

UNITED STATES NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

IE Investigation Report No. 030-00696/78-03
IE Investigation Report No. 030-01609/78-01

Subject: Purdue University
West Lafayette, Indiana
License No. 13-02812-04

Indiana University - Purdue University at Indianapolis (IUPUI)
Indianapolis, Indiana
License No. 13-02752-03

The widow of a former Physics Laboratory Technician claimed
radiation exposure caused him harm.

Period of Investigation: September 12-14, 1978

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REASON FOR INVESTIGATION

The widow of a former Physics Laboratory Technician employed by Purdue University and IUPUI stated in a letter dated July 21, 1978, that her husband's fatal cancer was due to radiation exposure he had received. Following receipt of her letter on August 9, 1978, Region III initiated an investigation.

SCOPE OF INVESTIGATION

This investigation was conducted to obtain information concerning the extent of exposure to radiation received by a former Physics Laboratory Technician. It consisted of an examination of pertinent records and procedures, personal observations and interviews with personnel. The investigation included consideration of the exposure the Laboratory Technician may have received from radium as well as byproduct material although radium does not fall within the jurisdiction of the NRC.

SUMMARY OF FACTS

The widow of a former Physics Laboratory Technician expressed concern that the radiation exposure he received in connection with his work had caused him harm. In this regard she also alleged: that his exposure had not been monitored; that it was higher than an instructor's exposure which had been monitored; and, that he had worked more with radioactive material than others realized or would admit.

At the request of the Laboratory Technician and/or his wife, the Division of Radiological Health, Indiana State Board of Health performed an evaluation of his exposure in January 1972 and in response to his widow's expression of concern the NRC performed an inspection in June 1978. The findings in both instances were that the Laboratory Technician's radiation exposure was well within the regulatory limits. In response to the further expression of concern by the Laboratory Technician's wife, this investigation was conducted.

This NRC investigation conducted in September 1978 ascertained that the individual worked as a Laboratory Technician in the Physics Department of what was originally known as the Indianapolis Extension or Indianapolis Campus of Purdue University which subsequently became Indiana University - Purdue University at Indianapolis (IUPUI) from 1954 to April 1971. From early 1958 until after his departure, the

Physics Department used and stored a 11.5 milligram radium-beryllium sealed source which was used a maximum of twice per year in a laboratory demonstration-experiment. When not in use, the source was stored in a lead shielded container on a shelf in one of two laboratory equipment rooms. The experiment-demonstrations entailed the transfer of the source to a neutron moderator device from the storage container and back again. There are some indications that the Laboratory Technician may have made these transfers on one or more occasions himself although it was usually accomplished by a faculty member with the Laboratory Technician's assistance. On these occasions the faculty member wore a film badge.

Although the exposure received by the Laboratory Technician is not certain since he was not equipped with a film badge or other personnel monitoring device, an attempt was made, as part of the investigation, to estimate the upper limit of the exposure he may have received. With regard to the handling of the radium-beryllium source for the preparation for, and conduct of experiments, it is assumed he would have received no more than the maximum amount of exposure recorded on the faculty member's film badge on these occasions. The film badge records for the ten year period 1960-1970 for the faculty member show he received a total of 755 millirems, the highest annual exposure being 390 millirems. Assuming the Laboratory Technician received this amount, 390 millirems, each year from 1958 through 1971 his total exposure for source handling would have been 5.46 rems.

Additionally, it is conservatively estimated that the Laboratory Technician could have received an annual exposure of 440 millirems from working around the source while it was in storage. The summation of this annual rate of exposure would have totaled 5.57 rems as of the time of his retirement in April 1971. This added to the exposure for handling the source would give the Laboratory Technician a total life-time exposure of 11.03 rems from association with this source.

In about August 1968 the Physics Department received five other sources contained in density measurement gauges. These sources were as follows: two one curie each strontium 90 sealed sources; one 100 millicurie cobalt 60 sealed source, one 100 millicurie cesium 137 sealed source and one radium 226 sealed source of 0.2 millicuries. All of these sources remained in the gauges which were stored in a basement storage room and were not used during the Laboratory Technician's employment. The maximum radiation level detected on these gauges when surveyed in May 1978 was 10 mR/hr at the surface and approximately 0.2 mR/hr at a distance of one meter.

The Laboratory Technician's only known association with these gauges consisted of periodic entries into the storage room for various reasons, one of which may have been to perform radiation surveys of these

gauges. Had he been wearing a film badge, it is highly doubtful that the exposure received from the byproduct material contained in these gauges would have been detectable on the film.

The only other known sources of radiation were a set of six check sources, nominally 0.5 microcuries each and two 0.0018 microcurie lead 210 sources for use with a cloud chamber. These items are all exempt quantities of material and would not have contributed any measurable exposure.

On September 11, 1978, the State of Indiana was advised by telephone of Region III's plan to perform this investigation. A representative of that agency was not present during this investigation.

CONCLUSIONS

1. An estimate of the upper limit of the Laboratory Technician's occupational exposure from radioactive materials was 11.03 rems received uniformly during a 13 year period. This radiation exposure does not exceed any regulatory limits.
2. The Laboratory Technician probably received more radiation exposure than did a Physics Instructor who was monitored largely because he would have spent more time working in the room where a radium-beryllium source was stored.
3. The Laboratory Technician was not furnished a film badge, but there is no indication that his exposure was of sufficient magnitude to require personnel monitoring.
4. In addition to the radium-beryllium source acquired by the Physics Department in 1958, the Physics Department had the following from 1968 until after the Laboratory Technician retired in 1971:

- Two 0.0018 uCi lead 210 sources used with a cloud chamber
- Six 0.5 uCi check sources
- Two 1 curie Strontium 90 sources in gauges
- One 100 mCi Cobalt 60 source in a gauge
- One 100 mCi Cesium 137 source in a gauge
- One 0.2 mCi Radium 126 source in a gauge

The Laboratory Technician had some association with the set of check sources and the two sources used with a cloud chamber. He had also spent some time in a room where radioactive sources contained in gauges were stored; had worked in a room where

the radium-beryllium source was stored; had been involved with the transfer of the latter source to and from its storage container; and, may have been present when it was used in experiments. The radium-beryllium source was the primary source of exposure.

5. The Laboratory Technician had not handled radioactive water. Since the radium-beryllium source was not leaking, the water used in association with it would not have been radioactive through contamination.
6. The radium-beryllium source was transferred to the Nuclear Engineering Company for burial in April 1976.

Although not related to the allegations, the following items of noncompliance were identified during this investigation:

Purdue University

10 CFR 30.41(c)-in that the licensee transferred two one curie strontium 90 sealed sources to another licensee without verifying that the transferee's license authorized the receipt of the materials transferred.

License Condition 16C-in that leak tests of four sealed sources were not performed every six months during the period August 1968 to May 1973.

IUPUI

10 CFR 30.51(a)-in that the licensee did not maintain a record of the receipt of four sealed sources received in 1973.

License Condition 8-in that the licensee was in possession of two one curie strontium 90 sealed sources which exceeds the maximum amount of strontium 90 authorized by this license condition.

License Condition 24C-in that leak tests of four sealed sources were not performed every six months during the period May 1973 to May 1978.

DETAILS

Background

1. The Indianapolis Extension of Purdue University was established in 1946 occupying space at 902 North Meridan Street, Indianapolis, Indiana. In 1961 the campus moved to East 38th Street and occupied the newly constructed Krannert Building.
2. In 1973 the Indianapolis Extension was separated from Purdue University and became a part of Indiana University - Purdue University at Indianapolis (IUPUI). A report on an inspection of the Purdue University's activities under License No. 13-02812-04 conducted November 28-29, 1973, states ". . .the licensees former Indianapolis Campus, Indianapolis, Indiana as of May 1973, is no longer under Purdue University's administrative jurisdiction, and that complete responsibility for that campus has been transferred to Indiana University, Indianapolis, Indiana and is presently undergoing incorporation into the broad license of Indiana University - Purdue University at Indianapolis (IUPUI) through a pending licensing action now awaiting approval by Directorate of Licensing." By letter dated May 31, 1973, from Purdue University to the Division of Materials Licensing the following statement appears which relates to materials authorized for use at the Indianapolis Campus. "The byproduct materials in items B, C, and D, are no longer under Purdue University's administrative jurisdiction. Complete responsibility for that campus has been transferred to Indiana University."
3. The first authorization for licensed byproduct material at the Indianapolis location was by Amendment No. 26 to the Purdue University License No. 13-02812-14 dated August 5, 1968, for storage only of strontium 90 sealed sources of one curie each contained in Ohmart Corporation gauges, Models LBG-3G and BG-3G.
4. On June 3, 1969, the license was reissued in its entirety as Amendment No. 27. This amendment authorized possession and use of the following materials at the Indianapolis campus:

<u>Byproduct Material</u>	<u>Chemical and/or Physical Form</u>	<u>Maximum Amount of Radioactivity</u>
any by-product material with atomic number between 3 and 83; hydrogen 3, and polonium 210.	any	As listed in paragraph 33.11(c) of 10 CFR 33 for a "Type C specific license of broad scope"

Cobalt 60	Sealed source (U.S. Radium Corporation model LAB 355)	130 millicuries
Strontium 90	Sealed sources (U.S. Radium Corporation model LAB-370-3)	Two sources of one curie each
Cesium 137	Sealed sources (U.S. Radium Corporation model LAB 713-E)	Two sources of 100 millicuries each

5. Amendment No. 36, dated October 31, 1974, amended the license in its entirety and under License Condition No. 10, the Indianapolis Campus was deleted as an authorized location of use under the Purdue University license.
6. License No. 13-02752-03 was initially issued on March 31, 1958, to Indiana University Medical Center, Department of Radiology, Indianapolis, Indiana - Amendment No. 34, dated May 5, 1970, amended the license in its entirety and among other things changed the licensee's name to Indiana University - Indianapolis, Indianapolis, Indiana. Amendment No. 39, dated May 29, 1974, amended the license in its entirety and among other things changed the licensee's name to Indiana University - Purdue University at Indianapolis, Indianapolis, Indiana.

Introduction

7. The NRC first became aware of the concerns of the widow of the deceased Physics Laboratory Technician, hereafter referred to as Individual A, through her letter dated May 15, 1978, addressed to the NRC, Washington D. C. A copy of this letter is attached to this report as Exhibit A. Also, a letter from Individual M, Individual A's wife, to Senator Richard J. Lugar, dated March 31, 1978, was referred to the NRC on June 6, 1978. A copy of the letter to Senator Lugar is attached to this report as Exhibit B. By letter dated June 1, 1978, the Director, Office of Inspection and Enforcement assured Individual M that the matter would be examined during a forthcoming inspection. A copy of this letter is attached to this report as Exhibit C.
8. On June 19, 1978, an inspection was conducted at Purdue University and the findings were provided during a meeting with Individual M on June 21, and by a letter dated June 29, 1978. A copy of this letter is attached to this report as Exhibit D.

