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DUQUESNE LIGHT COMPANY
SHIPPINGPORT ATOMIC POWER STATION

TEST EVALUATION

DLCS 2340107
T-641306

RADIATION LEVELS IN THE VICINITY OF THE
PURIFICATION DEMINERALIZERS

CORE I SEED 2

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Purpose

To measure the extent of activity build-up inside the LAC and LBD purification demineralizer concrete enclosures.

Conclusions

This test indicates that the long-lived activity in the LAC and LBD purification demineralizers have decreased considerably, since the previous performance, with the addition of new resin.

Demineralizer	Maximum Reading mr/hr		
	DLCS 2340107	DLCS 2340106	DLCS 2340105
LAC	50	*	800
LBD	30	650	

* LAC demineralizer was out of service at this time.

Description of Test Equipment and Test Procedure

DLCS 2340107, Radiation Levels in the Vicinity of the Purification Demineralizers, was performed in accordance with the First Issue of the Approved Test Procedure dated May 11, 1960.

A Jordan survey meter equipped with a 25 foot extension cord was used to determine the radiation levels inside the concrete enclosures, adjacent to the LAC and LBD purification demineralizer vessels. Radiation levels were obtained at six inch intervals from 6 to 17.5 feet below the top of the concrete shield on the LAC demineralizer and from 0.5 feet to 24.5 feet on the LBD demineralizer by lowering the probe through the 3 inch pipe on top of the concrete enclosure. At each position, the probe was slowly rotated and the highest activity recorded. This survey was performed approximately 30 hours after shutdown.

Results

DLCS 2340107, (T-641306), Radiation Levels in the Vicinity of the Purification Demineralizers, was performed on November 26, 1960. The data obtained during the performance of this test is shown in Tables I, II, III and IV.

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The Station was shutdown at 1606 on November 25, 1960. At this time, the reactor head accumulated 9370 EFPH while the total gross generator output was 616,928,000 kw hours.

New resin was charged into the LBD and LAC demineralizers on October 28 and November 16, 1960. Since this time, the resin has been in service in the LAC demineralizer for approximately 208 hours* while the resin in the LBD demineralizer has been in service for approximately 458 hours*.

Tables I and II are a tabulation of the radiation levels measured at specific elevations in the LAC and LBD purification demineralizer enclosures. Figures 1 and 2 are graphs showing plots of the radiation level versus the position of the probe relative to the demineralizer for the LAC and LBD purification demineralizer respectively. Also shown on these figures are scale drawings of the demineralizers.

Table III contains the calibration data for the Jordan survey meter no. 729 which was used during this test.

Table IV is a tabulation of the maximum radiation level observed, the position of the probe for the maximum level, the time of the survey relative to shutdown, and the service history of each of the demineralizers for the first, fifth, sixth and seventh performances of this test.

A maximum radiation level of 50 mr/hr was measured in the vicinity of the LAC demineralizer at a distance of 14.5 feet from the top of the concrete enclosure. A maximum radiation level of 37 mr/hr in the vicinity of the LBD demineralizer was recorded at 9 feet and 10 feet from the top of the concrete enclosure.

The maximum radiation level in the vicinity of the LAC demineralizer was at 14.5 feet and this height is approximately at the bottom of the resin bed. Figure 2 (Radiation Level vs. Distance from the top of the LBD Purification Cubicle) shows that a peak also exists at 14.5 feet, however, this peak is not the maximum radiation level. This indicates the possibility that all of the old resin was not flushed from the demineralizers and the new resin was placed on top of the old resin.

The curves on Figure 1 indicate that during the first performance (September 17, 1958) a band of high radiation approximately one foot high was measured near the center portion of the LAC demineralizer vessel. The fifth performance** (September 6, 1959) showed a narrow band of high activity in the upper portion of the demineralizer. The seventh performance (November 25, 1960) showed a band of low radiation at the bottom of the demineralizer. In the first performance, the maximum activity of the radiation band was 150 mr/hr at 9 hours after shutdown. The fifth performance of this test showed a maximum activity of 800 mr/hr at 30 hours after shutdown. In the seventh performance, taken 30 hours after shutdown, the maximum activity decreased considerably as a result of the new resin. The maximum activity dropped from 800 mr/hr in the fifth performance to 50 mr/hr during the last performance.

* Determined from Station Operating logs.

