank	760	Yard	120 (Note 12)	252	12-10	2.0
Aux Waste Evap Feed Tank Pump	760	Yard	6	4	12-10	1.5
Liquid Waste Monitor & Disposal System						
Laundry & Hot Shower Tank	716	LL-51	69	180	12-6, SI	1.5
LHST Pump	716	KK-51	4	8	12-6, SI	1.5
LHST Pre-Filter, Post Filter	733	LL-55	1.25	19	12-8	2.0
LHST Carbon Filter	733	LL-55	1.25	19	12-8	2.0
Waste Monitor Tank Filter	733	KK-55	1.25	19	12-8	2.0
Waste Monitor Tank Demin.	733	KK-55	16.2	90	12-7	2.5
Floor Drain Tank	716	KK-52	60	240	12-6, SI	1.5
FDT Pump	716	KK-51	6	10	12-6, SI	1.5
FDT Filter	733	MM-55	1.25	19	12-8	2.0
Mixing and Settling	716	KK-55	60	24.5	12-6, SI	1.5
Sludge Pump	716	LL-55	4	15	12-6, SI	1.5
Mixing and Settling Tank Pump	716	KK-55	4	15	12-6, SI	1.5
Aux Floor Drain Tank	760	Yard	120 (Note 12)	252	12-10	2.0
Aux FDT Pump	760	Yard	6	4	12-10	1.5

Component	Location (Typical) Elevation/Columns		Source: Dimension (Note 11) R(in.)	Source: Dimension (Note 11) H(in.)	Source: Table/Flag	Shield (ft) (Note 10)
Solid Waste Disposal System						
Chemical Drain Tank	695	LL-57	21	108	12-6, SH	3.0
Chemical Drain Tank Pump	695	LL-57	5.5	15	12-6, SH	3.0
Spent Resin Storage Tank	716	KK-53	107.3	132	12-6, SM	4.0
Spent Resin Sluice Pump	716	LL-53	5.5	14	12-6, SM	4.0
Spent Resin Sluice Filter	733	MM-52	4.325	20	12-6, SM	3.0
Resin Batching Tank	750	NN-55	30.	92.5	12-6, SN	3.0
Evaporator Concentrate Storage Tank	750	QQ-55	42.	120.0	12-6, SL	3.0
Drumming Room	750	PP-54	(Note 7)			3.0
Solid 171GD Liner Storage	760	VV-51a, 52a	(Note 13)		12-6, SN	1.0
Waste Gas System						
Compressor	716	NN-52	6	25	12-6, SO	4.0
Tank	716	PP-53	60	91	12-6, SO	4.0
Hydrogen Recombiner	716	NN-53	6	25	12-6, SO	1.5
Spent Fuel Pool Cooling System						
Cooling Pump	750	PP-52	11	15	(Note 5)	2.0
Cooling Heat Exchanger	750	PP-53	17	228	(Note 5)	2.0
Cooling Strainer (Note 8)	750	PP-52			(Note 5)	2.0
Demineralizer	750	NN-53	19.45	60	12-7	2.0

Component	Location (Typical) Elevation/Columns		Source Dimension (Note 11) R(in.)	H(in.)	Source Table/Flag	Shield (ft) (Note 10)
Filter	733	MM-51	6	20	12-8	2.0
Skimmer Pump	750	PP-52	7	4	(Note 5)	2.0
Skimmer Strainer (Note 8)	750	PP-52			(Note 5)	2.0
Skimmer Filter	733	MM-51	3	18	(Note 5)	2.0
Sampling System						
Heat Exchangers (Note 9)	716	EE-53	3	90	12-6, SA	2.0
Steam Generator Blowdown Recycle System						
Tank	716	FF-53	36	120	(Note 5)	1.0
Pump	716	FF-53	4	5	(Note 5)	1.0
Heat Exchanger	733	FF-54	7	120	(Note 5)	2.0
Demineralizer	733	KK-55	13.8	60	12-7	3.0
Filter	733	HH-52	1.25	19	12-8	2.0

Note:

1. Source is reactor core at full power plus coolant activity.
2. Biological shielding (2 ft) provided above operating deck level for active height.
3. Accident source only.
4. Intermittent use only; no shield on annulus side.
5. Minimal radioactivity expected, shielding provided for conservatism.
6. Both shell and tube side are sources, no credit taken for activity removal across thermally regenerative ion exchanger.