9. Following receipt of the June 29, 1978 letter from Region III Individual A's wife discussed the matter with the Director of Region III by telephone on July 5, 1978, and indicated she had additional information that could change the findings. It was agreed that any additional information furnished by her would be evaluated and an investigation would be conducted to examine her concerns further. By letter dated July 13, 1978 the Deputy Executive Director for Operations, NRC advised Senator Lugar of these developments. A copy of this letter is attached to this report as Exhibit E.
10. On August 9, 1978, Region III received a letter dated July 21, 1978, from the widow of the laboratory technician forwarding copies of correspondence and other materials. A copy of the July 21, 1978 letter is attached as Exhibit F.
11. The following pertinent correspondence was received along with the July 21, 1978 letter:

Letter dated December 20, 1977 (Exhibit G)
Memo dated January 3, 1978 (Exhibit H)
Letter dated January 25, 1978 (Exhibit I)
Letter dated April 8, 1978 (Exhibit J)
Letter dated April 25, 1978 (Exhibit K)
Letter dated May 31, 1978 (Exhibit L)
Letter dated June 6, 1978 (Exhibit M)
Letter dated June 29, 1978 w/encl (Exhibit N)

Somewhat different versions of the letters identified as Exhibits G and J above were received from other sources and are attached as Exhibits O and P, respectively.

During the inspection conducted June 19, 1978, copies of the following pertinent correspondence were obtained:

Letter dated January 25, 1972 (Exhibit Q)
Letter dated February 8, 1978 (Exhibit R)
Letter dated February 17, 1978 (Exhibit S)
Letter dated February 24, 1978 (Exhibit T)
Memo dated March 16, 1978 (Exhibit U)
Letter dated May 11, 1978 (Exhibit V)

12. Through a review of this material, an interview with Individual A's wife on September 12, 1978, a visit to Purdue University on September 12, and to IUPUI on September 13 and 14 together with subsequent telephone contacts, the following information was obtained.

Interview with Individual M

13. On September 12, 1978, Individual M was interviewed. Through this interview and letters she had written, Individual M alleged the following in addition to her primary claim that her husband, Individual A, had been harmed by radiation exposure.
- a. Individual A was not furnished a film badge although he had asked for one.
 - b. Individual A had worked with radioactive material more than anyone realized or would admit.
 - c. Individual A had handled radioactive water.
 - d. Individual A received more radiation exposure than did Individual B.
 - e. There were radioactive sources present in the Physics Department in addition to the radium-beryllium source.
 - f. Disposition may not have been made of the radium-beryllium source.

Work History of Individual A

14. Individual A was initially employed in December 1945, as an Administrative Assistant for the Purdue Indianapolis Extension. In 1954 he became a laboratory technician in the Physics Department. In that position he set up laboratory demonstrations and experiments, made and repaired apparatus and equipment for demonstrations, assisted in ordering supplies and equipment and, on occasion, presided over a laboratory class while the instructor was not present. Individual A remained in the position of laboratory technician on a full-time basis until July 1, 1970. He returned to that position on a part-time basis in 1970 and worked until April 27, 1971.

Visit to Purdue University, West Lafayette, Indiana

15. During a visit to Purdue University, West Lafayette, Indiana, on September 12, 1978, the following information was obtained through discussions with the University Radiological Control Officer and a review of records. A 11.5 milligram radium-beryllium sealed source, Model RN-10, Serial Number N-10-39, was shipped by Atomic Energy of Canada Ltd., to the West Lafayette campus on July 29, 1957. At the time of shipment the exposure rate was 70mR/hr

at the surface of the container and 4mR/hr at 1 meter. A copy of the packing slip pertaining to this source was obtained and is attached to this report as Exhibit W. This source was transferred to the Indianapolis Campus in September 1958, for use in the Physics Department by Individual B.

16. The Radiological Control Officer indicated he had on file a record indicating that in February 1968 the Chemistry Department at Indianapolis had on hand a set of five check sources of .5 micro-curies each. On February 12, 1968, a sixth source of cadmium 109 was also shipped to the Chemistry Department. The container in which the source was shipped showed less than 1mR/hr at its surface. A copy of this record is attached to this report as Exhibit X.
17. Another record on file at Purdue showed that Individual B had requested approval for two one curie strontium 90 sealed sources in Ohmart Corporation gauges on May 27, 1968. The record indicates that approval would be limited to possession only. A copy of this record was obtained and is attached to this report as Exhibit Y.
18. The Radiological Control Officer said these sources were subsequently received at the Indianapolis Campus from the Allison Division of General Motors. Amendment No. 26, dated August 6, 1968, to the Purdue University license authorized the storage only of these two sources. In response to an inquiry concerning Amendment No. 27, described earlier in this report, which authorized additional sources for the Indianapolis Campus, the Radiological Control Officer stated he had no knowledge of any other sources received from Allison. A search of his files failed to reveal any information in this regard, except a request which included those items which was submitted to the Division of Materials Licensing by a letter dated April 9, 1969. The Radiological Control Officer indicated that he had no personal recollection of the circumstances surrounding the inclusion of these sources in the request made to the Division of Materials Licensing.
19. During the discussion he contacted Allison by telephone and was informed that in addition to the two strontium 90 sources, three other sources were also transferred to the Purdue - Indianapolis Campus in about 1968.
20. The Radiation Control Officer then contacted the IUPUI Radiation Safety Officer by telephone and was informed that five sources had been located in storage, all of which had apparently been acquired from Allison.

21. Film badge records for Individual B were also reviewed. They showed the following:

<u>Year</u>	<u>Millirem</u>
1960	15
1961	M
1962	M
1963	no record of use
1964	no record of use
1965	260
1966	390
1967, 1968, 1969	no record of use
1970	<u>90</u>
TOTAL	755 millirem

22. The Radiological Control Officer stated that film badges were supplied to personnel at the Indianapolis Campus on request and no restrictions were ever placed on the number provided. He indicated that he had some informal notes in his files indicating that film badges were furnished to the Indianapolis Campus at least periodically during the years 1958 and 1959, but he had no way of determining whether they were used or, if they were used, by whom. He went on to explain that before 1960 the regulations specified weekly limits rather than quarterly limits for personnel exposures. There were no requirements to maintain exposure histories for personnel. Film badge reports from the processor showed the exposure by a serial number rather than by a name. If the badges showed little or no exposure, no record was made as to whom they had been assigned. Available records for 1958-59 were reviewed and no significant exposures were noted.
23. The Radiological Control Officer indicated that from 1971 until the change in responsibility for the Indianapolis Campus in 1973 he received no requests for film badges from the Indianapolis Campus.

Discussions with the Radiation Safety Officer, IUPUI, Indianapolis, Indiana

24. During discussions on September 13 and 14, 1978, the Radiation Safety Officer, IUPUI, Indianapolis, Indiana, furnished the following information. He stated that he became the RSO in September 1976, and therefore, had no firsthand knowledge of what had taken place during the 1960's and early 1970's.

25. He said that a technician had performed surveys at the Krannert Building on April 11, 1978, and had detected no radiation above background. Through conversations with an employee of the Physical Plant Department, the technician learned that some radioactive material was being stored in the Service Building, also known as the West Building. This building had been used as a dead storage facility for a variety of furniture and equipment for several years. During a search of the Service Building the technician found the following: one cobalt 60 100 millicurie source, two strontium 90 1,000 millicuries sources, one cesium 137 100 millicuries source, and 1 radium 226 .200 millicuries source, all within individual devices.
26. On April 11, 1978, the technician performed a survey of the devices containing the sources with a GM meter. According to the technician's handwritten notes on file, he measured approximately .2mR/hr at one meter from the sources stored together. The highest reading of any of the source containers was 10mR/hr at the surface. A radiation area sign was posted on the door of the room containing the source devices and another was in front of the devices themselves.
27. The Radiation Safety Officer said he arranged to have the sources transferred to the Radioactive Waste Storage Room adjacent to his offices. On May 9, 1978, the RSO checked the devices and recorded the following additional information: the cesium 137 source was contained in a device with a Purdue University identification tag, No. 67590, and a maximum of 4mR/hr was measured in the well of the apparatus; the device containing the cobalt 60 source bore Purdue identification No. 679581 and a maximum of 5 mR/hr was measured in the apparatus well; the two strontium 90 sources were contained in devices bearing Purdue identification Nos. 679592 and 679583 and a maximum reading of 1.7mR/hr was measured between the armature of the devices; and, the device containing the radium 226 source bore no Purdue identification number and a maximum reading of 5mR/hr at the surface of the device was measured. He also noted that all of the devices were manufactured by Ohmart Corporation and each was labeled with the Radiation Caution symbol and the words caution - radioactive material. A Caution - Radiation sign was also found lying on top of the sources. A member of the Plant Services Department informed him that these devices had been moved from the basement storage room in the Krannert Building to the West Building about five years ago.
28. The RSO said that on May 12, he leak tested four of the sources. The radium source was not leak tested because there was no means of doing so. The results of the leak tests were negative. He said

that the two individuals who physically accomplished the move from the West Building to the Radioactive Waste Storage Room were equipped with dosimeters and they received less than 1mR exposure. He indicated that the sources would remain in storage until disposal of them could be arranged.

29. The RSO stated he had no record concerning the receipt of these sources by IUPUI, presumably coming into IUPUI's possession when it became independent from Purdue University. 10 CFR 30.51(a) requires that licensees maintain records showing the receipt of byproduct material. IUPUI is, therefore, in noncompliance with 10 CFR 30.51(a) in that the licensee did not maintain a record of the receipt of four sealed sources received in 1973.
30. The RSO said the sources apparently had not been leak tested while in IUPUI's possession until he performed the leak test on May 11, 1978. IUPUI is, therefore, in noncompliance with License Condition 16C in that leak tests of four sealed sources were not performed every six months during the period May 1973 to May 1978 as required.
31. The RSO also acknowledged that the IUPUI was authorized a maximum of 200 mCi strontium 90 under License Condition 8. The IUPUI is, therefore, in noncompliance with License Condition 8 in that the licensee was in possession of two one curie strontium 90 sealed sources which exceeds the maximum amount of strontium 90 authorized by this license condition.
32. These gauges were examined on September 13, 1978. It was noted that the device labeled as containing .200 millicuries of radium 226 was further identified as an Ohmart Corporation Model RTSN, Serial No. 2078. While the number of sources on hand matched the number of sources contained in the licensing correspondence relating to them noted in the Purdue University files, the correspondence indicated two cesium 137 sources while they had on hand one cesium 137 source and one radium source. In an effort to resolve this apparent discrepancy literature was subsequently reviewed in the Region III office, which contained a description of RTSN-3 and RTSN-4 manufactured by Ohmart Corporation. This description matched the description of the device containing the radium source. This literature further indicated that these devices usually contained a 500 microcurie cesium 137 source but that a radium source of 10 to 500 micrograms was sometimes used. At the time these sources were transferred from Allison some confusion may have arisen as to the material contained in the device.

