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PRELIMINARY RADIATION

SURVEY OF THE SRE

By

J. P. Hale

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PRELIMINARY RADIATION SURVEY OF THE SRE

STATEMENT OF PROBLEM

To determine radiation dosage rates associated with operation of the SRE at 8.3 MW (1n N recorder reading) and extrapolation of these values to full power operation.

SUMMARY OF RESULTS AND RECOMMENDATIONS

The appendix lists the measured and extrapolated values.

Excessive radiation levels were measured in the following areas:

1. Cracks around the shield blocks over the main and auxiliary sodium piping
2. Primary sodium pump
3. Auxiliary secondary sodium system.

All other areas were less than design tolerance of 0.75 mr/hr.

Air samples taken during the run showed no airborne particulate activity above normal background. Air concentrations of radioactivity were measured continuously throughout the run by use of a continuous air monitor (AM-2) located in the reactor high bay area and periodically checked with an electrostatic precipitator and a high volume air sampler (Staplex).

Exposures of personnel during the entire run did not exceed 50 mrem. Tolerance for one week as set down by the National Bureau of Standards (NBS Handbook 58) and the State of California is 300 mrem.

Before full power operation suitable shielding should be incorporated in these areas to reduce the extrapolated radiation levels at full power (see appendix) to 0.75 mr/hr.

METHOD USED, DESCRIPTION OF EQUIPMENT, SAMPLE CALCULATIONS

All beta-gamma measurements were made with a Model 2612 G-M counter calibrated with radium. Beta-gamma measurements were also made with type K photographic film.

All neutron measurements were made with a Pu-Be calibrated RCL slow-fast neutron counter.

For purposes of extrapolating radiation leakage at full power the following estimates were used.

1. At the times of the survey, the primary sodium had reached ~80% of its equilibrium value at 8.3 megawatts.
2. Full power for the reactor is 20 MW .

APPENDIX

The following locations and associated readings may be found on the plan sketch of the reactor floor.

Column 1 are readings obtained with a G-M counter at floor level. Where readings exceed 20 mr/hr the reading was obtained by extrapolation from 1, 2 or 3 feet above floor level.

Column 2 lists the neutron dose rates obtained during the survey.

Column 3 lists the total dose rates for all radiation extrapolated to full power operation. The neutron dose rates are extrapolated by the reactor power ratio, and the gamma levels take account of the Na²⁴ buildup.

RESULTS OF RADIATION SURVEY

<u>Location</u>		<u>B-7</u> <u>mr/hr</u>	<u>Neutrons</u> <u>mrem/hr</u>	<u>Total at</u> <u>20 MW</u> <u>mrem/hr</u>
1.	Sodium pipe gallery vault shield	1.1	Bkg	3.3
2.	"	1.1	0.006	3.3
3.	"	0.4	Bkg	1.2
4.	"	0.7	"	2.1
5.	"	1.0	"	3.0
6.	"	1.1	"	3.3
7.	"	0.5	"	1.5
8.	"	0.1	"	0.3
9.	"	0.1	"	0.3
10.	"	4.5	"	14.0
11.	"	5.5	"	17.0
12.	"	5.0	0.013	15.0
13.	"	4.0	Bkg	12.0
14.	"	1.4	"	4.2
15.	Aux. heat exchanger vault shield	Bkg	"	0
16.	Valve operator #206	"	"	0
17.	" 199	"	"	0
18.	" 202	"	"	0
19.	Valve operator #211	Bkg	Bkg	0
20.	" 203	"	"	0
21.	" 177	"	"	0
22.	" 175	"	"	0

RESULTS OF RADIATION SURVEY (Cont'd)

	<u>Location</u>	<u>B-7</u> <u>mr/hr</u>	<u>Neutrons</u> <u>mrem/hr</u>	<u>Total at</u> <u>20 MW</u> <u>mrem/hr</u>
23.	Aux. heat exchange vault shield	Bkg	Bkg	0
24.	"	"	"	0
25.	"	"	"	0
26.	"	"	"	0
27.	"	"	"	0
28.	"	0.3	"	0.9
29.	"	1.9	"	5.7
30.	"	3.0	"	9.0
31.	"	4.0	"	12.0
32.	"	3.5	"	11.0
33.	"	3.0	"	9.0
34.	"	Bkg	"	0
35.	"	"	"	0
36.	Aux. Primary Sodium pump shaft	0.5	"	1.5
37.	Aux. vault valve handles	Bkg	"	0
38.	"	"	"	0
39.	"	"	"	0
40.	Valve operator #330, 331 & 332	"	"	0
41.	" 185	"	"	0
42.	Aux. secondary pipe vault shield	"	"	0
43.	"	"	"	0
44.	"	"	"	0
45.	"	"	"	0
46.	"	"	"	0
47.	Valve operator #153, 154 & 155	"	"	0
48.	Shield blocks (south end of main pri vault)	0.35	"	1.0
49.	Shield blocks (south end of main pri vault)	0.15	"	0.45
50.	"	1.3	"	3.9
51.	"	1.5	"	4.5
52.	"	0.2	"	0.6
53.	"	1.0	"	3.0
54.	"	1.5	"	4.5
55.	"	5.0	"	15.0
56.	"	4.0	"	12.0
57.	"	15.0	"	45.0

RESULTS OF RADIATION SURVEY (Cont'd)