Component	Location (Typical) Elevation/Columns	Source Dimension (Note 11) R(in.)	H(in.)	Table/Flag	Shield (ft) (Note 10)

7. Designed to handle wastes such as filter cartridges, evaporator bottoms, etc; handling area is 28.5 feet by 37 feet.
8. Strainer located on pump intake.
9. Heat exchangers for potentially radioactive samples are to be located behind a shield wall at the end of the Sample Room nearest the Reactor Building.
10. Ordinary concrete or equivalent.
11. Dimensions are for a right circular cylinder unless otherwise noted.
12. Dimensions of AUX WEFT and AUX FDT used in shielding calculations.
13. Largest Liner used in storage vault has a radius of 40 in. and a height of 106 in.

Table 12-3. Primary Shield Description

Region	Material	Thickness (in.)
Core baffle	Stainless Steel	1.125
Coolant	Water	6.52
Core Barrel	Stainless Steel	2.25
Coolant/	Water/	4.75/
Neutron pads[1]	Stainless Steel	2.75
Pressure Vessel	Carbon Steel	8.625
Gap	Air, Insulation	7.00
Biological shield	Reinforced concrete	
Detector wells		72.0
Other		102.0

Note:

1. Neutron pads are affixed to the barrel and cover azimuthal regions which experience peak fast neutron exposures. There are four such panels covering the regions from 30° to 65°, 117° to 150°, 210° to 245°, and 297° to 330°.

Table 12-4. Parameters Used for Design Basis Accident Analysis of Control Room Direct Dose

Power Level	3565 MWt
Equivalent fraction of core melting	1.0
Fission product fractional releases	
Noble gases	1.0
Halogens	0.5
Remaining inventory	0.01
Minimum full power operating time	650 days
Clean-up rate following accident	0.0
Containment net free volume	1.22×10^6 ft^3
Post-accident water depth	15.2 ft
Shielding	(see Section 12.1.2.5)
Occupancy time	30 days
0-1 day 100%	
1-4 days 60%	
4-30 days 40%	

Table 12-5. Design Basis Accident Containment Source Strength (gammas/cc-sec) vs (hours after release)

	0	1	2	24	720
Gas					
0.4 MeV	1.7E8[1]	1.7E8[1]	1.6E8	5.0E7	9.4E4
0.8	1.6E8	8.3E7	6.1E7	4.3E6	4.3E4
1.3	3.1E6	2.4E6	2.0E6	8.4E3	-
1.7	2.4E8	1.2E7	9.0E6	3.9E4	-
2.2	1.1E8	3.3E7	2.1E7	8.3E4	-
2.5	6.9E7	4.9E7	3.3E7	9.9E4	-
3.5	5.0E7	-	-	-	-
Liquid					
0.4MeV	3.9E8	3.4E8	3.4E8	3.1E8	1.8E8
0.8	3.0E9	2.5E9	1.9E9	3.6E8	4.5E7
1.3	6.1E8	4.1E8	3.2E8	1.9E7	4.5E5
1.7	2.0E8	9.9E7	7.5E7	1.8E7	4.0E6
2.2	5.5E8	4.7E8	4.2E8	4.2E7	1.8E5
2.5	5.3E7	2.8E7	2.1E7	2.3E8	2.4E5
3.5	4.1E7	9.0E6	2.6E6	3.1E4	8.3E3

Note:

1. 1.7E8 means 1.7×10^8

Table 12-6. Design Basis Source Strengths for Fluids.

