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Health Physics Monthly Information Report (4)

Date: October 1 - 31, 1952

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Department of Energy Declassification Review

Schedule DATE Item No. 5d

Contract Number AT-33-1-GEN 53

Mound Laboratory, Operated By
Monsanto Chemical Company

Well Disposal

DATA 81a

This is copy 12A of 12A

MLM-778
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GENERAL

One health physicist from Mound Laboratory attended the conference on "Hot Laboratories" held in Oak Ridge on October 7, 8, and 9.

Three Mound Laboratory personnel attended the Health Physics Conferences held in Idaho Falls on October 16, 17, and 18.

On Monday, October 13, the 200 HP motor servicing the west stack fan burned out. It was temporarily replaced with a 150 HP motor. This provided sufficient ventilation for the "R" and "GP" buildings, but it was necessary to exhause air from the "T" Building through the head house instead of the stack. The 200 HP motor was put into place again on October 25 and ventilation returned to normal. No undue amounts of polonium were detected in the head house exhaust during this period.

SURVEY GROUPS

Statistics

- Air monitoring samples (polonium) 5,307
- Air monitoring samples (other) 1,022
- Wipe samples 34,432
- Routine and special surveys 1,317

Laboratories "T" Area

The supervisor of the Neutron Source laboratory reported that surface contamination had been detected in his area. The active material had spread as far as the loading dock just outside the door of his labs. An investigation and survey disclosed that some high risk trash had been thrown into some of the room waste cans instead of into the high risk area disposal chutes. The error was corrected and the area decontaminated by the second shift clean-up crew. The concentration of polonium in the room air did not increase during this period.

A micro-assay foil was dropped on the block of one of the low geometry alpha counters. The incident was reported to Health Physics immediately and the resultant contamination confined to a small area which was easily cleaned. A second incident, occurring when a similar foil was dropped on the floor, was not reported until 15 minutes after it happened. Polonium had, by this time, been tracked throughout most of the lab and some of the corridors near the lab. Decontamination of the room and corridors required almost a full day. This serves to emphasize the importance of immediate action in such cases.

There were 22,846 wipe samples taken in the "T" Area laboratories during October. Of these, 3.5 per cent showed surface contamination of polonium greater than 500 d/min/40 in². The higher percentage is due, in part, to the incidents reported above.

Laboratories "G" Area

Surveys made in the X-ray room of the "B" Building indicated high radiation intensities at three points in the room. These were:
1. Around the door handle - ~ 1 r/hr
2. Near the floor next to the X-ray room - 185 mr/hr.
3. A small area on the wall near the pass box into the dark room - 83 mr/hr

When the X-ray machine was installed, a 30-minute run at 265 KV was made for monitoring and testing purposes. Meters and films used to check the shielding and general radiation intensities did not show these points to be hazardous. It should be noted, however, that there was nothing between the tube and the floor during the test run.

During actual operations, either a small shaker or a small shaker or a table of equal height is placed under the tube. Scattered radiation, then, accounts for the discovery of faults in the shielding. These are being repaired or additional shielding added.

Two biologists were irradiating cells with 24.3 mc of polonium divided into six flasks. These were suspended in a constant temperature bath and agitated continuously for four hours. At each half-hour interval, gas under approximately 10 pounds pressure was blown over the surface of the liquid. The flasks were exhausted through a glass manifold containing a glass fibre filter and thence into the exhaust ducts. Air samples taken in the laboratory during these runs were much higher than normal, indicating that more stringent precautions must be taken during future operations of this type.

Lights in the high risk corridors R-132 and R-148 were sealed with MMM-471 tape. This is a plastic tape and is the same as that being used in the "GP" Building as a protective covering for parts of the floor. It is felt that this tape has better adhesive qualities than that previously used and will provide a better and longer lasting seal around light fixtures. An order has been placed for enough of this tape to use on the remaining high risk corridor light fixtures.

On September 26, three test slugs which were to be sent to the MTR were found to be contaminated. This contamination occurred in the cave during the sealing and welding process and ranged to about $10^8$ d /min alpha radiation at the welds. Since these slugs contained no radioactive materials (they were filled with various salts for irradiation tests), it was decided to investigate possible methods of decontamination. An attempt to clean the slugs by scrubbing with a Versene-detergent mixture was unsuccessful as were other scrubbing attempts. Final decontamination was effected by immersing the slugs in a concentrated NaOH solution. The slugs were resurveyed approximately one week later and were found to be clean.

It might be well to note the methods used in this decontamination procedure and the results obtained. The first slug was immersed in the NaOH solution, agitated a few times, removed, rinsed, dried, and surveyed. All of the contamination was removed by this process. The other two slugs were scrubbed in the same NaOH solution. This method was only partially successful in removing the active contaminants. The two slugs were then immersed in a freshly prepared NaOH and given the same treatment as the first slug. This removed all of the remaining contamination. At the time, it seemed that the clean solution made the difference.

