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ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
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1333 BROADWAY
OAKLAND, CALIFORNIA 94612

F:MHS-4

NOV 10 1976

Martin B. Biles, Director, Division of Safety, Standards and Compliance, HQ

GILMAN HALL STUDY

The enclosed report contains the result of a survey of designated areas of Gilman Hall on the University of California at Berkeley Campus. The survey was conducted by representatives of the Lawrence Laboratories. The third floor and basement floor areas were surveyed. Selection of areas for survey was based on the history of prior use associated with the Manhattan Project and/or early Atomic Energy Commission activities.

While the results of the survey show the presence of low levels of residual activity in the two areas surveyed, it is clear that these levels represent no health hazard.

Key findings are as follows:

1. Entire survey was free of removable contamination.

2. Low level but measurable alpha activity was detected under the asphalt tile covering small areas in two rooms on third floor.

3. Low but significant levels of $Cesium^{137}$ were detected in and around a floor drain and two other areas in the basement.

Although these levels do not represent a health hazard to the occupants of the survey areas, they do exceed those recommended by the Proposed ANSI Standard for the release of facilities for uncontrolled use and should be addressed from that perspective.

The following options should be considered:

1. Leave the area as is, since the activity is low and has been fixed in place for many years.

2. Leave the survey areas as is for now but provide a control procedure which would require any future renovation and/or demolition work to be covered by contamination removal and control procedures.

3. Require complete removal of all activity to levels meeting proposed ANSI standards. Such a step would require stripping away floor tile and probably sandblasting concrete surfaces to remove fixed contamination, followed by floor restoration.

Cost analysis for these options has not been performed.

Due to the close association of the UC Campus with the Lawrence Berkeley Laboratory, we believe that a feasible control procedure could be worked out whereby LBL would assume the responsibility for providing contamination control coverage in the event of future renovation and/or demolition activities involving the designated survey areas. SAN, therefore, recommends option 2 for designated areas.

However, if the intent of the survey is to decontaminate facilities to eliminate any further control then clearly option 3 for the Third Floor and Basement Area should be implemented.

Please let us know if additional information is needed.

Calvin D. Jackson
Calvin D. Jackson, Director
Environment and Safety Division

Enclosure:
As stated

August 11, 1976

Manley Wu
Safety & Nuclear
Materials Division
U. S. ERDA
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Dear Mr. Wu:

At your request, representatives from LLL and LBL surveyed several areas of Gilman Hall on the University of California, Berkeley campus in order to document alpha contamination remaining from Manhatten Project activities of the 1940's. The survey relied on americium x-rays which could penetrate the asphalt tile which covered the original floor. A preliminary survey using the FIDLER detector and an Eberline PRM-5 indicated activity in three areas in the basement and two areas on the third floor (see figures).

Basement Floor

Spectra taken with a 2x2 NaI detector and a portable multi-channel analyzer identified ^{137}Cs as the major nuclide in the contaminated basement areas (photos #5, 7, 9). Barium x-rays were pronounced in the corresponding x-ray spectra taken with the FIDLER detector in place of the 2x2 NaI crystal (photos 6 & 8). Although no plutonium or americium x-rays were visible, the high background from ^{137}Cs made detection of low levels of transuranics difficult (photos #10, 11).

Both photos #5 and #9 have spots in their spectra which might be due to activity other than ^{137}Cs. Because the ^{137}Cs contamination appeared to be distributed in a complicated manner on the walls of pipes below the basement floor or absorbed into the concrete of the floor itself, no quantitative estimates were attempted.

Third Floor

The spectra from Room 301B revealed both americium and enriched uranium distributed over an area of several square meters. The accompanying sketch of the room shows the extent of contamination as well as estimates of americium activity. Photo numbers 10, 11, and 12 are typical of the x-ray and gamma spectra seen.

The estimate of ^{241}Am activity required two simplifying assumptions. First, all contamination was assumed to be on the surface of the concrete floor but under the asphalt tile covering. Although the activity estimate accounts for attenuation in the tile no attenuation in concrete was assumed. Second, the FIDLER detector was in contact with the tile surface so all counts were assumed to originate from the surface area directly below the detector face. In fact, some counts were from areas close to the detector perimeter but outside the contact area of the detector with the floor.