		Gamma Groups					
Source Designation		1	2	3	4	5	6
SA	Reactor coolant, high temperature, fission and corrosion products						
	SS	1.08 E+6	3.23 E+5	2.00 E+5	7.55 E+4	7.20 E+4	5.16 E+4
	E	.114	.510	.888	1.40	1.94	2.50
SB	Reactor coolant, nitrogen-16 term (per microcurie/cc)						
	SS	---- ----	---- ----	---- ----	3.33 E+2	2.55 E+4	1.85 E+3
	E				2.74	6.13	7.12
SC	Reactor coolant, pressurizer						
	SS	1.01 E+4	1.07 E+5	3.08 E+4	3.87 E+3	1.85 E+3	1.25 E+2
	E	.177	.524	.829	1.31	1.80	2.98
SD	Reactor coolant, ambient temperature						
	SS	1.53 E+6	4.58 E+5	2.83 E+5	1.07 E+5	1.02 E+5	7.31 E+4
	E	.114	.510	.888	1.40	1.94	2.50
SE	Reactor coolant, downstream mixed-bed demineralizer						
	SS	1.51 E+6	2.00 E+5	1.25 E+5	5.30 E+4	4.91 E+4	6.76 E+4
	E	.113	.514	.844	1.46	2.08	2.46
SF	Reactor coolant, downstream mixed-bed and cation-bed demineralizer						
	SS	1.51 E+6	1.93 E+5	1.19 E+5	5.05 E+4	4.85 E+4	6.73 E+4
	E	.113	5.10	.845	1.46	2.08	2.46
SG	Reactor coolant, demineralizer, gas-stripped (volume control tank)						
	SS	1.11 E+6	1.42 E+5	1.01 E+5	4.23 E+4	2.63 E+4	3.73 E+4
	E	.111	.534	.844	1.44	2.11	2.46
SH	Reactor coolant, fully degassed						
	SS	4.04 E+4	3.70 E+5	2.44 E+5	8.75 E+4	6.49 E+4	9.50 E+3
	E	.180	.528	.894	1.36	1.86	2.88
SI	Reactor coolant, degassed, diluted with other leakage (factor=1/50)						
	SS	8.08 E+2	7.40 E+3	4.88 E+3	1.75 E+3	1.30 E+3	1.90 E+1
	E	.180	.528	.894	1.36	1.86	2.88
SJ	Reactor coolant, degassed, evaporated (DF=1000)						
	SS	4.04 E+1	3.70 E+2	2.44 E+2	8.75 E+1	6.49 E+1	9.50 E+0
	E	.180	.528	.894	1.36	1.86	2.88

		Gamma Groups					
Source Designation		1	2	3	4	5	6
SK	Reactor coolant, residual heat removal mode						
	SS	1.30 E+6	2.59 E+5	1.11 E+5	3.64 E+4	2.25 E+4	1.79 E+4
	E	.105	.510	.873	1.36	1.92	2.42
SL	Evaporator concentrates (non-recyclable)						
	SS	1.23 E+5	8.71 E+5	2.85 E+5	3.29 E+4	6.05 E+3	3.66 E+1
	E	.181	.517	.812	1.31	1.80	2.57
SM	Demineralizer resins (combined, no sluice water)						
	SS	3.90 E+7	8.55 E+8	1.41 E+8	1.11 E+7	2.80 E+6	3.51 E+4
	E	.207	.571	.824	1.34	1.76	2.96
SN	Demineralizer resins (combined, 6 mo. decay, no sluice water)						
	SS	2.14 E+4	1.65 E+8	2.40 E+7	1.43 E+6	1.01 E+3	4.52 E-1
	E	.122	.651	.817	1.35	2.19	2.54
SO	Waste gas tank (maximum)						
	SS	5.43 E+7	5.90 E+5	1.91 E+4	1.10 E+4	1.42 E+4	3.02 E+4
	E	.084	.513	.850	1.55	2.18	2.42

Notes:

1. SS = Source Strength in gammas/cc-sec
2. E = Average energy in MeV
3. E + 6 means 10^6

Table 12-7. Design Basis Source Strengths for Demineralizers

Demineralizer[1] (in Place)	0.4 MeV	0.8 MeV	1.3 MeV	1.7 MeV	2.2 MeV	3.0 MeV
Mixed Bed	3.8×10^{8}	5.0×10^{8}	3.1×10^{7}	1.0×10^{7}	2.0×10^{6}	1.1×10^{5}
Cation Bed	4.8×10^{6}	4.8×10^{8}	4.2×10^{6}	2.4×10^{6}	-	-
Recycle Evaporator Feed	3.5×10^{7}	4.1×10^{7}	1.9×10^{6}	8.2×10^{5}	1.8×10^{5}	-
Boron Thermal Regeneration	6.3×10^{6}	2.6×10^{6}	5.2×10^{5}	1.9×10^{5}	5.5×10^{4}	-
Spent Fuel Pool	5.3×10^{6}	9.3×10^{5}	3.2×10^{3}	2.8×10^{3}	-	-
Miscellaneous Low Activity:	1.1×10^{5}	2.8×10^{4}	4.2×10^{3}	1.5×10^{3}	4.5×10^{2}	-
(Recycle Evaporator Condensate) (Waste Evaporator Condensate) (Waste Monitor Tk) (S.G. Blowdown Recycle)						

Note:
1. See Table 12-2 for location and shielding.