** The LAC Demineralizer was out of service during the sixth performance.

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A comparison of the activity levels measured in this performance (seventh) with the activities measured in the sixth performance, indicates that the radiation band is now located nearer the top of the LBD demineralizer. The first performance and the seventh performance showed that maximum activity occurred at approximately the same height. In the first performance the peak radiation band occurred at 9.5 feet from the top of the concrete enclosure. The sixth performance indicated that the peak was measured at 10.0 feet to 10.5 feet from the top of the enclosure. In the seventh performance, the maximum activity of the radiation band changed considerably from the sixth performance to the last performance. The activity levels of the first and seventh performances were almost identical. Maximum activity was 35 mr/hr at 9 hours after shutdown for the first performance and 37 mr/hr at 30 hours after shutdown for the seventh performance. In the sixth performance, the maximum activity was 650 mr/hr 26 hours after shutdown.

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NOTE: IAC demineralizer was out of service for the sixth performance of the test.

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RADIATION LEVELS IN THE VICINITY
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TABLE I

1AC PURIFICATION DEMINERALIZER RADIATION LEVELS

Distance from the Top of Enclosure (feet)	Radiation Level mr/hr	Time
6.0	9	2206
6.5	13	2206
7.0	15	2206
7.5	19	2206
8.0	22	2206
8.5	26	2206
9.0	21	2206
9.5	14	2206
10.0	7	2206
10.5	4.5	2206
11.0	3.5	2207
11.5	3.5	2207
12.0	3.5	2207
12.5	4.1	2207
13.0	13	2207
13.5	30	2207
14.0	45	2207
14.5	50	2207
15.0	26	2207
15.5	17	2207
16.0	13	2208
16.5	9	2208
17.0	7	2208
17.5	6.5	2208

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TABLE II

1BD PURIFICATION DEMINERALIZER RADIATION LEVELS

Distance from the Top of Enclosure (feet)	Radiation Level mr/hr	Time	Distance from the Top of Enclosure (feet)	Radiation Level mr/hr	Time
0	< 0.5	2142	12.5	4.5	2150
0.5	< 0.5	2142	13.0	5.5	2151
1.0	< 0.5	2142	13.5	9.0	2151
1.5	< 0.5	2142	14.0	11.0	2151
2.0	< 0.5	2142	14.5	12.0	2151
2.5	< 0.5	2143	15.0	9.0	2152
3.0	< 0.5	2143	15.5	8.0	2152
3.5	< 0.5	2144	16.0	7.0	2152
4.0	< 0.5	2144	16.5	6.0	2153
4.5	< 0.5	2144	17.0	5.5	2153
5.0	2.8	2145	17.5	7.0	2154
5.5	8.0	2.45	18.0	6.5	2154
6.0	10.0	2145	18.5	6.0	2154
6.5	14.0	2146	19.0	6.0	2154
7.0	17.0	2146	19.5	6.2	2155
7.5	21.0	2147	20.0	6.0	2155
8.0	30.0	2147	20.5	6.0	2156
8.5	36.0	2147	21.0	6.0	2156
9.0	37.0	2148	21.5	6.0	2156
9.5	33.0	2148	22.0	6.0	2156
10.0	37.0	2149	22.5	6.0	2157
10.5	33.0	2149	23.0	6.0	2157
11.0	17.0	2149	23.5	6.0	2157
11.5	10.0	2150	24.0	6.0	2158
12.0	6.0	2150	24.5	6.0	2158

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TABLE III
SURVEY METER CALIBRATION DATA

Survey Meter - Jordan No. 729

Calibrated Date	Source	Calculated Value mr/hr	Measured Value mr/hr
11/26/60	Co ⁶⁰	5	5
11/26/60	Co ⁶⁰	10	10
11/26/60	Co ⁶⁰	25	22
11/26/60	Co ⁶⁰	50	45
11/26/60	Co ⁶⁰	100	90
11/26/60	Co ⁶⁰	150	130
11/26/60	Co ⁶⁰	250	220
11/26/60	Co ⁶⁰	500	500

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TABLE IV
IAC DEMINERALIZER

	Date	Hours After Shutdown	Hours in Service	Maximum Radiation Level mr/hr	Height at Maximum Radiation Level Feet
1st Perf.	9/17/58	9	5366	150	11.5
5th Perf.	9 / 6/59	30	12213	800	10.0
7th Perf.	11/26/60	30	* 208	50	14.5

1 1 AC Demineralizer was out of service during the 6th performance.
1 BD DEMINERALIZER

	Date	Hours After Shutdown	Hours in Service	Maximum Radiation Level mr/hr	Height at Maximum Radiation Level Feet
1st Perf.	9/17/58	9	5366	35	9.5
6th Perf.	6/11/60	26	11000	650	10,10.5
7th Perf.	11/26/60	30	* 458	37	9,10

* Number hours the IAC and IBD demineralizers have been in service
with new resin.

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