This, however, is apparently not the case. One of the research chemists, assigned the problem of developing a suitable procedure to be used on future hot slugs, performed several tests. He contaminated several aluminum disks and attempted to clean them using...
solutions of various reagents such as HCl, HNO₃, H₂SO₄, NaOH, and Chromic-Sulfuric acid cleaning solution. He found that the NaOH and the C-S cleaning solution gave the best results. He also found, however, that if the disks were left in the NaOH solution longer than 20 seconds, or in the C-S cleaning solution longer than 50 seconds, the contaminants would begin to replate on the metal. The C-S cleaning solution has been adopted for future use.

The MMM Plastic Pressure tape, which had been used as a protective floor covering in the air-lock behind the cave, was removed on September 30. The tape, before removal, showed alpha surface contamination of 68,000 d./min./100cm², while the floor under the tape generally clean with a few spots contaminated up to 450 d./min./100cm². This seems to indicate that this type of covering will be adequate for these areas. Results of wipe samples taken in the "G" Area polonium laboratories during October were:

- "B" Building - 2,639 wipe samples taken with none above 500 d./min./40in²
- "R" - 8,107 wipe samples taken with 0.2 per cent above 500 d./min./40 in²
- Laundry (hot side) - 840 wipe samples taken with 5.6 per cent above 500 d./min./40 in²

**AIR SAMPLING**

The following table summarizes the results of air samples collected and analyzed for polonium content during October:

<table>
<thead>
<tr>
<th>SAMPLING LOCATION</th>
<th>NO OF SAMPLES</th>
<th>PER CENT ABOVE 1,000 d./min./m²</th>
<th>AVERAGE D./MIN./m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I&quot; BLDG. CLEAN</td>
<td>118</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>LOW RISK</td>
<td>1098</td>
<td>3.6</td>
<td>532</td>
</tr>
<tr>
<td>HIGH RISK</td>
<td>460</td>
<td>51.9</td>
<td>18,396</td>
</tr>
<tr>
<td>EXHAUST SYSTEMS</td>
<td>308</td>
<td>1.6</td>
<td>260</td>
</tr>
<tr>
<td>&quot;R&quot; BLDG. LOW RISK</td>
<td>1305</td>
<td>0.3</td>
<td>26</td>
</tr>
<tr>
<td>HIGH RISK</td>
<td>268</td>
<td>4.5</td>
<td>219</td>
</tr>
<tr>
<td>EXHAUST SYSTEMS</td>
<td>252</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>&quot;B&quot; BLDG. LOW RISK</td>
<td>764</td>
<td>1.2</td>
<td>106</td>
</tr>
<tr>
<td>HIGH RISK</td>
<td>82</td>
<td>0</td>
<td>113</td>
</tr>
<tr>
<td>EXHAUST SYSTEMS</td>
<td>126</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>
A large number of air samples were collected in the radium-actinium areas. These samples were given an alpha count, and most of them a beta count, immediately after collection. Re-counts were taken at intervals to establish the decay rate of the material collected. Initial decay rates indicate that an extremely high percentage of the material collected consists of daughter products of the radon isotopes.

The following table gives the results of these samples based upon initial count only.

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>CLASSIFICATION</th>
<th>NO. OF SAMPLES</th>
<th>MAXIMUM*</th>
<th>AVERAGE*</th>
<th>NO. OF SAMPLES</th>
<th>MAXIMUM*</th>
<th>AVERAGE*</th>
</tr>
</thead>
<tbody>
<tr>
<td>R 120</td>
<td>LOW RISK</td>
<td>85</td>
<td>5</td>
<td>0.8</td>
<td>86</td>
<td>70</td>
<td>4</td>
</tr>
<tr>
<td>R 109</td>
<td>LOW RISK</td>
<td>43</td>
<td>46</td>
<td>2</td>
<td>43</td>
<td>297</td>
<td>18</td>
</tr>
<tr>
<td>R 129</td>
<td>LOW RISK</td>
<td>42</td>
<td>69</td>
<td>10</td>
<td>42</td>
<td>435</td>
<td>60</td>
</tr>
<tr>
<td>R 130</td>
<td>LOW RISK</td>
<td>38</td>
<td>8</td>
<td>1</td>
<td>35</td>
<td>138</td>
<td>10</td>
</tr>
<tr>
<td>R 140</td>
<td>LOW RISK</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R 147</td>
<td>LOW RISK</td>
<td>45</td>
<td>11</td>
<td>1</td>
<td>38</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>R 161</td>
<td>LOW RISK</td>
<td>47</td>
<td>48</td>
<td>3</td>
<td>44</td>
<td>313</td>
<td>22</td>
</tr>
<tr>
<td>R 167</td>
<td>LOW RISK</td>
<td>9</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>R 168</td>
<td>LOW RISK</td>
<td>43</td>
<td>5</td>
<td>2</td>
<td>40</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td>R 215</td>
<td>LOW RISK</td>
<td>7</td>
<td>25</td>
<td>12</td>
<td>7</td>
<td>117</td>
<td>66</td>
</tr>
<tr>
<td>R-CORRIDORS</td>
<td>LOW RISK</td>
<td>108</td>
<td>1</td>
<td>0.3</td>
<td>108</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>R-121</td>
<td>HIGH RISK</td>
<td>41</td>
<td>3,467</td>
<td>210</td>
<td>41</td>
<td>238</td>
<td>918</td>
</tr>
<tr>
<td>R 128</td>
<td>HIGH RISK</td>
<td>41</td>
<td>231</td>
<td>101</td>
<td>41</td>
<td>128</td>
<td>679</td>
</tr>
<tr>
<td>GP-1A</td>
<td>LOW RISK</td>
<td>141</td>
<td>401</td>
<td>78</td>
<td>19</td>
<td>229</td>
<td>68</td>
</tr>
<tr>
<td>GP 1B</td>
<td>LOW RISK</td>
<td>45</td>
<td>140</td>
<td>62</td>
<td>21</td>
<td>102</td>
<td>54</td>
</tr>
<tr>
<td>GP-1AB</td>
<td>HIGH RISK</td>
<td>10</td>
<td>1,230</td>
<td>420</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*MULTIPLY ALL VALUES BY \(10^{-10}\) TO GIVE \(\mu\text{C/cc}\)
Samples of the type reported above are counted at intervals for a period of 20-30 days. Information obtained from these counts makes it possible to estimate the amount of long-lived material in the air. These results, of course, come too late to assist materially in preventing exposure. For this reason, if the initial counts are significant, personnel are required to wear fresh air respiratory protection.