Table 12-8. Design Basis Source Strengths For Filters

Filter[1]	Estimated Source Strengths (Gamma/cc-sec)		
	0.4 MeV	0.8 MeV	1.3 MeV
Reactor Coolant		7.1×10^{7}	1.2×10^{7}
Seal Water Injection		6.0×10^{7}	9.2×10^{6}
Seal Water Return		1.4×10^{7}	2.3×10^{6}
Recycle Evaporator Feed		1.4×10^{7}	2.3×10^{6}
Recycle Evaporator Condensate	4.0×10^{5}	1.0×10^{5}	2.5×10^{4}
Recycle Evaporator Concentrate		1.5×10^{6}	-
Spent Fuel Pool (Pre and Post Filter, Skimmer Filter)		1.4×10^{7}	2.3×10^{6}
Waste Evaporator Feed		4.25×10^{7}	6.85×10^{6}
Waste Evaporator Condensate	4.25×10^{5}	3.25×10^{5}	2.74×10^{4}
Waste Monitor Tank	4.25×10^{5}	3.25×10^{5}	2.74×10^{4}
Laundry and Hot Shower (Primary and Secondary Tank Filter, Carbon Filter)	4.25×10^{5}	3.25×10^{5}	2.74×10^{4}
Boric Acid		1.5×10^{6}	-
Floor Drain Tank		4.25×10^{7}	6.85×10^{6}
Spent Resin Sluice		1.4×10^{7}	2.3×10^{6}

Note:

1. See Table 12-2 for location and shielding.

Table 12-9. Reactor Coolant System Nitrogen-16 Activity

Component	N-16 µCi/gm
Reactor Vessel, Core	95
Reactor Vessel, Upper Region	125
Reactor Outlet Pipe	113
Steam Generator	92
Coolant Pump	69
Reactor Inlet Pipe	65

Table 12-10. Design Source Strengths for Outside Storage Tanks.

Gamma Groups						
	1	2	3	4	5	6
Refueling Water Storage Tank:						
SS	1.96E+3	1.09E+2	1.2E+2	9.87E+0	---	---
E	.008	.483	.879	1.25	---	---
Reactor Makeup Water Storage Tank:						
SS	4.34E+1	3.74E+1	4.68E+1	6.67E+0	---	---
E	.159	.493	.889	1.26	---	---
Radwaste Facility Tank #1:						
SS	3.97E+4	3.52E+5	2.32E+5	8.28E+4	6.23E+4	9.02E+3
E	.180	.525	.893	1.36	1.86	2.89
Radwaste Facility Tank #2:						
SS	7.94E+2	7.04E+3	4.64E+3	1.66E+3	1.25E+3	1.80E+2
E	.180	.525	.893	1.36	1.86	2.89

Notes:

1. SS = Source strength in gammas/cc-sec
2. E = Average energy in MeV
3. E+6 means 10^6

Table 12-11. Area Radiation Monitors

Detector Number	Detector Location [1]	Type	Range	Fig. Ref.
1-EMF-1	Auxiliary Building Corridor - E1 695 - (FF, GG-56)	G-M	.1 to 10^4 mr/hr	1-2
1-EMF-2	Auxiliary Building Corridor - E1 716 - (MM, NN-56)	G-M	.1 to 10^4 mr/hr	1-3
1-EMF-3	Auxiliary Building Corridor - E1 716 - (LL, MM-59)	G-M	.1 to 10^4 mr/hr	1-3
1-EMF-4	Auxiliary Building Corridor - E1 716 - (GG-56)	G-M	.1 to 10^4 mr/hr	1-3
1-EMF-5	Sample Room Unit 1 - E1 716 (FF-54)	G-M	.1 to 10^4 mr/hr	1-3
1-EMF-6	Auxiliary Building Corridor - E1 733 (MM, NN-53)	G-M	.1 to 10^4 mr/hr	1-4
1-EMF-7	Auxiliary Building Corridor - E1 733 (NN-59)	G-M	.1 to 10^4 mr/hr	1-4
1-EMF-8	Auxiliary Building Corridor - E1 733 (HH-56)	G-M	.1 to 10^4 mr/hr	1-4
1-EMF-9	Reactor Building Incore Instrument Room Unit 1	G-M	.1 to 10^4 mr/hr	1-4
1-EMF-10	Auxiliary Building Corridor - E1 750 (LL-56)	G-M	.1 to 10^4 mr/hr	1-5
1-EMF-11	Waste Drumming Area - E1 750 (PP-54)	G-M	.1 to 10^4 mr/hr	1-5
1-EMF-12	Control Room - E1 755 (CC-56)	G-M	.1 to 10^4 mr/hr	1-6
1-EMF-13	Laboratory - E1 767 (QQ-56)	G-M	.1 to 10^4 mr/hr	1-6
1-EMF-14	Auxiliary Building Corridor - E1 760 (RR-54)	G-M	.1 to 10^4 mr/hr	1-6
1-EMF-15	Hot Machine Shop Area - E1 760 (TT-59)	G-M	.1 to 10^4 mr/hr	1-7
1-EMF-16	Refueling Bridge Unit 1 Reactor Building	G-M	.1 to 10^4 mr/hr	1-7
1-EMF-17	Refueling Bridge Unit 1 Spent Fuel Building	G-M	.1 to 10^4 mr/hr	1-7
1-EMF-18	Reactor Coolant Filter 1A	I-C	.1 to 10^4 R/hr	
1-EMF-19	Reactor Coolant Filter 1B	I-C	.1 to 10^4 R/hr	
1-EMF-20	New Fuel Storage (North)	G-M	.1 to 10^4 mr/hr	
1-EMF-21	New Fuel Storage (South)	G-M	.1 to 10^4 mr/hr	
1-EMF-22	Tech Support CTR, ELE 767 (SS-32)	G-M	.1 to 10^4 mr/hr	