33. Further, a review of information obtained during an inspection of Allison's activities under License No. 13-01106-02 on June 20, 1968, indicated Allison had four gauges on hand which were all in their original shipping crates and maintained in storage. It was indicated these gauges may possibly be given to Purdue University. The gauges were identified as follows: Two one curie strontium 90 sealed sources, Model LAB-370-3; one 150 millicurie cesium 137 sealed source, Model LAB-713-E; and, one 100 millicurie cobalt 60 sealed source, Model LAB-355.
34. Information obtained during an inspection conducted by Region III on May 20, 1971, identifies these four sources and states that they were transferred to Purdue University, Indianapolis in August 1968.
35. The Radiation Safety Officer stated that the radium-beryllium source formerly possessed by the Physics Department had been disposed of prior to his arrival. He said that according to information he had received through inquiries he had made, the source in its lead container had been picked up from the Physics Department by a Radiation Safety technician sometime in late 1975 or in 1976 prior to the RSO's arrival in September. The source was temporarily stored in the Radioactive Waste Storage Room. Later it was placed in one of several containers of radioactive waste which were picked up by the Nuclear Engineering Company, a licensed radioactive waste disposal firm.
36. Records of the waste shipments were examined for shipments made on the following dates: August 21 and October 30, 1975; and, January 16, April 22 and June 10, 1976. The number of containers shipped on these occasions ranged from 43 to 63. These records list the isotopes contained in each package. The radium source was not shown on any of these records. The Radiation Safety Officer stated that he had been unable to find any records concerning the disposal of that source but he was confident that it was no longer present at IUPUI. He indicated the neutron moderator device, in which the source was used, was currently located in a basement storage room in the Krannert Building. A survey of this device had indicated it contained no radioactive material. The possession and transfer of radium, which is not a byproduct material, is subject to the jurisdiction of the State rather than NRC.

Interview with Individual C

37. On September 13, 1978, Individual C, a professor in the Physics Department was interviewed. He stated that he had been a member of the department since 1964 and was, therefore, in the department for several years while Individual A was employed as a laboratory technician.

38. Individual C indicated he did not use radioactive material and had no knowledge of Individual A's association with it. He said he was generally aware that a radium source was occasionally used by other faculty members but he had no personal involvement in its use.
39. Individual C said that Individual A had prepared laboratory demonstrations for him and he had spoken with him many times. He stated that to the best of his recollection, Individual A never spoke to him about radioactive material or radiation exposure. Individual A had never expressed concern about the methods used in handling or storing radioactive material nor did he express any concern about receiving radiation exposure. Individual C said that Individual A had never mentioned he felt he should have a film badge or that he had been denied being furnished one.

Interview with Individual D

40. On September 13, 1978, Individual D, who is the Chairman of the Physics Department at IUPUI, was interviewed. Individual D stated that he came to the department in December 1969. Soon after he arrived he requested that any radioactive material and any mercury be located and placed in storage until their need could be assessed. He indicated that it was his recollection that a device using mercury was present in the department and he instructed Individual A to put it in a basement storage room, since it would not be used.
41. Individual D also recalled that the experiment using the radium-beryllium source was discontinued a few years ago and he was under the impression that it too was put in the basement storage room. He discovered later that although the moderator device was stored in the basement, the radium source was still being stored on a shelf in Room 129, a laboratory equipment room. Arrangements were made with the Radiation Safety Office to remove and dispose of the source. It was his recollection that this occurred in about 1975.
42. Individual D said that the gauges received from Allison were kept in one of two storage rooms in the basement. He indicated that he was under the impression that the gauges may have been moved from one storage room in the basement to another before they were transferred to the West Building. He did not recall when the gauges were moved but guessed that it may have been in 1976. He stated the gauges were never used by anyone in the department.
43. Individual D said that Individual A had spent the major portion of his time in Rooms 126 and 129, which are both laboratory equipment rooms where laboratory demonstration equipment is stored, assembled and repaired. He said that the desk used by the laboratory technician is located in Room 126. The radium source container was stored on a shelf behind glass doors in Room 129.

44. Individual D stated that the demonstration-experiment involving the use of the radium source in a neutron moderator took place once each year, usually during the second semester. The demonstration-experiment was involved in only one laboratory session of about two hours duration. The Individual B was the only individual that Individual D could recall who included this demonstration-experiment in his course. Individual D said Individual A had assisted Individual B in setting up this demonstration but he did not know exactly what was involved in this assistance. He recalled that it was part of Individual A's duties to fill the moderator device, a large galvanized can, with water in preparation for the experiment and to empty the water afterward.
45. Individual D said that the only association Individual A would have had with the Allison gauges would have been his occasional entries into the room where they were stored. Individual D said Individual A may have been requested by Individual B to check the gauges with a survey meter periodically. Individual D said that to his knowledge Individual A had no other association with the gauges such as performing leak tests. As far as he knew leak tests were not made of the sources contained in the gauges.
46. Individual D stated that in addition to developing and preparing laboratory demonstrations and maintaining and repairing equipment, it was his understanding that during the years prior to his arrival, Individual A had also spent a lot of time working in the audio-visual program.
47. Individual D said that Individual A had never requested a film badge from him and had never expressed any concern about the storage and handling of radioactive materials or about his exposure to radiation. He said he had never personally observed Individual A working with radioactive material.

Interview with Individual E

48. On September 13, 1978, Individual E, who is the Evening Administrator, was interviewed in an effort to determine when the Allison gauges were moved from the Krannert Building to the West Building. Individual E advised that he was unable to find anything in his files indicating when the gauges and other miscellaneous furniture and equipment were taken to the West Building for storage. He estimated, however, that this occurred in about 1975.

49. During this contact Individual E stated that he had known Individual A for several years. He said that Individual A had never expressed any concern to him about radiation exposure or working around radioactive materials. Individual E said that Individual A had never requested or indicated a desire to be furnished a film badge.
50. Individual E said that Individual A had a close working relationship with Individual B for many years. He expressed the opinion that Individual B regarded Individual A as a friend and would not do anything that was not in his best interest. Individual E said that it would not be unusual for an experienced laboratory technician to be left in charge of a group of students during a laboratory period while the instructor was absent for an hour or so. The instructor would rely on the technician to watch over the activities of the students and to assist them in any way he could.

Interview with Individual F

51. On September 13, 1978, Individual F, who is a Chemistry laboratory technician, was interviewed. He stated that he had been acquainted with Individual A for several years before he became employed in the Chemistry Department in 1965. When Individual F first started working as a laboratory technician, Individual A had assisted him in learning his duties. He recalled one discussion with Individual A during which Individual A took him outside the building and using a radiation detection instrument showed him that there was some reading on the instrument. According to Individual F, Individual A had told him the radiation level indicated on the instrument was due to the presence of the radium source stored within the building. Individual F said that he could not recall what radiation levels were indicated on the instrument at that time.
52. Individual F recalled that occasionally Individual A borrowed a radiation detection instrument from the Chemistry Department and a cloud chamber which had a small radioactive source associated with it. He recalled that there were some other occasions when Individual A borrowed only the radiation detection instrument.
53. Individual F said that although the subject of radiation had come up during conversations with Individual A, the latter had never expressed concern about not being furnished a film badge or that he might be receiving excessive exposure. Individual F said that it was his impression that Individual A was a conscientious and careful individual in performing his work and that he would not endanger himself or others by his actions. He indicated that he is not aware of any incidents or any unusual occurrences involving radioactive materials.

Review of Facilities on September 13, 1978

54. During a visit to the Krannert Building on September 13, 1978, the moderator device in which the radium source had been used was examined in Room B23, where it was being stored. The device consisted of a 30-gallon galvanized trash can which contained several lead bricks and blocks of paraffin. A hollow metal rod about four feet long stood upright in the center of the container being held in position by the paraffin blocks. The apparatus was situated on a cart so that it could be readily transported.

The laboratory equipment rooms, numbers 126 and 129, were also visited. These rooms are situated on opposite sides of the corridor on the main floor of the Krannert Building. Both rooms have connecting doors to laboratories situated on each side of them to facilitate the movement of laboratory equipment to and from the laboratories. Both are large rooms, approximately thirty feet by thirty feet, with a major portion of the floor space taken up by shelving. Immediately inside the entrance to Room 126 was the laboratory technician's desk. In Room 129 the wall opposite the entrance is lined with glass enclosed shelves. The radium source in its lead container was kept on one of those shelves. The space between the entrance and the shelves is used as a work area.

Interview with Individual G

55. On September 14, 1978, Individual G, who is the Chief Custodian at the 38th Street Campus, was interviewed. Individual G stated that he had known Individual A for many years and while Individual A was employed as a laboratory technician he had almost daily conversations with him.
56. Individual G stated that he recalled that Individual A had stated to him on one occasion that he felt he should be furnished a film badge. Individual A had indicated that Individual B had a film badge and Individual A assisted him when the radium source was used. Individual A also pointed out to Individual G that he spent more time in the vicinity of the radium source when it was in storage than did Individual B.
57. Individual G recalled that for an extended period of time, about one or one and a half years, the moderator device was located about 10 feet away from Individual A's desk in Room 126. At that time the device had a radioactive label on it. Individual G said that on one occasion Individual A had told him that the device contained radioactive material. Individual G said that he did not know whether the radioactive material was left in the device for extended periods of time but, since it was so labeled, he had assumed that was the case.

58. Individual G said that except for the one occasion Individual A mentioned his not having a film badge, he could not recall Individual A ever expressing concern about working around radioactive material.
59. Individual G said that he had no knowledge concerning the storage of gauges containing radioactive material in the storage room in the Krannert Building. He indicated he occasionally entered the storage rooms but did not recall seeing any devices in or out of crates which fit the description of the gauges.

Interview with Individual B

60. On September 14, 1978, Individual B, a former faculty member in the Physics Department, was interviewed. Individual B stated that he was the head of the Physics Department when Individual A transferred from his position of Administrative Assistant to become a laboratory technician in 1954.
61. Individual B stated that the gauges from Allison were never used. When they were received, they were placed in a storage room in the basement of the Krannert Building. He indicated it was his impression that they were moved once from one store room to another and in about 1975 they were moved to the West Building. Individual B said that Individual A was not required to do anything with gauges. To his knowledge Individual A was not instructed to perform periodic radiation surveys.
62. Individual B said that the radium source was acquired in 1958 while they were located at the Meridian Street address and it was brought with them when they moved to the Krannert Building in 1961. Individual B said this source was used for only one experiment each year. This experiment, however, was sometimes repeated a few weeks after the first demonstration for the benefit of the students.
63. In preparation for the experiment it was necessary to transfer the source from its lead storage container and to attach it to the end of a rod which was then inserted into the neutron moderator device through a metal tube. He said the device was a galvanized trash can lined on the bottom with lead bricks. Paraffin blocks were stacked on top of the bricks and the can was then filled with water. With the rod fully inserted into the can, the source was shielded by the lead bricks. For the experiment the source was raised part way up the rod to expose strips of indium and silver which had been inserted into the paraffin block.