For the activity estimate the sum of the counts in 15 channels either side of the 60 keV ^{241}Am peak were summed and ratioed to a similar summation using a source of known activity. Attenuation in the asphalt tile required that the calculated activity be increased by 14% as compensation. This calibration procedure led to an estimated average alpha activity due to ^{241}Am of 200 dpm/cm^2 over the general area with one area about 300 dpm/cm^2 (averaged over 1 meter).

If the ^{241}Am is assumed to be the daughter of ^{241}Pu from weapons grade plutonium 26 years old (0.58% ^{241}Pu, 0.0% ^{241}Am at origin), then a total alpha contamination estimate is possible. Since there would be about 7 alpha disintegrations for such a plutonium mixture for every ^{241}Am disintegration in the mixture, the total alpha activity would be 1000 to 2000 dpm/cm^2.

No 17 keV x-rays were observed or could be observed through the tile. Therefore, none of the measurements prove that any plutonium exists under the tile. However, from records of the work performed in the room it seems likely that the americium arose from work with plutonium. No record of the isotopic composition of the plutonium has been found so the use of 0.58% ^{241}Pu may be erroneous.

One other room (Room 307) contained measureable activity; however, the levels were one-third or less the level in Room 301B so no spectral analysis was made.

In summary, 1000 to 2000 dpm/cm^2 alpha activity may exist below the floor tiles in Room 301B and perhaps one-third as much activity in one area of Room 307. Positive identification of plutonium was not possible through the asphalt tile floor covering.

Gordon E. Williams
Health Physics Group
Hazards Control Department

GEW:gw

Attachments

Distribution:
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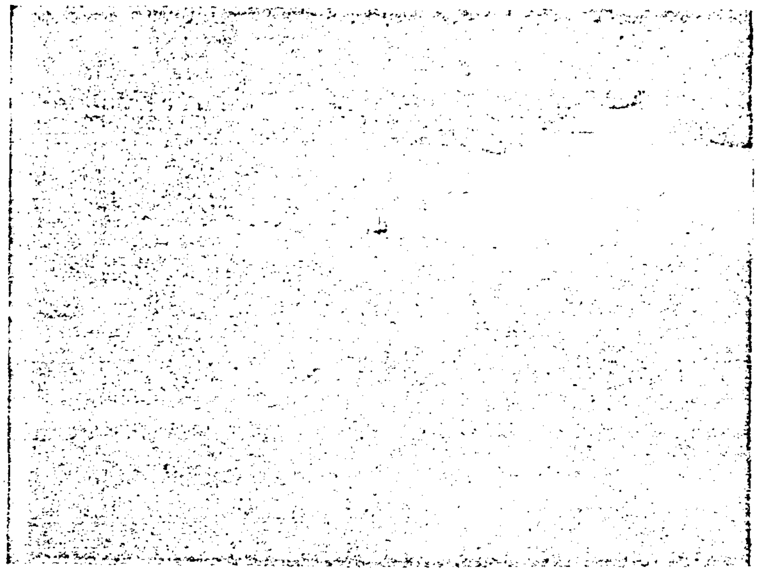
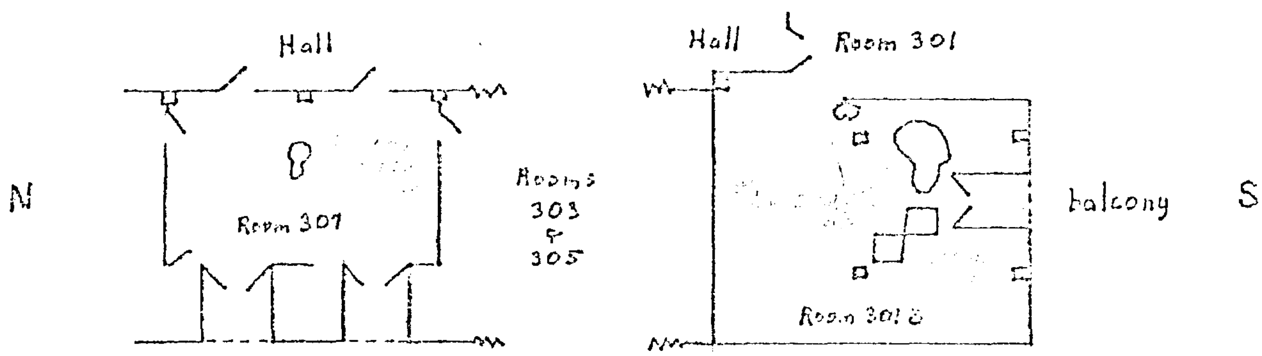
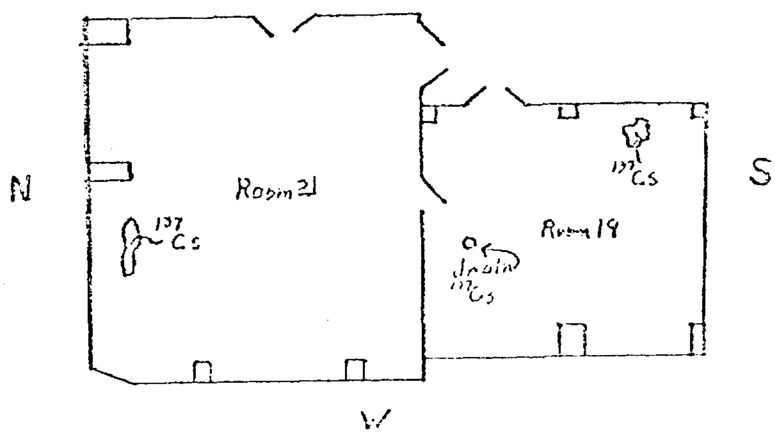
J. L. Olsen



