

MOUND LABORATORY

MONSANTO CHEMICAL COMPANY
U. S. GOVERNMENT CONTRACT NUMBER AT 33-12665

- Thursday 24

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To Dr. J. J. Burbage

Date

September 19, 1951

OSTI

At Mound Laboratory

Subject

Mound Laboratory Participation
in the Kelley-Koett Instrument
Company Radium Accident.

At 11:20 A. M. Tuesday, July 24, 1951, a radium capsule containing 49.6 milligrams of radium became open to the atmosphere at the Kelley-Koett Instrument Company, 930 York Street, Cincinnati, Ohio. This radium was contained in a platinum tube and was used for the purpose of calibrating radiation detection instruments. At the time of the accident, the actual chemical composition of the radium salt was not known.

On Monday, July 30, 1951, Mr. L. E. Rasmussen of the Kelley-Koett Instrument Company requested of Mr. F. H. Belcher, Manager, Dayton Area, Atomic Energy Commission, that personnel from Mound Laboratory assist in the removal of the health hazard that was created by the spilling of this radium.

On Tuesday morning, July 31, 1951, at the direction of Belcher, Mr. W. A. Bigler and Mr. R. A. Miller of the Monsanto Chemical Company, Mound Laboratory, Miamisburg, Ohio were sent to the Kelley-Koett Instrument Company for the purpose of recovering as much of the radium as possible and to help in the reduction of the health hazard. Upon arrival, Bigler and Miller made the following recommendations:

1. No smoking or eating should be permitted anywhere in the plant.
2. All personnel who could have been exposed to radium by being present at any time during or after the spill in the calibration area, where the spill occurred, should be barred from admittance to the plant until such time as their safety could be guaranteed.
3. All fans in the entire plant should be put in a non-operating condition.
4. All personnel should have their hands, clothing, shoes, and hair monitored daily before leaving the plant.
5. No shipments should be made from the plant until such time as it could be guaranteed that ICC regulations governing the shipment of radioactive items could be met.
6. Seal off the calibration area from all adjacent areas. This had actually been done; however, it was decided that the sealing off process, prior to the arrival of Miller and Bigler, was inadequate.

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On Tuesday afternoon, Bigler and Miller after donning adequate protective equipment, which included fresh air masks, entered the calibration area and recovered approximately 15 milligrams of radium. This left approximately 34 milligrams of radium either on the floor or spread throughout the building. They covered all horizontal surfaces in the immediate area of the spill with a strippable plastic coating.

On Tuesday evening, Miller and Bigler attended a meeting at the Kelley-Koett Instrument Company with representatives from the U.S. Public Health Service, Public Health Service of the State of Ohio, and Kelley-Koett Instrument Company. The purpose of this meeting was to

1. Determine the extent of the contamination.
2. Formulate plans for the elimination of the contamination.

Two major decisions were reached at this meeting. These were:

1. The recommendations made by Miller and Bigler on Tuesday morning would be adhered to.
2. All contaminated surfaces would be assumed to be the result of radium and not the result of the daughter products of radon.

The following morning, Wednesday, August 1, 1951, Miller and Bigler surveyed the building to determine the spread of the contamination and to determine the nature of the contaminant. By "nature of contaminant" it is meant either daughter products of radon or radium itself. The first area surveyed was the shipping and receiving area, which is adjacent to the calibration area. At the time of the spill there were two open doorways between these two areas. Wipe samples were taken in the shipping and receiving area and counted approximately every hour for a four-hour period. The results of these samples are listed in Table I. The analyses of these samples indicated that the alpha activity was of long half life. Thus, it was decided, that the contamination was due to radium and not to the daughter products of radon. Most of the direct readings on the floor in this area were in excess of 100,000 disintegrations per minute per 100 square centimeters.

The next area surveyed was the Physics Laboratory on the second floor of the building. This room had an intake fan which opened over the alley and was located directly over a doorway which opened into the calibration area. Also, a stairway connected the Physics Laboratory to the calibration area. Wipe samples for this laboratory are tabulated in Table I.