64. Individual B stated that no one was allowed to get near the device when the experiment was being performed. He said he did not have a survey meter available to monitor for radiation while he performed the experiment so he could not say what the radiation levels were around the device.
65. Individual B said that he always transferred the source using forceps and attached one or two wires to it with pliers. While doing so Individual A held the rod at the other end and attached the other end of the wires to the rod. Individual B said Individual A assisted him but Individual A was not permitted to perform the operation himself.
66. Individual B said he always protected Individual A. Because he always handled the source, Individual B felt he received more exposure than Individual A during these transfer operations. Individual B said he could not recall that Individual A had ever asked him for a film badge or that Individual A had ever expressed any concern to him about his receiving exposure to radiation.
67. Individual B said the source was always stored in the lead container. At most it might have remained in the moderator device overnight before being returned to the lead container. Individual B said that the source under those conditions would have been shielded by the lead bricks.
68. Individual B said the cloud chamber experiment involved a small source that was furnished with the cloud chamber which could be ordered by mail with no restrictions. Individual B said he did not recall what radioisotope the source was but that it was not a hazard to anyone from a radiation standpoint.

Telephone Interview with Individual H

69. On September 14, 1978, Individual H, a former IUPUI Radiation Safety Technician, was interviewed by telephone. Individual H stated that he had removed the radium source in its lead storage container from the shelf in the Physics Department equipment room. He said he checked the container with the survey meter but did not recall the readings he obtained. The source was taken to the Radiation Safety Office and was subsequently leak tested by a physicist in the Nuclear Medicine Department.
70. Individual H indicated it was his recollection that the source was found to be leaking slightly. He did not recall the test results but said his recollection was that the readings taken with a flow meter were two or three times background.

71. Individual H said he was instructed to dispose of the source by including it in a shipment of radioactive waste picked up by Nuclear Engineering Company (NECO), a licensed radioactive waste disposal firm. Individual H said he placed the lead container in a couple of heavy plastic bags, sealed them and placed them in the center of a barrel of radioactive waste. Some excess lead was also placed around the lead container to reduce the radiation levels at the surface of the barrel. He went on to say to the best of his recollection the barrel containing the radium source was one of several picked up by NECO in April 1976. The radium source was not listed on the NECO shipping papers although the other radioisotopes in each container were listed. Individual H said that he was instructed not to list the radium source and to his knowledge NECO was not informed that it was included in the shipment. He said he could not recall with certainty who gave him that instruction but he assumed it would have been Individual J who was the RSO at that time.
72. Individual H said he recalled checking the barrel containing the radium source and, although he could not recall readings, he was sure they were low enough to meet DOT requirements for the transport index radioactive yellow II label that was placed on the barrel.
73. Individual H stated that he had no knowledge of any radioactive sources contained in gauges in the possession of the Physics Department.

Telephone Interview with Individual I

74. On September 15, 1978, Individual I, who was formerly a Physics Laboratory Technician, was interviewed by telephone. Individual I stated that he had been employed as a Physics Laboratory Technician from 1971 to November 1974. He said he worked with Individual A who assisted him in learning his duties until Individual A had terminated his employment.
75. Individual I said he had little involvement with any radioactive material. He recalled that on one occasion he had brought the moderator device from the basement storage room so it could be used in an experiment. This occurred a short time before Individual A retired. He also recalled carrying the lead container from a shelf in Room 129 to a table but he did not open the container or work with the source. He said he had never observed the source being transferred to or from the lead container. He said Individual B

had performed these operations himself. Individual I said that Individual A had told him that he had made these source transfers himself on more than one occasion although it was normally performed by Individual B. Individual I said he never observed Individual A make such a transfer.

76. Individual I said he recalled having once assisted Individual A in straightening out the strings on the outside of the moderator. He said these strings were attached to the metal strips that were situated in the paraffin blocks.
77. Individual I said it was his recollection the source was used once a semester while he was employed in the Physics Department. He said, however, it may not have been used during his last year of employment.
78. Individual I said it was his recollection that Individuals B and D were supplied with film badges but neither he nor Individual A had film badges. Individual I said that Individual A had never expressed any concern to him about working around radioactive material but had impressed him that it was necessary to be careful with it.
79. Individual I said that it was his recollection that there were two lead containers, both located behind glass doors on a bottom shelf in Room 129. Individual I said he had some papers in his possession relating to his work as a laboratory technician. He agreed to review them in an effort to determine whether there was in fact a second lead container and possibly what it contained. He said that he could again be contacted for any further information he might find in a review of these papers. (Note: Six unsuccessful attempts were subsequently made to again interview Individual I.)

Telephone Contact with the Radiological Control Officer, Purdue University

80. On September 20 and 21, 1978, telephone conversations were held with the Radiological Control Officer, Purdue University. During these conversations the Radiological Control Officer advised that during the time Allison gauges were in the possession of Purdue University they were not leak tested since they had been under the erroneous impression that they were not required to leak test them unless they were placed in use or transferred. License Condition 16C requires that leak tests of sealed sources be conducted every six months. Purdue University is, therefore, in noncompliance with License Condition 16C in that leak tests for sealed sources were not made every six months during the period August 1968 to May 1973.

81. The Radiological Control Officer also advised that he had been unable to find any record of the transfer of the four byproduct material sources from Allison to Purdue University or from Purdue University to IUPUI. 10 CFR 30.41(c) requires a licensee transferring byproduct material to verify that the transferee's license authorizes the type, form and quantity of byproduct material to be transferred. Purdue is, therefore, in noncompliance with 10 CFR 30.41(c) in that the licensee transferred two one curie strontium 90 sealed sources to a licensee (IUPUI) without verifying that the transferee's license authorized the receipt of the material transferred.
82. The Radiological Control Officer advised that the last record of a leak test being performed on the radium source was dated May 7, 1970, and it indicated the wipe was made by Individual B and sent to the West Lafayette campus where it was counted. The record shows the source was not leaking. He went on to say that a note in his files regarding a telephone conversation with Individual B on May 29, 1973, confirmed that Individual B had two strontium 90 sources and the radium source in his possession and that arrangements were being made to test them.

Telephone Conversation with IUPUI Radiation Safety Officer

83. During a telephone conversation on September 20, 1978, the IUPUI Radiation Safety Officer stated that he had been unable to find any leak test records relating to the radium source or the four byproduct material sources. During a telephone conversation later the same day the Radiation Safety Officer advised that he had spoken to two individuals who recalled the leak test of the radium source in 1976 before it was disposed of. The Radiation Safety Officer said that they had indicated, however, no record was made of the results.

Telephone Conversation with Individual J on September 20, 1978

84. On September 20, 1978, Individual J, a former Radiation Safety Officer at IUPUI, was contacted by telephone. Individual J advised that he did not recall ever being aware that the Physics Department possessed gauges containing radioactive sources given to them by Allison.
85. Individual J stated he recalled that the radium source picked up from the physics Department in 1976 had been leak tested prior to its disposal. He said that, although no record was made of the test results, he was sure they showed the source was not leaking. Individual J recalled that a short time after the leak test was performed the source was disposed of by including it in a shipment of radioactive waste which was picked up by NECO.

Telephone Conversation with the Radiological Control Officer, Purdue University

86. On September 21, 1978, the Radiological Control Officer, Purdue University advised during a telephone conversation that he had checked the property accounting records in an effort to determine whether a second cesium 137 source had been received from Allison. He said the gauges found in the West Building by the IUPUI RSO had consecutive property numbers and he had checked the item assigned to the next higher number and had determined it was assigned to a non-radioactive item having no association with Allison or the Indianapolis Campus. He said the next lower number had been assigned to a crystal puller, a non-radioactive item donated by Allison along with the gauges and sent to the West Lafayette campus. The next lower number was a non-radioactive item not associated with either the Allison or the Indianapolis Campus. He concluded by saying that he had been unable to find any indication that a second cesium 137 source had been received from Allison.

Telephone Conversation with Radiation Safety Officer, IUPUI

87. During a telephone conversation on October 5, 1978, the Radiation Safety Officer, IUPUI advised that seven smears were made in and around the moderator device on September 28, 1978. Upon being counted with a multi-channel analyzer no contamination was found.
88. The RSO further advised that the cloud chamber was a Central Scientific Laboratories Corporation Catalog and Model No. 72707-100. He said it came with two needles having a very small amount of radioactive material but the isotope could not be determined. He indicated the cloud chamber had not been used for several years. ((Note: Through a telephone inquiry of Central Scientific Laboratories Corporation on October 5, 1978, it was determined that the needles contain .0018 microcuries of lead 210.))

Dose Evaluation

89. From the information obtained, there were four possible sources to be considered in evaluating the exposure Individual A could have received during his employment as a laboratory technician. They are: the set of check sources; the cloud chamber source; the sources in the five Allison gauges; and, the radium-beryllium source used with the neutron moderator.

90. The occasional handling and use of the check sources as well as the small source associated with the cloud chamber would result in minimal exposure to the individual which would likely not be measurable by conventional dosimetry.
91. Individual A's only known association with the .2 millicurie radium source and the four byproduct material sources in the Allison gauges consisted of periodic entries into the room where they were stored for various purposes, one of which may have been to perform radiation surveys of them. Had he been wearing a film badge during those entries it is highly doubtful that the exposure received would have been sufficient to be reported by the film badge processor, i.e., less than 10 millirem. This conclusion is based upon the radiation levels detected during the May 1978 surveys of the gauges, taking into consideration the reduced strength of the sources through decay, and the dosimeter readings of the individuals who transported the gauges from the West Building to the Radioactive Waste Storage Room.
92. Individual A's exposure, therefore, would be attributable primarily to the radium-beryllium source. In order to estimate the exposure Individual A could have received during normal handling of this source, estimates were made of working times near the source. The assumptions are such that the maximum exposure is estimated. While the radium-beryllium source emits both neutron and gamma radiation, the neutron contribution is negligible compared to the gamma and is, therefore, not included in these estimates.
93. The first activity considered where exposure may have been received was the actual source handling and the conduct of laboratory experiments. Since Individual B, who performed source handling activities, was badged, his exposure record provides some indication of the exposure involved in these activities. While available records showed his annual exposure ranged from minimal to 390 millirems, the highest annual exposure to Individual B, 390 millirems, was assumed to be the possible exposure Individual A could have received every year he and the source were present in the Physics Department. The assumption that 390 millirems per year would be the maximum received appears reasonable considering that the calculated radiation levels from this source are about 100 mR/hr at one foot from the bare source. Information obtained indicates the source was used no more than two times each year. Each use would have involved two handling operations, transferring it from the storage container to the moderator and back again. Each of these operations can be accomplished in a few minutes. Some additional exposure would be received during the course of the experiment which was completed during a laboratory class lasting about two hours.

94. On the basis of the above, individual A's total exposure from this activity for 14 years, 1958-1971, would have been 5.46 rems.
95. The reading of 4mR/hr at one meter recorded on the 1957 shipping invoice was used to calculate the possible dose Individual A could have received from the radium-beryllium source while it was in storage. The configuration of the Meridian Street storage location and Individual A's proximity to it for the years 1958-61 was not determined. In view of the size and configuration of the laboratory equipment room in the Krannert Building where the source was stored, it was assumed Individual A was an average of ten feet from the source while in the room. Since Individual A divided his time largely between the two equipment rooms, the other room being the location of his desk, it was assumed he spent four hours per day in the room where the source was located. Using a five day, fifty week work schedule, Individual A would have spent 1,000 hours (20 hrs/wk X fifty weeks) a year an average distance of ten feet from the source. The dose rate ten feet from the source in the storage container was calculated to be .44mR/hr, giving Individual A an annual dose of .440 rems per year.
96. Using 12 years, 8 months (September 1958 through April 1971), which assumes the configuration was similar at the Meridian Street location, Individual A's total dose from the source in storage would be 5.57 rems. This added to the 5.46 rems would result in a total lifetime dose for Individual A of 11.03 rems.
97. While this dose was calculated on the basis of several assumptions it is considered to represent a conservative upper limit.