Contaminated area marked by squares in figure of Room 301B below.



Third Floor



Basement Floor

EXPLANATION OF PHOTOS

Each photo consists of the cathode ray tube (CRT) display of the spectrum followed by explanatory information listed under several headings. The number under the "Peak Energy" heading is the energy (in keV) of the "A" or left energy marker on the CRT display. "Sample" gives the sample number. "Integral A to B" gives the sum of the counts from the channels between the left, "A," and right, "B," energy markers. The "Preset time" and "Live time" give the counting period. "B Mark Counts" gives the number of counts under the "B" marker, and "B Mark Energy" gives the energy (in keV) of the "B" or right marker. The "Day" and "Time" give the date and time of each photograph.

Photo 1

A bare ^{241}Am spectrum displaying 17 keV, 26 keV and 60 keV x-rays.

Photo 2

Pure ^{239}Pu showing the characteristic 13 keV and 17 keV x-ray peaks (overlapping).

Photo 3

Background gamma spectrum (2x2 NaI) made in uncontaminated area of Gilman Hall.

Photo 4

Background x-ray spectrum (FIDLER detector) made in uncontaminated area of Gilman Hall.

Photo 5

Spectrum of floor drain in Room #19 made with the 2x2 NaI detector. Even with the drain cap in place, two peaks are visible. The one at 662 keV is unquestionably ^{137}Cs; the lesser peak at 196 keV may be the 185 keV gamma from ^{235}U or a backscatter peak.

Photo 6

X-ray spectrum of the floor drain in Room 19, cap removed. The peak between 26 and 34 keV is probably due to barium x-rays from the ^{137}Cs decay.

Photo 7

Gamma spectrum of floor area in southeast corner of room 19. ^{137}Cs alone is evident.

Photo 8

X-ray spectrum of floor in southeast corner of Room 19. Barium x-rays between energy markers.

Photo 9

Gamma spectrum of floor along north wall of Room 21. A pronounced ^{137}Cs peak as well as possible peaks at 287 keV and 156 keV.

Photo 10

X-ray spectrum of Room 301B. ^{241}Am 60 keV and 26 keV gammas prevalent. No 17 keV is visible because of attenuation.

Photos 11 and 12

Gamma spectrum of Room 301B. No ^{137}Cs; however, 184 keV and 90 keV peaks from enriched uranium. Photo 12 is the photo 11 spectrum expanded. The 60 keV ^{241}Am peak is visible in photo 12.