Direct readings in the Physics Laboratory ran as high as 3,500,000 disintegrations per minute per 100 square centimeters. The highest readings were found on the roof of its dark room.

The next area to be surveyed was the machine shop adjoining the Physics Laboratory. Direct readings in this area averaged approximately 10,000 disintegrations per minute per 100 square centimeters.

The Special Instruments Assembly Area was surveyed next. Direct readings in excess of 2,000 disintegrations per minute per 100 square centimeters were uncommon. This area is also located on the second floor of the building.

The Physics office adjacent to the Physics Laboratory was surveyed and found to be comparatively clean, with the exception of window sills, light fixtures, and fans.

The next area to be surveyed was the basement of the building. This area was used for the construction of electronic instruments and served as a rest area for Kelley-Koett employees. When this area was entered, four fans were in operation and the stairwell leading from the basement to the shipping and receiving area was closed. Direct readings ranging up to 50,000 disintegrations per minute per 100 square centimeters were found at intervals over the entire basement. Wipes ranging from 1,000 to 20,000 disintegrations per minute were found on all horizontal surfaces. The values of some of the wipe samples for this area are tabulated in Table I. A beta and gamma reading of 2 milliroentgens per hour was detected on a horizontal surface of the doorway which led to the shipping and receiving area. The remainder of Kelley-Koett areas within the building were spot checked for contamination, and the levels were found to be comparatively low, therefore no wipe samples were tabulated.

The next survey was conducted on the third floor of the building, which was occupied by the Safe-Gard Corporation which manufactures pillows for boats and other equipment of the same type. No significant results were obtained. However, on the stairway leading up to the third floor of the building direct readings as high as 30,000 disintegrations per minute per 100 square centimeters were recorded. The average level of contamination was around 3,000 disintegrations per minute per 100 square centimeters.

After the survey within the building was completed, Naeher Street which runs along the rear of the building was surveyed. Direct readings as high as 8,000 disintegrations per minute per 100 square centimeters were found at a distance of 30 yards from the door of the calibration room; and readings as high as 800,000 disintegrations per minute per 100 square centimeters were noted close to the doorway.

Upon completion of the survey, the following recommendations were made:

1. Seal off the shipping and receiving area, the basement, and the Physics Laboratory from the rest of the building.
2. Seal off the office which adjoins the Physics Laboratory from the rest of the area.

On Wednesday evening all personnel leaving Kelley-Koett were monitored to determine the contamination level of shoes, clothing, hands, and hair. As the result of this survey, eight people were issued clothing to wear home and one lunch box was confiscated. Some of the clothing that was confiscated was contaminated in excess of 50,000 disintegrations per minute per 100 square centimeters. Shoes that were found to be contaminated were scrubbed. No shoes were confiscated. One girl's hair was found to have a contamination level of 50,000 disintegrations per minute direct reading.

On Wednesday evening, August 1, Miller and Bigler returned to Mound Laboratory and discussed the problem with Belcher and Mr. E. C. McCarthy, who acted as coordinator at Mound laboratory. It was decided that Belcher would make a trip to Cincinnati to discuss the problem further with Rasmussen.

On Thursday morning, August 2, 1951, Miller, Belcher and Dr. D. S. Anthony, Director of The Biology Division, Mound Laboratory, discussed the problem with Rasmussen and an agreement was reached between Rasmussen and Belcher as to the extent of the work that would be accomplished by Mound Laboratory personnel.