Detector Number	Detector Location [1]	Type	Range	Fig. Ref.
1-EMF-23	RB Purge Filter, ELG-767 (JJ-53)	G-M	.1 to 10^4 mr/hr	
1-EMF-24	Steam Line 1A, Outboard Doghouse, (GG-43)	G-M	.1 to 10^4 mr/hr	
1-EMF-25	Steam Line 1B, Inboard Doghouse, (GG-53)	G-M	.1 to 10^4 mr/hr	
1-EMF-26	Steam Line 1C, Inboard Doghouse, (GG-52)	G-M	.1 to 10^4 mr/hr	
1-EMF-27	Steam Line 1D, Outboard Doghouse, (GG-44)	G-M	.1 to 10^4 mr/hr	
1-EMF-28	Diesel Generator Room, (BB-45)	G-M	.1 to 10^4 mr/hr	
1-EMF-36HH	Unit Ventilation (Unit Vent)	I-C	1 to 10^8 R/hr	
1-EMF-51A	Containment	I-C	1 to 10^8 R/hr	
1-EMF-51B	Containment	I-C	1 to 10^8 R/hr	
2-EMF-1	Sample Room Unit 2 - E1 716 (EE, FF-58)	G-M	.1 to 10^4 mr/hr	1-3
2-EMF-2	Reactor Building Incore Instrumentation Room Unit 2	G-M	.1 to 10^4 mr/hr	1-4
2-EMF-3	Refueling Bridge Unit 2 Reactor Building	G-M	.1 to 10^4 mr/hr	1-7
2-EMF-4	Refueling Bridge Unit 2 Spent Fuel Building	G-M	.1 to 10^4 mr/hr	1-7
2-EMF-5	Reactor Coolant Filter 2A ELE 733 (KK, JJ-60, 61)	I-C	.1 to 10^4 R/hr	1-7
2-EMF-6	Reactor Coolant Filter 2B ELE 733 (KK, JJ-60, 61)	I-C	.1 to 10^4 R/hr	
2-EMF-7	New Fuel Storage (North) ELE 767 (TT-62)	G-M	.1 to 10^4 mr/hr	
2-EMF-8	New Fuel Storage (South) ELE 767 (SS-62)	G-M	.1 to 10^4 mr/hr	
2-EMF-9	RB Purge Filter, ELE 767, (JJ-59)	G-M	.1 to 10^4 mr/hr	
2-EMF-10	Steam Line 2A, Outboard Doghouse, (FF-68)	G-M	.1 to 10^4 mr/hr	
2-EMF-11	Steam Line 2B, Inboard Doghouse, (FF-59)	G-M	.1 to 10^4 mr/hr	
2-EMF-12	Steam Line 2C, Inboard Doghouse, (FF-60)	G-M	.1 to 10^4 mr/hr	
2-EMF-13	Steam Line 2D, Outboard Doghouse, (FF-69)	G-M	.1 to 10^4 mr/hr	
2-EMF-14	Diesel Generator Room, (BB-69)	G-M	.1 to 10^4 mr/hr	

Detector Number	Detector Location [1]	Type	Range	Fig. Ref.
2-EMF-36HH	Unit Ventilation (Unit Vent)	I-C	1 to 10^8 R/hr	
2-EMF-51A	Containment	I-C	1 to 10^8 R/hr	
2-EMF-51B	Containment	I-C	1 to 10^8 R/hr	

Note:

1. The approximate detector location is indicated. For example: 1-EMF-1 is located in the Auxiliary Building corridor at floor elevation 695 between column lines FF and GG at column line 56.