Attachment:
Exhibits A through Y

Indianapolis, Indiana
46205
May 15, 1978

Nuclear Regulatory Commission
1717 H. N.W.
Washington, D.C. 20555

RE: (Individual D)
Head of Physics Department
IUPUI 30th St. Campus
1201 E. 30th. St.
Indianapolis, Indiana
46205

Dear Sir:

(Ind. D) is licensed by the Atomic Energy Commission and has been with IUPUI for a long time, he took a (Ind. B) place I understand who was the instructor when he taught me just a while ago.

As Head of Physics, I would like to know just what are his responsibilities? The course Nuclear Physics, Lab 7 Physic 343

My husband (Ind A) retired from IUPUI July 1 1970 from full time and returned part-time Sept. 1970 and continued until April 28, 1971 when he was forced because of health to give up his work. He was Physic Technician for about 16 yrs., during which time he handled Radio-active materials (he had been Assistant Administrator 8 yrs. in fact he helped to start the center in 1945 (it was then Purdue Extension.) and happens to be the Great-Grandson of Jonathan Baldwin Turner who was the author of the Morrill Act (Land Grant College Act), the Act carries Morrill's name because he was the Senator who introduced the bill in Congress.

My husband asked for a film monitoring badge but was told by (Ind. B) (the instructor) that he (Ind. B) could only get one badge. Sounds unbelievable doesn't it? Ind. B had one to be checked for radiation exposure, my husband's life was just as valuable as his. Ind. B even had my husband teach the class in his absence and also had Ind. A to help in class demonstration. Ind. A had the materials in his lab preparation room all the time, in fact even when my husband was in hospital coming out of 2 days of shock from a Radical on his Bladder, Ind. B call him up and said there was a lab demonstration not prepared and he wanted it and to tell him where to find each piece and how to put it together, I have 2 witnesses that were in the room with my husband and I. My husband never was checked for radiation exposure

The Radium-Beryllium was kept in a glass storage case in the Lab. Preparation room all the time. I want to know WHY my husband wasn't given a monitoring badge, Ind. B had one. WHEN it was ordered out, WHO ordered it out, WHY it was ordered out, BY WHOM was it ordered out, HOW strong was the source? No-one will answer my questions. They didn't give my husband a chance for

I've given people a chance to answer, if I have to take it tomorrow, I can. Ind. B's wife was at the hospital the very first day, they found my husband had Cancer of the Bladder and I told her he would have to have 3 more operations (he had 4 operations within 3 weeks) and when they would be.

I found in my husband's textbooks (he died Nov. 22, 1977 after nearly 7 years of terrible suffering) a couple of papers one from Lawyer's Medical Encyclopedia which states Cancer of Bladder is occupational disease of Physicians, Laboratory Technicians, individuals handling wastewaters (laboratory waste waters which my husband also did and handling Radio-active materials, Compounds artificial radioactive substances, Radioactive water. The State Board of Health man said it was strong enough to harm. The other paper I found is from National Academy of Sciences Washington Local radiations in sufficient amounts to almost any part of body may produce Cancer. All types of induced and spontaneous tumors don't arise at once, but pass through a preliminary series of stages, and radiation induced tumors take particularly a long time to develop. It can take 2 to 40 years to develop. Radiation affects Blood forming organs, tissues and target is kidneys (as in my husband's case. It started in Bladder, spread through out his body shutting off his kidneys and finally into his lungs. He became helpless in all ways. I thank God he answered my prayers and gave me the strength to take care of him to his last breath. He had no pains to start with but was tired all the time and finally he started passing blood. All the X-rays, tests & Scans failed to show tumors. Ultra-Sound clued them in a little but the Cystoscopy is when they found it.

After we got a lot of information about Radiation from Government we became disturbed about the man who took my husband's place. I contacted the 38th St. Campus and was told he was gone. I have since located, he had no monitoring badge either. The Technician who took his place told me Ind. D was ordered to take out the Radioactive materials, but he couldn't tell me when nor why, but would try to find out. I immediately contacted

Ind. D and he denied there had ever been any there nor that my husband had ever handled any Radioactive materials. He said I didn't know what I was talking about. When I confronted him & that I knew he had been ordered to take it out, he hesitated and finally said, "Seems I do remember something about it, I'll come and talk to you." He came up on the morning my husband died that night. My husband told him he had asked for a monitoring badge but never received one. I asked Ind. D what the half life of Radium was he didn't even know, said, he thought it was a good many years, and he asked me if I was going to believe the government books instead of him, I said "Yes, you denied there had ever been any Radioactive materials there or that my husband had handled it. He said and I quote "I'll have you know I have a Phd in Physics. I saw him about 3 or 4 weeks ago and again asked what the half-life of Radium was, I got the same reply and I quote "I don't know I only know its a lot of years" end of quote.

Here he is licensed by Atomic Energy Bureau, I understand. There are a lot of Physic Technicians and I pray to God they are protected, it won't bring my husband back, I have suffered a great loss, nothing can replace him, not anything nor words.

I want to know just what Ind. D was doing. I was told it was ordered out, but no-one will answer my questions. Why, When

Ind. D just shrugged his shoulders and said and I quote "Just say I didn't want the stuff around" end of quote. Ind. B told me at Mortuary (my son was sitting beside me) and I quote "It was just dangerous to have around." end of quote, he hardly finished the sentence, Please answer this letter Nuclear Physics was the cause

Indianapolis, Indiana
March 21, 1978 46205

Honorable
Senator Richard G. Lugar,
U.S. Senate PLNC
Washington, D.C.

RE: Lack of protection
of Individual A
(my husband) now
deceased as of Nov 22, 1977

Dear Senator Lugar:

I lost my darling husband November 22, 1977, after a nearly 7 year battle with Cancer of The Bladder, which had spread throughout his body.

Ind. A worked at Purdue University, 28th St. Campus, in fact he helped start the Campus originally at 902 W. Meridian St. Dec. 1945. Note: See attached papers.

He was Administrative Assistant about 8 years. Then he became Technician Of Physics in which capacity he handled Radioactive materials-using (Radium- Barium) making radioactive isotopes, cloud chambers etc. He never had any protection (adolescent or monitoring badge) to see how much Radiation his body was absorbing. Note: See letter to Ind. N

28th St. Campus, also the year he sent me from Ind. O Ind. A had asked Ind. B for a protection badge (the instructor) but, Ind. B told him that he Ind. B) could only get 1. Ind. B had a badge.

Ind. A retired July 1, 1970, it was compulsory ruling age 66 yrs. They had him back part-time (after P.H. & I. merged) he returned about last of Sept. 1970 and March 11, 1971 he started passing blood in urine. He went to the Doctor (he continued to work, he loved his work) and Dr. thought it was Prostate trouble, gave him some medicine and a couple of Prostate treatments, but, told him if blood did not stop, he would put him in hospital to examine him for Tumors, or Cancer. The blood stopped for 2 weeks then started again. They couldn't get him in until April 28th. He continued to work up to and including April 27th, and planned to return to work. However, He was in hospital 5 weeks, having 4 operations with in 3 weeks, one being a radical on Bladder, I nearly lost him in it as he went into shock. They found he had Cancer of Bladder. April 28. He had 2 Diverticulas in wall of Bladder full of Malignant Tumors plus Bladder being full, they cut his Bladder in 2 places to remove Diverticulas with tumors. Mrs. Ind. B came down the day of first operation asked me what was wrong. I told

her and that he would have to have 3 more operations and when they would be, particularly the Radical on Bladder. Ind. A went into shock from Radical and for 2 days didn't know much of anything. The 3rd day when he was becoming more alert, Ind. B called up, saying there was a Physic Lab. Demonstration that hadn't been prepared and he wanted it done and for Ind. A to tell him where each part was and how to put it together. Another Purdue friend and his wife were in the room with Ind. A and me and we were stunned. Ind. A as sick as he was told Ind. B where to find each piece and how to put it demonstration together. His mind was still on his work, he really didn't want to retire and was so glad and happy when he could go back to work after he had retired as Purdue and Indiana had come together. Purdue retirement age was 66 yrs. Indiana 70.

Ind. A answered the telephone, but I answered the telephone. I would have told Ind. B Ind. A was too sick to talk and after all he was the Physic Instructor and it was part of his job to know. Ind. B never even came to see Ind. A.

Ind. B didn't care enough about Ind. A to ask for a monitoring badge for Ind. A's protection to be checked for radiation exposure for his safety, but, yet he still expected Ind. A to work even in the hospital. I might add that Ind. B had Ind. A to help him with class demonstrations and also hold the meter rod in demonstrations when before Ind. A had to be put in hospital. He knew Ind. A had no monitoring badge or film protection.

Ind. B same to Mortuary and said "I feel real sorry about Ind. A. I told him it's too late to do anything for Ind. A now" and thanked him for coming. I also asked him just why they took out the Radium Radium (Radium has a half life of 1620 yrs. quoted from Modern College Physics Textbook, used by Ind. A in his work) the Radioactive materials, I think I caught him off handed and he barely replied "Because it was too dangerous to have around" He barely finished the sentence.

It seems when they did the Radical on Bladder, some of the Cancer cells flowed to them and got into the abdominal cavity and right leg. It was nearly 5 yrs. before they showed up to the place of hurting. In the Exploratory in January 1976 they took out a 3 inch indurated tumor in wall of abdominal cavity, the 2 inch in diameter one in right leg was inoperable as it was growing around the big artery. They had never showed up in all the X-rays and examinations. He had had Gallium Scans, Bone Scans and Ultra-Sound. He had had Thiotepe Chemotherapy in 1972, 5000 lb it in 1976, 5Fu (Fluorouracil) plus Thiotepe in 1976. It knocked his body chemistry out of balance, he went into Pneumonia and it damaged the Auditory nerve in left ear and made him deaf. He had been deaf in right ear since a little boy. So we had to get him a hearing aid for left ear, he had had two different tubes put in it but they didn't help. His suffering was pitiful he became helpless. You could see the Tumor growing larger and larger each day like a ball on his abdomen, but were helpless to stop it, or stop the continually bleeding. He had 17 blood transfusions from January 1977 to October 1977. I had to take care of him like a baby but, I think God he gave me the strength and my only consolation is that he is out of his suffering.