Also on Thursday, a meeting was held at the U. S. Public Health Service office at which the spheres of interest of the parties participating in the program were outlined. Represented at this meeting were the U. S. Public Health Service, the Cincinnati Health Commission, the Public Health Service of the State of Ohio, Argonne National Laboratory, Mound Laboratory, and the Kelley-Koett Instrument Company. Also, on Thursday the compound that was spilled was identified as radium sulfate, which was coprecipitated with 97 milligrams of barium sulfate. Since the compound and the extent of the contamination were now known, plans for the decontamination work were formulated by Miller and Bigler. It was decided to work all active areas with air line masks and to furnish clothing for all personnel doing the work. Up to the time that Mound Laboratory appeared on the scene, the solution being used for washing all surfaces consisted of four per cent Varsene, one per cent Tide, and one per cent Orvus. Some work by Mr. C. R. Siebenthal, Physics Department, Kelley-Koett Instrument Company, indicated that it was possible to dissolve one gram of barium sulfate in 200 milligrams of this solution. Therefore, it was decided to continue using the solution. The main reason for making such a decision is that most prior work had been done with a citrate solution. Work today indicates that it is not advisable to use citrate solutions because they may be absorbed by human tissue.

On Friday morning, August 3, Rasmussen, Mr. R. J. Gallagher of the U.S. Public Health Service, and Miller agreed to the following:

1. Mound Laboratory personnel would direct the decontamination work through Mr. Edward Keyes of the Kelley-Koett Instrument Company.
2. Mr. Gallagher would direct the survey work through Mr. Dale Luther of the Kelley-Koett Instrument Company.
3. Dr. D. S. Anthony of the Kelley-Koett Instrument Company would be responsible for the procurement of all supplies.

Miller and Figler formulated the following plans for the decontamination program.

1. All decontamination workers were to wear protective clothing, as listed below:

- a. Glove liners
- b. Rubber gloves
- c. Shoes that were to be left within the plant.
- d. Vinyl shoe covers
- e. Pants
- f. Shirt
- g. Paper hat

2. Respiratory protection would be provided to all employees who were to work in the following areas:

a. Calibration area, shipping and receiving area, physics laboratory, and basement.

Employees working in these areas during the initial phase of the decontamination work were to wear face masks supplied with fresh air from outside of the building.

b. Loading dock

Assault masks equipped with CWS-6 filters would be used for initial work, and then respirators could be used after the contamination level was decreased.

c. All other areas

Respirators would be acceptable except when water tank type vacuum cleaners were used, in which case assault masks would be worn.

3. The following plan was put into action:

- a. Clean stairwell from main floor to third floor of the building.
- b. Clean restrooms
- c. Clean passageway across building.

- d. Clean elevator which was used by the Safe-Gard Company.
- e. Clean loading dock.
- f. Provide a temporary loading dock for the Safe-Gard Company.
- g. Provide an air lock complete with change house and shower between loading dock and passageway which extends across the building.
- h. Clean shipping and receiving area, entering from the loading dock.
- i. Clean calibration area, entering from the shipping and receiving area.
- j. Clean Physics Laboratory, entering from the calibration area.
- k. Clean basement, entering from the shipping and receiving area.
- l. Clean general office area and drafting area, entering from the rear passageway across the building.
- m. Clean second floor of building, entering from main lobby via the general office area, and later changing this procedure to make entrance by means of the elevator.

- 4. Traffic control programs would be set up as the work progressed to minimize the spread of contamination.

In addition to setting up the above procedures, the following work was accomplished on Friday:

- 1. The stairwell from the passageway across the building to the third floor of the building was cleaned.*
- 2. The passageway across the building was cleaned.
- 3. The wash rooms, jointly used by the Kelley-Koett Instrument Company and the Safe-Gard Company, were cleaned.
- 4. A change house area, complete with an air lock and an improvised shower, was set up. This change house area was furnished with towels, soap, scrub brushes, and Versene solution.

Mr. W. P. Jolley and Mr. J. M. Garner, employees of Mound Laboratory, reported for work at the Kelley-Koett Instrument Company Friday evening.

*Cleaned as used in this report indicates a reduction in the contamination level as a result of the decontamination procedures used.