Table 12-12. Annual Station Dose Estimates (person-rem/yr)

	Dose (Rem)
Normal Operation & Anticipated Occurences	
Routine surveillance & plant operations	10
Valve maintenance	5
Miscellaneous maintenance	8
Primary sampling & analysis	1.5
Filter & strainer changeouts	1.5
Handling radioactive waste	2
Special maintenance (modifications, etc.)	3
In-service inspections	3
Total	**34**
Refueling Outage	
Stage area/equipment for Steam Generator work	6
Remove/replace Steam Generator primary manways & diaphragms	3
Install/remove Steam Generator nozzle dams	8
Steam Generator ECT testing	10
Steam Generator tubing plugging	8
Steam Generator tube plug removal	5
Reactor Coolant Pump seal maintenance	3
Reactor Coolant Pump motor maintenance	4
Reactor Head removal & replacement	8
Defuel/Refuel	1
Modifications	8
Miscellaneous preventitive maintenance	7
Miscellaneous clean-up & decontamination	4
Valve maintenance	25
Install/remove temporary shielding	10
In-service Inspections	10
Snubber Inspections	2
General Rx Bldg entry	1
Miscellaneous RP support	3
Miscellaneous Operations support	3

	Dose (Rem)
Penetration testing	1
Total	130
Total Station Dose	164

Table 12-13. Estimated Occupancy Times During Normal Operations and Anticipated Occurrences (man-hrs/wk)

Work Area	Administration & Staff	Operations	Technical Services	Maintenance	Guards	ESS[1]	Janitorial	QA
1. Aux. Bldg. Corridors	40	860	1100	960	-	900	800	800
2. Sample Room & Hot Laboratory	40	10	800	40	-	40	-	-
3. Letdown & Recycle Systems	-	220	215	125	-	165	-	-
4. Waste Gas Processing	-	220	215	100	-	165	-	-
5. Liquid Waste Processing	-	220	215	125	-	165	-	-
6. Solid Waste Processing	-	210	225	60	-	165	-	-
7. Turbine Bldg.	40	860	350	1300	800	1800	500	200
8. Control Room	40	1280	400	1170	-	1000	100	200
9. Service & Administration Bldgs., Outside	840	280	1160	1360	2500	1600	600	2000
Total	1000	4160	4680	5240	3200	6000	2000	3200

Note:

1. ESS Maintenance

Table 12-14. Estimated Occupancy Times During A Refueling Outage (man-hrs)

	Administration & Staff	Operations	Technical Services	Maintenance	Janitorial	QA
CRDM Disconnect/Reconnect	-	-	50	690	-	50
Head & Internals Movement	-	-	250	1330	-	150
Defuel/Refuel-Transfer Canal	-	2270	300	650	-	-
Defuel/Refuel-Spent Fuel Pool	-	850	900	200	-	800
Head Flange Work on Storage Stand	-	-	30	300	-	10
CRDM Work on Storage Stand	-	-	700	700	-	-
Reactor Coolant Pump Seal Work	-	-	200	1300	-	100
Reactor Coolant Pump Motor Work	-	-	50	2300	-	-
Inservice Inspection	-	-	200	3800	-	1300
Eddy Current Inspection	-	-	1500	1450	-	200
Incore Instrumentation	-	-	150	1400	-	50
Reactor Building Valve Work	-	-	250	2000	-	20
Aux. Building Valve Work	-	-	150	1200	-	10
Preventive Maintenance & Periodic Testing	-	-	50	500	-	50

	Administration & Staff	Operations	Technical Services	Maintenance	Janitorial	QA
Misc. Cleanup & Decon	-	-	450	-	1400	-
Reactor Building General Entry	80	1160	3450	1380	50	450
Totals	80	4280	8680	19200	1500	3190

Table 12-15. Estimated Occupational Dose by Job Function

Function	Dose[1]
Reactor Operations & Surveillance	5
Routine Maintenance	70
Inservice Inspection	3
Waste Processing	2
Defuel/Refuel	5
Misc. (less than 1 person rem/task)	10
Special Maintenance	5
	100

Note:

1. Percent of total station dose
2. Basis. 1994 & 1995 actual values averaged and correlated to Tabe 12-14 values.

Table 12-16. Estimates of Airborne Radioactive Contamination in the Containment

Isotope	Concentration (μC/ML)	Fraction of 10CFR 20.1201 Limit
AR41	8.6×10^{-08}	1.2×10^{-3}
KR83m	4.6×10^{-08}	1.8×10^{-7}
KR85m	3.0×10^{-07}	6.0×10^{-4}
KR85	7.7×10^{-05}	3.1×10^{-2}
KR87	1.2×10^{-07}	9.6×10^{-4}
KR88	8.9×10^{-07}	1.8×10^{-2}
KR89	1.3×10^{-09}	5.2×10^{-4}
XE131m	6.0×10^{-07}	6.0×10^{-5}
XE133m	8.9×10^{-07}	3.6×10^{-4}
XE133	8.3×10^{-05}	3.3×10^{-2}
XE135m	1.2×10^{-08}	5.3×10^{-5}
XE135	1.1×10^{-06}	4.4×10^{-3}
XE137	2.7×10^{-09}	1.1×10^{-3}
XE138	6.7×10^{-08}	6.7×10^{-4}
I130	2.7×10^{-12}	3.6×10^{-7}
I131	3.4×10^{-11}	6.8×10^{-5}
I132	1.4×10^{-09}	1.9×10^{-5}
I133	5.3×10^{-10}	2.1×10^{-4}
I134	5.5×10^{-11}	1.1×10^{-7}
I135	2.7×10^{-11}	1.5×10^{-6}
Total	1.6×10^{-04}	9.2×10^{-2}

Assumptions:

1. Reactor coolant activity from Table 11-3
2. Reactor coolant leak rate is 1%/day for noble gases; 0.001%/day for iodines.
3. Decay during build-up for 100 days.
4. Volume of lower compartment is 3.68×10^{5} ft.^{3}.
5. The Reactor Coolant System remains pressurized.
6. Recirculation cleanup time prior to entry into lower compartment is 16 hours.
7. Purge time prior to entry into lower compartment is 2 hours.
8. Lower compartment purge rate is 7500 cfm.
9. The total containment volume of 1.038×10^{6} ft.^{3} is available for dilution at the time of entry.
10. Occupancy time 1.5 hours per week.
11. Ar41 production by neutron capture near reactor vessel.
12. 10CFR 20.1201 derived air concentrations have been adjusted for occupancy.

Table 12-17. Estimates of Airborne Radioactive Contamination in the Auxiliary Building Room

Isotope	Concentration (μC/ML)	Fraction of 10CFR 20.1201 Limit
KR83m	1.2×10^{-08}	4.8×10^{-7}
KR85m	5.1×10^{-08}	1.0×10^{-3}
KR85	1.2×10^{-09}	4.8×10^{-6}
KR87	3.6×10^{-08}	2.9×10^{-3}
KR88	1.0×10^{-07}	2.0×10^{-2}
KR89	2.8×10^{-09}	1.1×10^{-2}
XE131m	3.1×10^{-09}	3.1×10^{-6}
XE133m	2.2×10^{-08}	8.8×10^{-5}
XE133	9.3×10^{-07}	3.7×10^{-3}
XE135m	8.4×10^{-09}	3.7×10^{-4}
XE135	1.2×10^{-07}	4.8×10^{-3}
XE137	5.1×10^{-09}	2.0×10^{-2}
XE 138	2.8×10^{-08}	2.8×10^{-3}
I130	9.8×10^{-13}	1.3×10^{-6}
I131	1.2×10^{-10}	2.4×10^{-3}
I132	4.9×10^{-11}	6.5×10^{-6}
I133	1.8×10^{-10}	7.2×10^{-4}
I134	2.4×10^{-11}	4.8×10^{-7}
I135	9.4×10^{-11}	5.4×10^{-5}
Total	1.3×10^{-06}	7.1×10^{-2}

Assumptions:

1. Activity shown in Table 11-3 is reduced by demineralizer efficiencies shown in Table 11-12.
2. Leak rate is 160 lb/day/unit.
3. All of the noble gas and 0.75 percent of the iodine escapes from leakage.
4. The ventilation flow rate is 3270 cfm.
5. The volume of the room is 3168 $ft.^3$.
6. Occupancy time is 15 hours per week.
7. Concentrations shown are equilibrium values.
8. 10CFR 20.1201 derived air concentrations have been adjusted for occupancy

Table 12-18. Estimates of Airborne Radioactive Contamination in the Turbine Building