Excuse this long letter but, it is the only way to describe the situation all because Ind. A "Ind. A" had no protection even though he asked for it and even before the Atomic Energy man Ind. D (he is licensed by Atomic Energy Commission I understand) was sent there and even after he came there. It seems he doesn't know a lot about Radium, Radioactive materials nor half life of Radium. When I confronted him with books, printouts, of Documents from Washington, he said are you going to believe those books in stead of me, I have degree in Physics. I told him "Yes, because you denied there had ever been any Radioactive materials there or that Ind. A handled any. When I asked him why it was ordered out, he just shrugged his shoulders and said "I just didn't want the stuff around" When I asked him when it was ordered out, he seemed to have a lapse of memory.

I am sorry to have a long discussion, it has only been through my diligent research that we found all this information about it. You'll note some papers, I found in my husband's Modern College Physics Textbook, he had copied from "Lawyer's Medical Encyclopedia Volume 5, 1960 Copyright and National Academy of Sciences Washington, D.C. "The Biological Effects of Atomic Radiation" 1956, Library 574.121 Indianapolis, when he wrote them or why, I don't know, but it shows he was worried about the matter and not having any protection, but, didn't want to worry me.

After we found the information recently, he became concerned about the man he took his place when he retired, a Ind. I (I have been unable to locate him, he should be checked. That was one of Ind. A's wonderful character traits, always thoughtful of others. It was a part of his fine character. There was no finer, honest, hard working, loyal and conscientious Christian man than my husband, Ind. A. Anyone who knew him should consider it a privilege and an honor to be counted amongst his friends.

I didn't find out until last August that Purdue had a Flood Tank. You'll note reply dated August 22, 1977 refusing to replace blood from it, since he retired before May 1975. Money can't buy blood, you need blood to replace blood in body. After I took the matter up with Ind. P, it was replaced. The replacement of the blood worried us and unfortunately

Ind. A died without knowing it had been replaced. He even cried when Purdue wouldn't replace blood at first. Note Ind. P's letter.

I pray you will give this matter your attention and see that proper safety measures are taken for the safety of others not only of others at Purdue but, throughout the country for people in hazardous occupations. If I can help to protect others from the same fate my husband suffered from lack of protection, I'll thank God every night.

The only thing Purdue has done is replacement of blood after taking matter of with Ind. P. It seems since Ind. A passed away before January 1, as a retiree's wife I am not eligible for any the retiree's spouse's benefits. If we had not had Medicare, Blue Cross-Blue Shield we would have lost, everything we had, 1977 expenses alone, were \$17,300.19, from Jan 1-77 to November 22, 1977, and that is low compared to other years.

started passing blood March 11, 1971 and was unable to continue his work, he was with INPUI at the time.

Thanking you for your patience in this matter and best regards to your Mother (my old school mate)

Sincerely

Individual M



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUN 1 1978

Individual M

Indianapolis, Indiana 46205

Dear Ind. M :

Please be assured that we will look into your concerns regarding apparent radiation exposures received by your husband during his employment at Indiana University. A representative from our Region III (Chicago) office will contact you in the near future to discuss with you the complaints expressed in your May 15 letter. Following that, we will conduct an inspection of NRC-licensed activities at the University, looking to the specific areas relating to your concerns. Afterwards, we will meet with you again to provide information regarding what we found during the inspection.

We are pleased to be of assistance.

Sincerely,

Ernst Volgenau
Director
Office of Inspection
and Enforcement



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
755 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60127

June 29, 1978

Individual M
Indianapolis, IN 46205

Dear Ind. M :

During the week of June 19, 1978, our Region III office (Chicago) conducted an inspection at Purdue University as promised in Dr. Ernst Volgenau's letter to you dated June 1, 1978. The inspection consisted of an examination of Purdue University records and interviews with Purdue University personnel. Messrs. J. A. Pagliaro and S. R. Lasuk of the Chicago office visited you at your residence on June 21, 1978, to discuss their findings of that inspection. Following are their findings regarding your concerns:

1. Purdue University in Indianapolis started work with radioactive material in 1958 when a radium-beryllium source containing 11.5 milligrams of radium was acquired. Two density gauges containing strontium-90 sources and a set of check sources containing small amounts of radioactivity were acquired in 1968. All of the above radioactive material is licensed by the Nuclear Regulatory Commission (formerly the AEC) except the radium-beryllium source which is registered by the State of Indiana.
2. The radium-beryllium source was used in laboratory instructive demonstrations which were performed a maximum of twice per year. The density gauges were never used and exposure from the check sources would have been negligible. The total radiation dose measured by Individual B film badge for the period 1960 to 1970 was 755 millirems, 1.5% of the exposure allowed by the Code of Federal Regulations, 10 CFR 20, "Standards for Protection Against Radiation," which governs all NRC licensed programs in the United States.
3. Based upon our understanding of your husband's duties at Purdue University, we believe his radiation exposure was much less than that received by Individual B.

June 29, 1978

4. NRC's regulations (10 CFR 20.202(a)) do not require personal monitoring (e.g., a film badge) for individuals, such as your husband, who are not likely to receive radiation exposure greater than 25 percent of the NRC's allowable exposure limits.

Based upon our inspection at Purdue University and other information supplied by you and others, we believe your husband received very little radiation exposure while employed at Purdue University.

We hope the above information is responsive to your concerns.

Sincerely,

James G. Keppler
James G. Keppler
Director

cc: William T. Paynter
Indiana State Board of Health
Individual K Radiation Control
Officer, Purdue University



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JUL 13 1978

The Honorable Richard G. Lugar
United States Senator
Room 447
46 East Ohio Street
Post Office Box 44122
Indianapolis, Indiana 46244

Dear Senator Lugar:

This is in response to your letter regarding Individual M and her concerns that her husband died of radiation induced cancer. We also have discussed this matter with Ind. M. We did this after completing a special inspection of the background and circumstances of her husband's work at Purdue University. The inspection was conducted in response to a letter from Ind. M. We have enclosed copies of two letters from NRC's Office of Inspection and Enforcement to Ind. M; the June 29 letter provides a summary of the results of our inspection and of our discussion with her.

Our discussion with Ind. M took place at her residence on June 21, 1978. Following that meeting, on July 5, 1978, she telephoned Mr. James Keppler, Director of NRC's Region III (Chicago) office, and provided additional information about certain aspects of her husband's work. As a result, inspectors from our Region III office will review that information and again visit the university during the week of July 17, 1978. We will notify you of the results of that inquiry.

In the meantime, if you have any further questions please contact Mr. Leo Higginbotham at 301-492-8188.

Sincerely,

A handwritten signature in dark ink, appearing to read "William J. Dircks", is written over a horizontal line.

William J. Dircks
Deputy Executive Director
for Operations

Enclosures:

1. Ltr dtd 6/1/78 fm E. Volgenau,
Dir. OIE to Ind. M
2. Ltr dtd 6/29/78 fm J. G.
Keppler, Dir. Reg. III, OIE
to Ind. M

Indianapolis, Indiana.

46205

July 27, 1978

Mr. James G. Keppler
 Director
 Nuclear Regulatory Commission
 Region III
 799 Roosevelt Road
 Glenn Ellyn, Illinois 60137

RE: Investigation of matter
 Of Individual A (deceased)
 Physic Technician, Purdue
 University (now known as I
 IUPUI, 30th St. Campus

Dear Mr. Keppler:

Please accept my apology for delay in getting this material to you sooner, but as will note it has taken time to look it up, talk to some people, get Xerox copies and assemble it. I have also been sick.

I have only touched the tip of the iceberg as one would say. I have about 15 books of my husband's (plus textbooks) that are about 3 and 4 inches thick with his Rules, Notes, Schedules, Demonstration and Diagrams. I have tried to pick out some things, Schedules, demonstrations, etc. I talked with Ind. C recently and he informed that Ind. A worked with some Alpha and Beta needles (gauges) (they are still down there he said) when making Cloud Chambers.

Ind. A worked with Laser, X-rays, Fluoroscope and Ultra Sound Demonstrations. So you see the truth is coming out as it always does.

Ind. C did not have a badge because he did not work with radioactive materials. You will note I have letters from Allison's, one dated Jan. 31, 1969 in which Ind. Q said and I quote "As indicated in my earlier letter (June 28, 1968) the Crystal Puller has been transferred to LaFayette Campus. The other items are being used here in Indianapolis." end of quote. You will also note in your letter to me June 29, 1978 and I quote "Two density gauges containing strontium 90 sources and a set of sources containing small amounts of Radioactivity were acquired in 1968. The density gauges were never used and exposure from the check sources were negligible". end of quote. That is contradictory to Ind. Q's letter. In fact Ind. D even denied about them being there like the Radium-Beryllium. He tried to tell me I didn't know what I was talking about, on the telephone and on the morning he was to our home and Ind. A died that night. I even asked Ind. D to help me set Ind. A up in bed (he was helpless) Ind. D grabbed his coat and hurriedly said and I quote "I've got to go, goodbye."

Ind. R has been very rude to me, he refused to return my telephone calls. He has refused to see me and very emphatically and slowly said and I quote "I donot want to see you" end of quote. then he banged up the receiver.

There are too many contradictions of which I have proof, denials about the materials being there, about Ind. A working with teaching classes, why it was ordered out, by whom it was ordered out when it was ordered out, who took it out and where it is. I am beginning to wonder would the people making those statements be willing to state under oath same statements and that Ind. A wasn't harmed? You know there are lots of other Technicians at the other centers in the state and throughout the country that should have film badges. That was not alone Ind. A's concern but mine also and still is, since finding information out from Government. Everyone's life is valuable to their loved ones and God. God gives us our life, but the life we give back to God is what we make it.

In my many, many years of teaching, I have many experiences to remember (I had to give up teaching because I got hurt by a 6th grader) I have taught the Blind, Mentally Retarded, and the regular and the brilliant, they all need Love, Security and protection. We are all born but, not buried yet and we don't know what will happen to us. Ind. A was Administrative Assistant 10yrs. He can't talk to defend himself and the truth (the principles for which he stood) but, I certainly intend to do it. He carried a heavy load, besides being Physic Technician (preparing all demonstrations, not only for Ind. B but others) he was an instructor, he had complete charge of all Visual-Aids and Closed Circuit Television working with the main Campus and other centers. After reading the materials, I think you will have to re-evaluate his work and the capacity in which he worked. As I said before, I think his good nature and willingness to help others was taken advantage of many times. He even showed me how the walls in his work room and loading dock next to it registered Radiation.

There are many old adages that hold true even to this day.

"A pitcher never went to the well so often that it didn't come back cracked or broken" All of you are assuming Ind. A didn't need (protection) a film badge BUT, none of you can prove it. Ind. R letter contradicts (letter of Jan 25-72) your letter of July 27, 1978. WHY, because Ind. R said Ind. A couldn't have exceeded 10 millirems per year, Ind. B got 64 times more. 10x64-- 640 and 2 yrs. are unaccounted for. 1958-9 Your own letter of June 29, 1969 states Purdue started working with Radium-Beryllium in 1958, yet you state records dates 1960-1970. that Ind. B received 755 Millirems. THEY DON'T MATCH DO THEY? There are 2 yrs not accounted for so that it would make it more wouldn't it?

Ind. R, Ind. S, Mr. Lasuk, Mr. Pagliaro and yourself, none of you have ever seen Ind. A, or checked him, because you couldn't 1. He never had a badge, 2. you couldn't check him and 3 you have never seen him.