On Saturday, August 4, the following work was accomplished under the direction of Garner and Jolley:

1. Cleaned stairwell from the third floor of the building to the passageway on the main floor.
2. Cleaned passageway across the building.
3. Set up a temporary loading dock for the Safe-Gard Company.
4. Cleaned washrooms that were used jointly by Kelley-Koett and the Safe-Gard Corporation.
5. Cleaned personnel office and first aid room which were located off the passageway.
6. Cleaned a janitorial storeroom which was located on the passageway, and set it up as a storage room for decontamination materials.
7. Cleaned stairwell from passageway to basement.
8. Resealed the doorway to the basement to insure a good seal.
9. Sealed off the main stockroom so that admittance could not be obtained from the main passageway.
10. Cleaned the temporary receiving area on Freeman Avenue, checked all records for contamination.
11. Cleaned air lock and washroom adjoining it.
12. Started cleaning the loading dock.

Miller and Bigler acted as coordinators for the purpose of obtaining supplies and manpower for accomplishing the work.

On Sunday, August 5, under the direction of Jolley, the cleaning of the loading dock was completed. Decontamination work was started in the general office under the direction of Garner.

On Monday, August 6, 1951, Jolley and Bigler directed the cleanup work in the shipping and receiving area. This area was entered from the loading dock. All the equipment in the area was sorted into two categories. That which was clean was removed for safe storage to the basement of Hammisen's home and the contaminated equipment was packaged and set aside to be decontaminated at a later time.

Garnett and Jolley directed the work in the general office area. The following work was accomplished:

1. All horizontal surfaces in this area, including four small offices and the front of the building, were scrubbed.
2. The air conditioner was completely cleaned.
3. All records on the tops of desks were sorted into "hot" and "dead" for appropriate disposal by Kelley-Moist Instrument Company personnel.

On Tuesday morning, August 7, work continued in the shipping and receiving area under the direction of Bieker and Jolley with no change in procedure. Garnett and Garnett directed the work on the first floor with the following being accomplished:

1. Surveyed the floor in the general office area to determine how efficient by the decontamination work had accomplished on Monday. Areas showing levels as high as 6,000 disintegrations per minute per 100 square centimeters were noted. All these areas were marked on the floor with a grease pencil.
2. Removed the air conditioner from an office which is located in front of the drafting room.

3. Scrubbed the four offices which are in front of the drafting area.

Started cleaning the drafting room. When the cleaning program started in the drafting room, one draftsman was called to work for the purpose of sorting papers and drafting equipment.

4. Cleaned the main lobby.

On Wednesday, August 8, the following work was accomplished in the shipping and receiving area under the direction of Jolley and Bieker:

1. Scrubbed the first floor.

2. All horizontal surfaces in the shipping and receiving area were scrubbed.

3. All desks were cleaned.

4. All records were sorted.

5. All desks were cleaned.

6. All desks were cleaned.

7. All desks were cleaned.

8. All desks were cleaned.

9. All desks were cleaned.

10. All desks were cleaned.

6. An air sample was collected on the loading dock to determine whether it would be necessary to continue providing respiratory protection for that area. The result is listed in Table II.

On Wednesday, the following work was also accomplished under the direction of Garner and Miller:

1. The general office area was scrubbed to eliminate all spot contamination prior to permitting entrance of employees who were scheduled to return at noon.

2. A procedure was set up for the purpose of checking the shoes of office employees reporting to work.

3. Completed scrubbing the drafting room.

4. Set up a procedure for the checking of all records and equipment in the general office area.

5. Sealed off a stationary stock room on the first floor. This room was to be scrubbed at a later time. Contamination over the floor was in the neighborhood of 3,000 disintegrations per minute per 100 square centimeters.

6. Sealed off the technical files storeroom which opened into the drafting room. It was decided that this room could be cleaned at a later time.

7. Scrubbed the stairwell from the Lobby on the main floor of the building to the second floor of the building.

8. Cleaned the restrooms on the second floor.

9. Set up a change area on the second floor for those people who were to work on the second floor starting the next day.

On Thursday, August 9, the following work was accomplished under the direction of Jolley and Bigler:

1. Continued cleaning the shipping and receiving area.

2. Entered the calibration area and accomplished the following:

a. Placed items in three barrels as listed below:

(1) Barrels No. 1

a. The tube containing what was left of the source.

b. Trigger assembly from the calibration table.

c. All parts of the air line from the calibration table.