Isotope	Concentration (μC/ML)	Fraction of 10CFR 20.1201 Limit
KR83m	8.4×10^{-15}	8.4×10^{-13}
KR85m	3.8×10^{-14}	1.9×10^{-9}
KR85	9.1×10^{-16}	9.1×10^{-12}
KR87	2.3×10^{-14}	4.6×10^{-9}
KR88	7.6×10^{-14}	3.8×10^{-8}
KR89	6.9×10^{-16}	6.9×10^{-9}
XE131m	2.4×10^{-15}	6.0×10^{-12}
XE133m	1.8×10^{-14}	1.8×10^{-10}
XE133	7.2×10^{-13}	7.2×10^{-9}
XE135m	8.2×10^{-15}	9.1×10^{-10}
XE135	9.0×10^{-14}	9.0×10^{-9}
XE137	1.4×10^{-15}	1.4×10^{-8}
XE138	1.5×10^{-14}	3.8×10^{-9}
I130	5.0×10^{-16}	1.7×10^{-9}
I131	1.3×10^{-13}	6.5×10^{-6}
I132	3.8×10^{-14}	1.3×10^{-8}
I133	1.8×10^{-13}	1.8×10^{-6}
I134	6.9×10^{-15}	3.5×10^{-10}
I135	7.9×10^{-14}	1.1×10^{-7}
Total	1.4×10^{-12}	8.5×10^{-6}

Assumptions:

1. Main steam iodine concentrations are shown in Table 11-6.
2. All of the iodine and noble gas from a 1700 lb/hr (per unit) steam leak is released.
3. 0.75 percent of the iodine present in a 5 gpm/unit liquid leak rate to the Turbine Building Sump is released.
4. Turbine Building volume is 8,880,000 $ft.^3$.
5. Turbine Building ventilation flow rate is 690,000 cfm.
6. Concentrations shown are equilibrium values.
7. Occupancy is continuous.

Table 12-19. RCA and RCA Control Points

Figure & Elevation	RCA Boundaries (Zones)	RCA Control Points		
		Location	(Column Lines)	Type
12-1 EL. 695'+0	IV, V &VI			
12-2 EL. 716'+0	IV, V & VI			
12-3 EL. 733'+0 & 739'+0	IV, V, & VI	Aux bldg. door to U-2 D/G Rm.	CC-67	Incidental Access Point
		Aux bldg. door to U-2 Turbine Bldg	AA-67	Incidental Access Point
		U-2 Aux Bldg double sub hatch	AA-59	Incidental Access Point
		Aux bldg. door to U-1 D/G Rm.	CC-45	Incidental Access Point
		Aux bldg. door to U-1 Turbine Bldg	AA-45	Incidental Access Point
		U-1 Aux Bldg double sub hatch	AA-53	Incidental Access Point
12-4 EL. 750'+0	IV, V, & VI	U-1 Aux bldg, sub hatch	AA-54	Incidental Access Point
		U-1 Aux Bldg. double sub hatch	AA-52	Incidental Access Point
		U-2 Aux bldg. sub hatch	AA-58	Incidental Access Point
		U-2 Aux Bldg. double sub hatch	AA-60	Incidental Access Point
12-5 EL. 760'+6 & 767+0	IV, V, and areas of III to the left of EE column line	First Aid Rm	SS-52	Incidental Access Point
		U-1 SFP door 1000	SS-52	Incidental Access Point
		U-1 SFP door 1000A	SS-48	Incidental Access Point
		U-1 SFP roll-up door	RR-47	Incidental Access Point
		1202 roll-up door	YYA-62	Incidental Access Point
		Waste Shipping roll-up door	YYA-68	Incidental Access Point

Figure & Elevation	RCA Boundaries (Zones)	RCA Control Points		
		Location	(Column Lines)	Type
		Hot Tool Crib roll-up door	UU-68	Incidental Access Point
		Hot Tool Crib door 1039	TT-68	Incidental Access Point
		U-2 SFP door 1026A	SS-64	Incidental Access Point
		U-2 SFP roll-up door	RR-65	Incidental Access Point
		Equip Staging Bldg. roll-up door	PPB-14	Incidental Access Point
		Equip Staging Bldg. door 1063	PPB-14	Incidental Access Point
		Solid Pad roll-up door	YY-50	Incidental Access Point
		Solid Pad door south	XX-50	Incidental Access Point
		Solid Pad door west	VV-52	Incidental Access Point
		U-1 Electrical Pen Rm 925E (MG Set Rm)	CC-53	Emergency entrance OPS TCA
		U-2 Electrical Pen Rm 925F (MG Set Rm)	CC-59	Emergency entrance OPS TCA
12-6 EL. 774'+0 & 784'+0	III, IV, & VI	RCA Entrance/Exit	QQ-56	Primary RCA personnel entrance/exit
		RP Office door 1115	XX-56	Incidental Access Point
		Corridor over Aux Bldg. roof, south stairs	FF-56	Secondary RCA personnel entrance/exit

Table 12-20. Deleted Per 2011 Update