The truth lies there in that Ind. A was receiving more Radiation exposure than has been stated, and it did him harm, even to the point of making him Anemic. Radiation affects the Blood forming tissues.

Sincerely .

Individual M

Ind. A worked with Laser, X-rays and Fluoroscopes demonstrations. He built all the demonstrations not only for Ind. B but, Ind. C, Ind. T and many others, so you see his work involved more than what I think you have been told. I certainly tend to see that he be given credit for it and the truth is told. Here are some of the people who can tell you about Ind. A, his work and the caliber of man he was. To have him for a friend was privilege and a honor. As, several have said and I quote "when Ind. A told you something, you knew you were getting the real truth" end of note. That was just one of his admirable character traits, there was one thing he disliked most in people to find out they weren't telling the truth. It is an honor and a privilege to be his wife and carry his name. Please excuse writing, as I have Arthritis in my hands and have been sick the results of the nearly 7 year strain I was under and the loss of Ind. A is beginning to show up physically. I have been and am under the Doctor care for Chronic Pancreatitis (Inflammation of Pancreas) and Anemia. I am thankful to God for answering my prayers and sparing me and giving me the strength to take care of my wonderful husband to his last breath. He was so kind and good. I feel the same way as my husband about telling the truth.

his man took Ind. A's place when he retired from full time work, he worked with Ind. A about 1 or 2 semesters, but had no film (monitoring) badge. He worked about 3 yrs. after Ind. A retired (he was) but they dismissed him. He was a good worker, Ind. A liked him very much. The man who took Ind. I's place, Ind. U has no badge.

Individual I

Telephone (home telephone)
Understand he is with , therefore you would have
call him no doubt on Saturday or evenings.

Individual F Dept, of Chemistry
(Krannert Bldg)
Indianapolis, Indiana 46205

Individual G (Charge of Custodians) been with Purdue almost since
it started. He even worries about the Radiation materials. He knows about the Radium-Beryllium
sitting around.

1201 Esst 38th Street
Administration Building
Indianapolis, Indiana 46205
Telephone

Individual W (He is in Security now)
PUI Safety Division

Telephone
Indianapolis, Indiana 46202

Ind. X (I will have to get her address, she was Ind. Q's Secretary
think, I kept in touch with her all the time Ind. A was in hospital.

There are others but, as they told me they are afraid to put anything in
writing or talk because of their jobs.

Note. When I talked with Ind. K he asked me if Ind. A didn't have any X-rays or about Examinations that were required and carried out on Lafayette Campus. I told him no, there weren't even any signs or information posted up, about the Radioactive materials. Ind. A even asked for better storage, safer storage. There are others down at 38th. St. Campus who knows about it, but, as they say they are afraid to put anything in writing because of their jobs. Ind. G, who has been with the center since shortly after it was started at 902 N. Meridian knows a lot about it and Ind. A.

Ind. F, Ind. W of IUPUI Security, Ind. I who took my husband's place, he had no film badge either. I couldn't get any information where Ind. I was, as he let go after about 3 yrs. (he is) and was a good worker, he even took his case to the appeal board at school. I felt he should be checked for radiation exposure. I finally found him in Louisville, Ky. after making 6 long distance calls to each Ind. I there. He was that anxious to let him know about his exposure. He knows Ind. A handled it more then Ind. B. It was in Lab preparation room all the time.

A Ind. Y (service dept.) told me about 2 months ago, it had been removed 8 yrs. ago, which is not true, because it was still there and being used when my husband had to go into hospital April 28, 1971 when I told him that he said and I quote "Well, it must be down in the building on Fairfield, (that's a storage building formerly used for Security force. Then Ind. D said 5 yrs. ago, that's not true. He told me Nuclear Engineering Inc. Sheffield, took it out, I called long distance, they knew nothing, they told me to call Louisville Ky. I did they knew nothing. Then later I saw the Moderator (which I had seen many times when Ind. A was teaching and in his preparation room. The meter rod was not extending very far up and you could see the paraffin blocks I have been keeping track of it). I immediately went to Ind. U (he's the one who told me first that it had been ordered out, but, I have never seen any records as to the date) in fact Ind. K, who came to Purdue (Lafayette Campus in 1959 only had records of the Radioactive materials dating from 1960. How, ever, you will note (see Artificial Radioactivity paper, dated 1958-9). I asked Ind. U who took it out, his reply was and I quote "The "radiation Safety Board" end of quote. Just then opened the door just far enough to stick his head in and the way he looked when he saw me, I guess he wished he hadn't. He tried to get away, but I said "Just a minute Ind. D, your just who I want to see". Ind. D looked at Ind. U and Ind. U looked at

Ind. D as if to say and I quote "What did you tell her". end of quote. I asked Ind. D, "Who did you say that is, told me took the Radioactive materials out" and he wouldn't answer me. Then he said and I quote "If you want to talk to me, you'll have to make an appointment." end of quote. I didn't tell either of them I had seen the Moderator. I have seen it three times since, but the last time I saw it, it had been changed. The meter stick was sticking high in the air and upside down and the paraffin blocks were upside down. I later contacted Ind. J, the former Radiation safety officer he is now with Nuclear Medicine at Methodist Hospital. He told me he had ordered it out about 3 yrs. ago, thought it was out. He didn't supervise the removal. That co-incides with the time Ind. B had a malignant growth removed from his throat or Larynx. The Radioactive materials were removed alright, down to sub-basement where there are Physic Classrooms. when I saw it, the Moderator was in Room B23, where the chemicals are stored and there is a vault, but, it is not in the vault. I just saw Moderator last week. So you see there are a lot of discrepancies.

Indianapolis, Indiana
46205
December 20, 1977

Individual N
Purdue University
Faculty of School of Science
Indianapolis, Indiana 46205

Dear Ind. N _____ :

Ind. A _____ was the Great Grandson of the author of the Morrill Act that made Purdue possible.

As you know I lost my darling husband November 22,, after a nearly 7 year battle with Cancer of Bladder which had spread through his body. As you know Ind. A _____ worked many years with Radium-Beryllium and never had any protection (a monitoring badge to be checked for Radiation), he even asked Ind. B _____ for one and was told that he (Ind. B _____) could only get one film (Badge) which is unbelievable, that a University as big as Purdue and known the world over could only supply 1 monitoring badge to check how much Radiation the person was absorbing into his body.

There are many questions unanswered, but, I want them answered. There were 2 violations (See NCRP REPORT # 32)

1. Why wasn't Individual A _____ given a monitoring badge, particularly after he asked for it? Ind. B _____ had one. Ind. B _____ only worked with it about 2 times a year.
2. Who was the monitoring badge for?
3. It should not have been kept in Lab. preparation room in a glass case for storage. Why was it kept there? Ind. A _____ emptied the waste waters and was around it everyday.
4. It has been removed I found out . WHY?
5. When was it removed?
6. Who ordered it removed?
7. What about some gifts from Allison's that contained Radioactive materials? It was in sub-basement and Ind. A _____ had to keep it checked for leakage. I know I saw it there, just like I saw the Radium-Beryllium in Ind. A's _____ Lab. preparation room in a glass door storage case.

Ind. D first told me there was no Radioactive materials there.
Ind. A had never worked with any, after I told him of talking
with Ind. U and that he(Ind. D was ordered to take it out ,
Ind. D admitted it was true about the Radium-Beryllium. He would
not tell me when nor why it was ordered out. I am trying to locate
the Physic Technician who took Ind. A place because I think for
his sake he should be checked for Radiation. As you know there are
2 types of damage, Somatic which is damage to the tissue's (as in ~~Bill~~
Bill's case) and Genetic. Neither occur instantainbusly, but over an
accumulated period. In Genetic it may not show up for several years
or generations. It is deadly stuff. I understand Ind. D is lisen-
sed by the Atomic Energy Commission, He said when he came there wasn't
any Radioactive materials. isn't it his job to investigate? They were
having classes using it at the very time.

Lawyer's Medical Encyclopedia states Cancer of the Bladder can
be caused by exposure to Radiation, also Industrial Board said it is
an occupational disease. If we had not had Medicare, Blue Cross-
Blue Shield, we would have lost everything out home and all. Purdue
has never done anything in any way. I tried to get them to replace
blood, but was told Ind. A was not eligible.

The following are quotations from NCRP Report # 32.
National Council on Radiation Protection and Measurements entitled
"Radiation Protection in Educational Institutions" published
July 1, 1966.

This report results from the original concern of the American
Association of Physics Teachers for these problems. The Association
pointed out the potential hazards that exist in the indiscriminate
use of radiation sources in educational institutions and asked the
Council to study the problem. The Association continued to provide
valuable support and assistance to the Council during the preparation
of this report, and for this the Council wishes to express its appre-
ciation.

The assistance of the Public Health Service was also invaluable to
this effort. During the initial stages of the study, a determination
of the scope and magnitude of the problems involved in current
practices in educational institutions was essential. There are
usually no early overt warnings from effect of radiation from
Radioactive substances.

Page 2 -paragraph 8.

Radiation effects on human beings are of 2 general kinds. The first
is injury to the body tissues of the irradiated individual i.e. Somatic
effect. 2. The second injury is to the germ plasma of the irradiated
individual, such injury would not be apparent in the individual but,
might become evident in the transmission of hereditary defects to the
decendents i.e. genetic effect.

11. Since there is a possibility of harm even from small doses of radiation an additional factor of safety should be provided. It is recommended that each experiment be so planned that at no time should an individual receive more than 0.01 rem while carrying it out.

Page 11. Paragraph 29.

Adequate precautions should be taken to prevent Radioactive materials irrespective of amount, from gaining entry to the body e.g. through the mouth, the nose, the skin.

Disposal of such devices requires precautions to insure that the Radioactive material does not gain entrance into the human body.

Page 20. Paragraph 55

It may not be sufficient merely provide shielding between the source and person to be protected. Radiation may be scattered by any object it strikes, and this scattered radiation, coming from various places may add to possible exposure. Additional shielding may be required against such scatter.

3. The final disposal of solid Radioactive waste may be required by a commercial disposal service, Ind. A had none.

66, Radioactive sources whether exempt or not shall be stored when not in use, in a suitable location with means to prevent unauthorized use. Adequate shielding should be provided (it was in a glass storage case). Special precautions are required to prevent fogging of unprocessed photographic films and papers. Radioactive materials should, not be stored in the vicinity of supplies.

Chpt. 2. page 24 paragraph 68

Radiation safety of students, instructors and others in educational institutions is primarily the responsibility of the instructor using the source, Ind. B was the instructor. Ind. A asked him for protection, but as I said Ind. A was told he (Ind. B) could only get 1 monitoring badge??? Ind. D saw Ind. A on Tuesday morning and Ind. A told him. My wonderful husband died that night.

Because my husband retired before May 1975, I cannot even get any blood replaced. He had 17 blood transfusions since January 1977. He helped to start the Indianapolis Campus in 1945. He didn't want to retire but Purdue required it. He went back part-time and started passing blood March 11, 1971. They couldn't get him in hospital until April 28, 1971 and he kept going to work including April 27. He was never able to return to work after April 28. He had 4 operations within 3 weeks, one being a Radical on the Bladder. May 13

Sincerely.