- d. The tire pump.
- e. The paraffin which was on the floor next to the calibration table.
- f. All paper that was on the floor near the calibration table.

(2). Barrel No. 2

- a. The dismantled calibration table.
- b. The lead bricks which served as a cave for source.

(3). Barrel No. 3

- a. A piece of the calibration table that would not fit in the second barrel.
- b. All strippable coating from the calibration area floor.

On Thursday, the following work was accomplished under the direction of Miller and Garner:

1. Surveyed the quartz-fiber area and the model shop to determine the extent of the contamination.
2. Started decontamination work in the quartz-fiber area.
3. Started decontamination work in the model shop.
4. Surveyed the electronics laboratory, and packaged all contaminated items.

On Friday, August 10, the following was accomplished under the direction of Jolley and Bigler:

1. Steam cleaned Maher Street.
2. Removed the trash pile that was adjacent to the calibration area.
3. Removed the barrier wall between the trash pile and the calibration area.
4. Packaged all contaminated items in the calibration area and set them aside to be contaminated at a later time.
5. Removed the bench tops from all benches in the calibration area with the exception of the one on the large calibration table.
6. Hosed down the calibration area and scrubbed items that could not be removed.

7. The X-ray machine was protected with a covering.

6. Vacuum cleaned the basement.

On Friday, the following was accomplished under the direction of Garner and Miller.

1. All basement windows were sealed from the outside.

2. All screens on the basement windows were decontaminated.

3. Work was continued in the quartz-fiber area and the model shop.

It was decided on Friday that the services of Jolley would no longer be required at the Kelley-Koett Instrument Company, and that the work on the second floor of the building could be accomplished under the direction of Kelley-Koett personnel, with the Mound Laboratory personnel acting only in a consultant capacity.

On Saturday, August 11, the following work was accomplished in the basement under the direction of Garner:

1. Drains were located under the linoleum covering on the basement floor and were opened.

2. As much of the basement as was possible was hosed down for the purpose of removing what loose dust could not be removed by the vacuum cleaner.

3. Those areas that could not be hosed down due to the fact that instruments would be damaged were vacuumed a second time and washed with Versene solution.

4. Most of the work benches were washed.

5. All instruments were removed from the shelving at the front end of the basement, and the shelves were washed.

6. Work was started on the washing of instruments and returning them to the clean shelving.

On Saturday, an employee of the Kelley-Koett Instrument Company was placed in charge of the crew responsible for the decontamination of the basement, with Garner serving as a consultant. The respiratory protection for the basement was changed from air line masks to assault masks, after the initial washing had been accomplished except that when the vacuum cleaner was used, air line masks were to be worn.

On Saturday, the following work was accomplished under the direction of Bigler:

1. The calibration area was completely scrubbed in an effort to further reduce the contamination level. 2. Two crews were assigned the task of filling barrels with all the scrap lumber that had accumulated from the basement, second

floor of the building, and the shipping and receiving area.

On Saturday, Miller and Mr. J. E. Bradley of Mound Laboratory served as consultants for decontamination crews that were working on the first and second floors of the building. The work being done on the first floor of the building consisted of clearing contaminated spots that were not removed in the initial decontamination work.

On Sunday, August 12, no work was accomplished by Mound Laboratory personnel at the Kelley-Koett Instrument Company.

On Monday, August 13, the Mound Laboratory crew at Kelley-Koett was reduced to three men. The following work was accomplished under the direction of Bigler:

1. Continued filling barrels with lumber and other scrap that had been removed from the building.
2. Steam cleaned the shipping and receiving area floor.
3. Steam cleaned the walls in the calibration area near the area where the spill occurred.
4. Steam cleaned the alley adjacent to the Kelley-Koett plant.
5. Removed shelving from the Physics Laboratory.
6. Removed all items from the Physics Laboratory that were active and of no value, such as paper and other similar items.
7. Vacuum cleaned the Physics Laboratory.
8. Scrubbed the Physics Laboratory floor.