The following presents a brief summary of such an analysis made on samples collected during September.

Low risk areas - no samples above $10^{-12}$ $\mu$C/cc

High risk areas - maximum sample $8 \times 10^{-12}$ $\mu$C/cc, average of all samples $1.4 \times 10^{-12}$ $\mu$C/cc

PERSONNEL MONITORING

Bioassay

Eighty-six control samples and 1,489 urine specimens submitted by plant personnel were analyzed for polonium content. Two individuals submitted specimens containing a polonium concentration greater than 24 $\text{d/mi}n/50\text{ ml}$. Recheck samples verified their exposures.

An investigation of the work history of these men during the week immediately preceding the high samples disclosed one common job. This consisted of handling some "T" Building contaminated waste materials. Although personnel are required to wear respirators for this operation, it is felt that the intake of polonium occurred through defective respirators or faulty use of the equipment. These operations are being thoroughly monitored, and personnel are wearing masks equipped with Type 6 filter paper until the exact cause has been ascertained.

Two blanks, 4 spike samples, and 15 twenty-four hour urine specimens were analyzed for radium content. All results were low.

Pocket Chambers

Total read 17,070

Number of single readings

- $(30-100\text{ mr})$ 87
- $(100-200\text{ mr})$ 7
- $(\text{over }200\text{ mr})$ 38

Number of paired readings

- $(30-100\text{ mr})$ 19
- $(100-200\text{ mr})$ 3
- $(\text{over }200\text{ mr})$ 7
Film Meters

Regular

Total processed 869

Number of readings
(50-150 mrep) 3
(150-300 mrep) 4
(300-600 mrep) 2
(over 600 mrep) 2*

*Exposure verified by investigation

Visitors

Total processed 1,830

Number of readings
(over 50 mrep) 0

Neutron Films

Total processed 122

Number of readings
(0-100 mrem) 122
(over 100 mrem) 0

Note: Regular film meter reading are for a period of two weeks.

SITE SURVEYS

Eighty-two off-area air samples were collected as nearly downwind from the plant as possible. Results of alpha counts on these samples were:

50 samples gave 0 counts
31 samples gave 1-20 d./min./m³
1 sample gave 21-40 d./min./m³

A summary of the analyses of mud, water, and vegetation samples for polonium content follows.
<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>NUMBER COLLECTED</th>
<th>MAXIMUM VALUE</th>
<th>AVERAGE VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUD</td>
<td>317</td>
<td>$2.5 \times 10^{-4}$ $\mu$C/GM</td>
<td>$1.2 \times 10^{-6}$ $\mu$C/GM</td>
</tr>
<tr>
<td>WATER</td>
<td>456</td>
<td>$4.1 \times 10^{-6}$ $\mu$C/cc</td>
<td>$2.0 \times 10^{-8}$ $\mu$C/cc</td>
</tr>
<tr>
<td>VEGETATION</td>
<td>45</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Maximum readings were obtained from samples collected at the point where Mound Laboratory effluent enters the Miami River, the mud sample on October 20 and the water sample on October 27.
PERSONNEL DISTRIBUTION

Personnel

Section Chief 1
Supervisors 4
Chemist 1
Ass't Health Physicist 1
Health Surveyors 13
Laboratory Assistants 7
Custodial Supervisor 1
Custodian 1
Decontamination workers 38
Clerk-Typist 1

Total 67 ½

Allocation of Time in Man-months

Pocket meters 2
Film meters 1 ½
Bioassay 3 ½
Mud, water, and vegetation 2 ¼
Surveys - "T" Area 8
Surveys - "G" Area 8
Custodial and Decontamination 26 ½
"T" Area
"G" Area 14 ½
Administrative 1 ½

Total 67 ½