	<u>Location</u>	<u>β-γ mr/hr</u>	<u>Neutrons mrem/hr</u>	<u>Total at 20 MW mrem/hr</u>
58.	Valve operator #198	3kg	"	0
59.	"	"	"	0
60.	"	0.1	"	0.3
61.	"	0.1	"	0.3
62.	γ facility	Bkg	"	0
63.	Shield block over main heat exchanger	30.0	"	90.0
64.	"	30.0	"	90.0
65.	"	20.0	"	60.0
66.	"	25.0	"	75.0
67.	"	1.5	"	4.5
68.	"	1.2	"	3.6
69.	"	0.8	"	2.4
70.	"	0.3	"	0.9
71.	"	12.0	"	36.0
72.	"	5.0	"	15.0
73.	"	5.0	"	15.0
74.	Valve operator #323 & 157	Bkg	"	0
75.	" 315	"	"	0
76.	" 314 & 148	"	"	0
77.	East end of shield block	20.0	"	60.0
78.	"	5.0	"	15.0
79.	Valve operator #147	Bkg	Bkg	0
80.	" 107, 111 & 162	"	"	0
81.	"	"	"	0
82.	Shield blocks (NE section of pri galley)	6.0	"	18.0
83.	"	5.0	"	15.0
84.	"	4.0	"	12.0
85.	"	Bkg	"	0
86.	"	"	"	0
87.	"	0.1	"	0.3
88.	Valve operator #313	0.75	"	2.2
89.	" 108 & 632	0.5	"	1.5

RESULTS OF RADIATION SURVEY (Cont'd)

				Total at 20 MW
<u>Location</u>		<u>β-γ mr/hr</u>	<u>Neutrons mrem/hr</u>	<u>mrem/hr</u>
90.	Valve operator #105, 142 & 297	0.5	Bkg	1.5
91.	" 106	0.5	"	1.5
92.	Shield blocks	20.0	"	60.0
93.	"	40.0	"	120.0
94.	"	35.0	"	100.0
95.	"	18.0	"	54.0
96.	"	14.0	"	42.0
97.	Shield blocks pri sodium system	14.0	"	42.0
98.	"	16.0	"	48.0
99.	"	0.9	"	2.7
100.	"	0.7	"	2.1
101.	"	0.15	"	0.45
102.	"	4.0	"	12.0
103.	"	2.0	"	6.0
104.	"	0.5	"	1.5
105.	"	0.2	"	0.6
106.	"	5.0	0.004	15.0
107.	"	2.0	0.005	6.0
108.	"	3.0	0.005	9.0
109.	"	0.5	0.005	0.16
110.	"	0.3	0.005	0.91
111.	"	1.0	0.005	3.0
112.	"	1.8	0.006	5.4
113.	"	1.8	0.006	5.4
114.	"	1.4	0.020	4.2
115.	"	6.0	0.024	18.0
116.	"	32.0	0.028	96.0
117.	"	50.0	0.010	150.0
118.	"	80.0	0.008	240.0
119.	"	100.0	0.008	300.0
120.	Main primary sodium pump	75.0	Bkg	220.0
121.	"	110.0	"	330.0
122.	"	0.1	"	0.3
123.	"	Bkg	"	0

RESULTS OF RADIATION SURVEY (Cont'd)

	<u>Location</u>	<u>β-γ mr/hr</u>	<u>Neutrons nrem/hr</u>	<u>Total at 20 MW nrem/hr</u>
124.	Valve operator #131	0.65	Bkg	1.9
125.	Valve operators	Bkg	"	0
126.	" #140	"	"	0
127.	" 104	"	"	0
128.	" 134, 135	"	"	0
129.	"	0.7	"	2.1
130.	"	0.6	"	1.8
131.	"	0.2	"	0.6
132.	North instrumentation pit	Bkg	"	0
133.	"	"	"	0
134.	South "	"	"	0
135.	South instrumentation pit	Bkg	"	0
136.	Tetralin lines	"	"	0
137.	Top shield	0.3 @ 7'	"	0.9 @ 7'
138.	"	1.25 @ 7'	"	3.8 @ 7'
139.	"	0.25 @ 7'	"	0.7 @ 7'
140.	"	Bkg	"	0
141.	"	0.10 @ 7'	"	0.3 @ 7'
142.	"	Bkg	"	0
143.	"	"	"	0
144.	"	"	"	0
145.	"	"	"	0
146.	"	"	"	0
147.	"	"	"	0
148.	"	"	"	0
149.	Hole #17	0.25	"	0.75
150.	40" plug	Bkg	"	0
151.	Control rod	0.3	"	0.9
152.	"	Bkg	"	0
153.	40" plug	"	"	0
154.	Holes 74, 75, 76, 79, 80 & 81	"	"	0
155.	Control rod	0.2	"	0.6
156.	"	0.3	"	0.9

RESULTS OF RADIATION SURVEY (Cont'd)

	<u>Location</u>	<u>β-γ mr/hr</u>	<u>Neutrons mrem/hr</u>	<u>Total at 20 MW mrem/hr</u>
157.	Tetralin system (exterior)	Bkg	Bkg	0
158.	"	20.0	"	60.0
159.	Top of pri fill tank vault	Bkg	"	0
160.	Main secondary sodium system	"	"	0
161.	15' down aux secondary sodium vault	500.0	0.32	1500.0

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