On Monday, Garner served as a consultant for the decontamination crew that was responsible for the work in the basement and Miller served as a consultant for the decontamination crews on the first and second floors of the building.

The day prior to completion, all equipment was removed from the Physics Laboratory.

The final cleaning of the interior of the Physics Laboratory was completed.

The Physics Laboratory was prepared for shipment to Oak Ridge.

2. A new traffic control program should be set up which would eliminate the use of the loading dock as a passageway, since this area had been decontaminated. The new traffic control program is as follows:

a. When reporting to work

- (1). Enter plant via entrance adjacent to time clock.
- (2). Change clothes at head of stairwell leading to basement from passageway.
- (3). Pick up respiratory protection equipment, gloves, and glove liners at stockroom.
- (4). Remove street shoes.
- (5). Put on paper slippers.
- (6). Go down stairway to basement.
- (7). Remove paper slippers and put on work shoes and shoecovers.
- (8). Proceed from basement to area in which worker is assigned.

b. When leaving work

- (1). Remove clothing at foot of stairwell and store in an appropriate container.
- (2). Remove shoes and put on paper slippers.
- (3). Remove respiratory protection equipment and store in a container.
- (4). Remove gloves and glove liners and place in a container.
- (5). Walk up stairway in paper slippers.
- (6). Put on street clothes prior to washing or wear a shower from head of stairway to stockroom, wash, and then put on street clothes. Either method was considered acceptable.

3. All clothing should be taken from contaminated areas to a clean area except for procedures listed in bullet 2.

4. Clothing should be collected in bags and sent them to Health Laboratory for

5. The alley adjacent to the building, the sidewalk along the side of the building, and the stairs in front of the building were steam cleaned.

6. The stairwell leading from the Physics Laboratory to the calibration area was cleaned.

On Tuesday, Garner continued to serve as a consultant for the crew in the basement and Miller continued to serve as a consultant for the crews on the first and second floors of the building.

On Wednesday, August 15, the following work was accomplished under the direction of Bigler:

1. The remaining lumber that constituted the dark room was placed in barrels.
2. The Physics Laboratory floor was washed after this lumber was loaded.
3. Air samples were collected.

The responsibility for the continuation of work in the Physics Laboratory was turned over to an employee of the Kelley-Koett Instrument Company with Bigler to serve as a consultant. Miller continued to serve as a consultant for crews working on the first and second floors of the building. Garner continued to serve as consultant for the crews in the basement. That evening Garner returned to Mound Laboratory.

Effective Thursday morning, August 16, the responsibility of the direction of all decontamination work had been turned over to Kelley-Koett personnel with Miller and Bigler serving as consultants. Bigler was handling the rear of the building and Miller was handling the first and second floors. On Thursday, August 16, Miller recommended that the alley again be steam cleaned. On Friday, August 17, Miller and Bigler, and on Saturday, August 18, Miller and Bradley, served as consultants. On Sunday, August 19, no employees of Mound Laboratory worked at the Kelley-Koett Instrument Company. On Monday, August 20, Bigler, the only Mound Laboratory employee at the Kelley-Koett Instrument Company, served as a consultant, directed the loading of a truck of 40 barrels of trash for shipment to Oak Ridge. On Monday night, Bigler returned to Mound Laboratory leaving Miller as the only Mound Laboratory employee at the Kelley-Koett Instrument Company. He continued to serve as a consultant through Thursday, August 23, 1951, when he returned to Mound Laboratory.

On Tuesday, August 28, Miller made a trip to Kelley-Koett at the request of Rasmussen to discuss decontamination procedures with Kuet and Wong. On that day Miller made the following recommendations:

1. All decontamination workers should continue to use respiratory protection, even though the air levels as indicated by air samples sent to Mound Laboratory for analysis were low.

Also on August 28, Miller informed Rasmussen that Mound Laboratory would analyse feces samples from five Kelley-Koett employees, who during the process of decontamination work had obtained skin abrasions or punctures. Rasmussen informed Miller that he would call him in the future for consultant use. The details were to be worked out by Wong. Miller recommended a schedule for the completion of the decontamination work. This schedule is as follows:

1. Continue cleaning the Physics Laboratory.

2. Clean the decontamination area.

3. Clean the shipping and receiving area.

4. While items 1 through 3 are being accomplished, decontamination work should continue in the basement.

5. Clean the rest area in the basement.

Miller also recommended that Neaer Street be cleaned by heating the pitch between the bricks with a flame and then removing the pitch and storing it in a barrel for burial. It was felt that most of the contamination would be removed by following this procedure.

On Wednesday, August 29, Miller informed Rasmussen by telephone regarding the contamination level of equipment that Kelley-Koett would be permitted to return to Mound Laboratory. These levels were:

1. Any clothing not contaminated beyond 500 disintegrations per minute per 100 square centimeters could be returned and would be washed at Mound Laboratory.

2. Any clothing contaminated in excess of 500 disintegrations per minute per 100 square centimeters, but less than 2,000 disintegrations per minute per 100 square centimeters, could be packaged and returned to Mound Laboratory. A list of the clothing returned should accompany each shipment.

3. Any clothing whose contamination level was in excess of 2,000 disintegrations per minute per 100 square centimeters, could not be returned to Mound Laboratory at this time. However, if the Kelley-Koett Instrument Company were to check with Mound Laboratory at a later date as to whether or not such clothing could be returned, it may be that Mound Laboratory would accept them and issue credit at that time.

Any respirators or small masks would be accepted for credit.

At the request of Wong, Miller reported to the Kelley-Koett Instrument Company on Wednesday, September 5, 1951. The only new recommendation that was made by Miller then was the floor of the calibration area should be chipped prior to covering it with concrete. This work was started on September 5.

As of the date of this report the work of Kelley-Koett has not been completed. However, Mound Laboratory personnel are continuing to serve in a consultant capacity.

R. A. Miller

R. A. Miller

W. A. Bigler

W. A. Bigler

W. P. Jolley

W. P. Jolley

J. H. Garner

J. H. Garner

TABLE I

WIPE SAMPLES

Area	Item	Disintegrations per minute-Alpha
Shipping and Receiving	Top of table next to telephone	40,000
Shipping and Receiving	Wrapping table	26,000
Shipping and Receiving	Table against calibration room wall	28,000
Shipping and Receiving	Shelving near stairwell to basement	56,000
Shipping and Receiving	Hand rail in stairwell to basement	56,000
Shipping and Receiving	Steps of stairwell to basement	8,000
Shipping and Receiving	Top of barrel	24,000
Shipping and Receiving	Top of clothes cabinet	22,000
Shipping and Receiving	Floor near calibration room door	22,000
Physics Laboratory	Top of shelving next to darkroom	33,000
Physics Laboratory	Second shelf from top of shelving next to darkroom	46,000
Physics Laboratory	Top of polystyrene container that was on the floor approximately five feet from darkroom wall	50,000
Basement	Lunch table in rest area	20,000
Basement	Top of Coca Cola machine	16,000
Basement	Floor near stairwell leading to shipping and receiving area	20,000
Basement	Top of instrument case approximately fifteen feet from doorway leading to shipping and receiving area	32,000

NOTE: Area wiped was approximately 10 square feet in area.

TABLE II
AIR SAMPLES - RADIUM

Date	Sample Collection Point	$\mu\text{g}/\text{cc}$	$\cdot 10^{-12}$	Remarks
8-8-51	Loading dock	1.805		
8-14-51	Calibration room	1.24		
8-14-51	Shipping room	52.6		Sawed contaminated lumber and placed it in barrels.
8-15-51	Calibration room	1.14		
8-15-51	Shipping room	1.61		
8-15-51	Physics lab. (A.M.)	52.0		Sawed contaminated lumber and placed it in barrels.
8-15-51	Physics lab. (A.M.)	106		Sawed contaminated lumber and placed it in barrels.
8-15-51	Basement	60.4		
8-15-51	Basement	257		
8-15-51	Physics lab. (P.M.)	1.69		
8-15-51	Physics lab. (P.M.)	1.23		
8-16-51	Calibration room	179		
8-16-51	Calibration room	0.36		
8-16-51	Loading dock	286		
8-16-51	Loading dock	214		
8-16-51	Physics lab.	211.5		Contaminated items being packaged for later decontamination or placed in barrels for burial.
8-16-51	Physics lab.	211.9		Contaminated items being packaged for later decontamination or placed in barrels for burial.
8-17-51	Physics lab.	1.45		
8-17-51	Physics lab.	9.5		
8-17-51	Basement	61.2		
8-17-51	Basement	0.53		
8-17-51	Calibration room	66.0		
8-17-51	Shipping room	1.25		
8-17-51	Basement	1.20		
8-17-51	Basement	1.20		
8-17-51	Physics lab.	5.65		
8-17-51	Physics lab.	2.00		
	Calibration room	0.4		Same time, same place, same method of collection.

TABLE II
(Continued)
AIR SAMPLES - RADIUM

Date	Sample Collection Point	μ g/cc	Remarks
		$\cdot 10^{-12}$	
8-22-51	Basement	.165	
8-22-51	Passageway - First Floor	.252	
8-22-51	Passageway - First Floor	.064	
8-23-51	Physics lab.	.413	
8-23-51	Physics lab.	.235	
8-24-51	Physics lab.	.096	
8-24-51	Physics lab.	.080	
8-24-51	Basement	.171	
8-24-51	Basement	.074	
8-27-51	Basement	.192	
8-27-51	Basement	.171	
8-28-51	Basement (rest area)	.450	
8-28-51	Basement (rest area)	.420	
8-29-51	Basement (rest area)	.116	
8-29-51	Basement (rest area)	.256	
8-30-51	Basement (rest area)	.331	
8-30-51	Basement (rest area)	45.4	
			Stockroom being cleaned - sample was collected close to the stockroom.
9-6-51	Calibration room	1.06	Concretes being chipped
9-6-51	Calibration room	7.06	Concrete being chipped
9-7-51	Shipping room	.049	
9-7-51	Shipping room	.112	
9-11-51	Physics lab.	.187	
9-11-51	Basement	.326	
9-12-51	Physics lab.	.467	
9-12-51	Basement	.446	
9-13-51	Physics lab.	.559	
9-13-51	Basement	.315	
9-14-51	Basement	.140	
9-14-51	Physics lab.	.209	
9-17-51	Physics lab.	.116	
9-17-51	Basement	.280	
9-18-51	Basement	.140	
9-18-51	Physics lab.	.280	

TABLE III
MAN POWER ANALYSIS IN MAN DAYS

Date	Miller	Bradley	Biglar	Garner	Jolley	Total
7-31-51	1	0	1	0	0	2
8-1-51	1	0	1	0	0	2
8-2-51	1	0	1	0	0	2
8-3-51	1	0	1	0	0	2
8-4-51	1	0	1	1	1	4
8-5-51	0	0	0	1	1	2
8-6-51	1	0	1	1	1	4
8-7-51	1	0	1	1	1	4
8-8-51	1	0	1	1	1	4
8-9-51	1	0	1	1	1	4
8-10-51	1	0	1	1	1	4
8-11-51	1	0	1	1	1	4
8-12-51	1	0	1	1	1	4
8-13-51	1	0	1	1	1	4
8-14-51	1	0	1	1	1	4
8-15-51	1	0	1	1	1	4
8-16-51	1	0	1	1	1	4
8-17-51	1	0	1	1	1	4
8-18-51	1	0	1	1	1	4
8-19-51	0	0	0	0	0	0
8-20-51	0	0	0	0	0	0
8-21-51	1	0	1	1	1	4
8-22-51	1	0	1	1	1	4
8-23-51	1	0	1	1	1	4
8-24-51	1	0	1	1	1	4
8-25-51	0	0	0	0	0	0
TOTAL	21	2	17	14	7	77