Individual M



SCHOOL OF SCIENCE
1201 East 38th Street • 46205 • (317) 923-1321

Office of the Dean

January 3, 1978

Memorandum to: Individual O, Chairman
Radionuclide Radiation Safety Committee

From: Individual N, Dean

Subject: Individual M's Letter

Enclosed is a letter from Individual M, whose late husband was employed with the 38th Street Physics Department for some years. Ind. M. asks certain questions relative to the safety of the environment during her husband's employ. It would seem that your committee is best constituted to investigate the possible radiation hazard mentioned in her letter.

Although her questions are quite specific, I believe your answer to the overriding implied question is desirable:

Is there any basis in fact for the opinion that Ind. M may have been subjected to a radiation hazard while in the employ of the University which could have proven injurious to his health?

In order that I might give Ind. M a timely answer to her letter, I would appreciate your immediate attention to this matter. Thank you.

cc:

Exhibit H

Page 1 of 1

INDIANA UNIVERSITY SCHOOL OF MEDICINE

1100 WEST MICHIGAN STREET • INDIANAPOLIS, INDIANA 46202

NUCLEAR MEDICINE

AREA CODE 317
TELEPHONE 264

January 25, 1978

Individual N , Dean
School of Science
1201 E. 38th Street
Indianapolis, IN. 46205

Dear Ind. N :

After receiving your memo on January 6th, regarding Ind. M letter, I began to look into the situation since prior to receiving the letter I had no knowledge of this question regarding radiation safety. I greatly appreciate your calling it to our attention. I have had telephone conversations with Ind. S in Bloomington regarding Ind. M letter. On January 10th, Ind. L, the present Radiation Safety Officer, and I met to begin to investigate the questions raised in Ind. M's letter. Ind. L was aware of early inquiries made by Ind. M of the State Health Department. We certainly shall attempt to answer the questions raised by Ind. M as best we can.

Several points are immediately evident. First of all, the Radiation Safety Office has only been responsible for radiation safety at the 38th Street campus for approximately the last 4 years. Shortly after becoming responsible for the safety program there, Ind. J the previous Radiation Safety Officer, worked with Ind. D to review the program and strengthen it in any way possible. In review of the program, the small radiation source to which Ind. M refers was identified and subsequently disposed of. The amount of radioactivity was so small that it could be disposed of readily in waste and no special precautions had to be taken. It is evident that during the bulk of the time that Ind. M served in his employment capacity, the radiation safety responsibilities for those facilities were under the aegis of the radiation safety program of Purdue University in West Lafayette. As a matter of fact, it was because of the numbers and nature of conducting radiation safety program from a distant geographical site that the radiation safety for the 38th Street campus came under the umbrella of the overall I.U.P.U.I campus in 1974 or so. Another aspect of the issue is that the kind of source containing natural radioactivity which is in question here has not been under regulatory restrictions by any federal agency and only recently has the state been involved with such sources. Thus, legally, the guidelines for protection procedures for such sources had not been mandated nor clear until very recently. The Nuclear Regulatory Commission, NRC or previously the AEC is only responsible for fission products and has no jurisdiction with regard to natural radioactive sources. In meeting with Ind. L, he indicated that in the next few weeks, he would prepare a report investigating all of the questions raised in Ind. M's letter. We thus shall be back to you with a reply. Also, Ind. L has already alerted the Radiation Safety Office at Purdue of this matter and Ind. K, the Radiation Safety Officer will work very closely with Ind. L in investigating this matter.

Exhibit I

Page 1 of 2

If we may be of any assistance at anytime in the future, please feel free to contact us.

Sincerely,
Individual O

CC:

Indianapolis, Indiana
46205
April 8, 1978

Individual R
Division of Radiological Health
State Board of Health
Indianapolis, Indiana 46206

RE: Individual A
Physic Technician
Purdue University (now known as
IUPUI) retired (required) from
full time work July, 1, 1970
Returned Sept. 30, 1970 Part-
time until put in Winona Hospital
April 20, 1971 Cancer of Bladder
found. Unable to return to work
Died November 22, 1977

Dear Ind. R :

I have read and re-read and analyzed your letter of January 25, 1972 to my late husband many times. I find it illogical on the following basis. You are saying that Ind. A who had no film (monitoring) badge to be checked for Radiation Exposure i.e. Radiation absorption into his body. couldn't have exceeded 10 millirems per year and yet saying Ind. B who had a film badge to be checked for radiation absorption was getting about 64 times more than Ind. A. You couldn't have checked Ind. A at anytime, because he never had a film badge and he was home sick and had been for nearly a year when you made the survey. You only talked to him on the telephone, I know as I was on the extension telephone.

Are you cognizant of the facts that Ind. B even had Ind. A help him teach the class, holding meter rod, emptying waste water and even teaching the class in Ind. B's absence. See paper that states (with Ind. B's name on it) I quote "The present technician has taught Physics labs when instructor was absent" end of quote. It was in Ind. A's preparation room all the time. I think it was your own Hypothesis. Are you cognizant of the fact how many years Ind. A handled it. He was a ministrative Assistant about 10yr. Then he was made Physic Technician. He had a brilliant mind and was always willing to help others.

1. Ind. A had no film(monitoring) badge that could be checked to know how much Radiation he was absorbing, SO how could you even approximate how much. Ind. B had a film and Ind. A's life was just as valuable as Ind. B's. NOTE See quote in NCRP report # 32. "Radiation Protection Program". Its on page 24, section 68 and I quote "Radiation safety of students, instructor and others in educational institutions is primarily the responsibility of the instructor using the Radiation Source." end of quote.
- "2 How come Ind B had one? I re-iterate Ind. A's life was u just as valuable as Ind. B's
3. Ind. A even asked for a film badge but was told by Ind. B that he (Ind. B) could only get 1. That's unbelievable. That's making feast of one and fowl of another one.
4. Ind. A prepared all demonstrations, emptied all waste waters
- 5 Ind. B even had Ind. A help him in class lecture and demonstration ,also hold the meter rod. This I know for a fact. Even to teach the lab. NOTE See document with Ind B's name on it. It is entitled "Technician Physics Job" and I quote " The present technician has taught Physics Labs when the instructor was absent". end o quote.
6. The Radium-Beryllium was kept in Ind. A's Lab. preparation room all the time where he prepared all his physic demonstrations. It was in the glass storage case. I saw it many times. You called it a stock room.
7. WHY WAS IT ORDERED OUT? THERE MUST BE A REASON. BY WHOM AND WHEN Ind. D denied it was there at first or that Ind. A had even worked with, until I confronted him with Ind. B's statement, it had been ordered out, then he admitted it. He talked to me like I didn't know what I was talking about when I told him I knew different , I had seen it many times. The fact is it was there when he came there. They were using it in Nuclear Physics class. Ind. A also had to keep some equipment checked for Radiation leakage that was given Purdue by Allison's Engineering Co (now known as Detroit Diesel Allison, Division of General Motors Corporation) I know , because I saw it many times. It was in Subbasement by the big meter board.
8. When was the last survey made prior to one stated in your letter? Ind. A had been home unable to work for nearly a year(he was unable to return to work after April 28 1971. so you couldn't have checked him.1.He wasn't there when survey was made, you had never seen him, he had no badge (never did have) to be checked by .
9. Did you check the things given to Purdue by Allison's?

Ind. D came up to our home on the morning Ind. A died that night. November 22, 1977. I took him into see Ind. A and Ind. A told him he had asked for a badge (film) and that Ind. B told him that he (Ind. B) could only get one.

When I asked him(Ind. D) why the Radium -Beryllium was ordered out, he just shrugged his shoulders and said and I quote " I just didn't want the stuff around" THERE MUST BE A REASON. Ind. B came out to the Mortuary and I asked him (my son was sitting beside me an heard it) Ind. B said an i quote" Because it was too dangerous to have around" end of quote. He barely finish the sentence. I think I caught him off hand and as one would say ,it was the slip of the tongue.

When I confronted Ind. D with the books from the government NCRP Report # 32. "Radiation Protection on Educational Institution" he said and "quote" "Are you going to believe those government books instead of me; I have a degree in Physics." end of quote. I replied and I quote, "I said 'Yes, I do because you denied there was ever any Radioactive materials there or that Ind. A had worked with it. I don't care how many degrees you have in Physics, you weren't doing your job. I know you are licensed by Atomic Energy Commission." end of quote.

When we found all the information out from the Government Supt. of Documents, we became concerned about Ind. I who took my husband's place when he retired from full time work. I called and that is when we found it had been ordered out from Ind. U. I then contacted Ind. D and that's when he denied about it.

Being thoughtful and concerned about others was just one of Ind. A's wonderful character traits. He was kind, thoughtful. A good Christian man. He was loyal, honest, a hard conscientious worker. Anyone who knew Ind. A should consider it a privilege and honor to be counted amongst his friends. I consider it an honor and privilege to be his wife and carry his name.

Mrs. Ind. B knew a couple of hours after they found Cancer of Bladder, as she was down at Winona Hospital and talked to me. Said no-one knew anything about where Ind. A was, she had talked to the Nurses Station and none of them knew, which is absolutely absurd as they have to check the patients in and out when they go to Surge etc. She asked me what was wrong and I told her they found Cancer of the Bladder and Ind. A would have to have 3 more operations, (he had 4 operations within 3 wks.) I told her when they would be. One was to be a Radical on Bladder. The Surgeon told me it would be dangerous but, he thought Ind. A would come through O.K. Thank God which he did, but he went into shock. His Bladder was full of malignant tumors, with 2 Diverticulas in wall of Bladder, also full of malignant tumors. That's why they had to do the Radical on Bladder. For 2 days he didn't know much about what was going on, then on the 3rd day (he had already had 2 operations before Radical) he began to be a little alert. Ind. B called him to tell him there was a lab demonstration not prepared and he wanted it and to tell him where each piece was and how to put it together. Its unbelievable but, I have two witnesses (one a retired person) in the room with Ind. A and me. We were all stunned when we heard Ind. A telling him, where to find each piece and how to put it together. Ind. A had answered the telephone. Had I answered it I certainly would have told him, Ind. A was too sick and couldn't be bothered, also that he was a Physics instructor and it was part of his job to know. That's how important Ind. A was to Ind. B and how much Ind. B considered Ind. A, even to expecting Ind. A to do his work in the hospital, BUT, he didn't value Ind. A otherwise to get him a film. He couldn't even come to see him at hospital nor anytime afterwards.

I have suffered a great loss of my husband through negligence, and he spent nearly 7yrs. of suffering, it was pitiful. He became helpless and I had to take care of him like a baby, but, I thank God he gave me the strength to do it. If I can help keep others from the same fate, I'll thank God everyday and do so for "My Ind. A's memory. Ind. B was lost when Ind. A died.

Sincerely
Individual M

INDIANA UNIVERSITY

Office of the University Counsel

304 BRYAN HALL

BLOOMINGTON, INDIANA 47401

TEL. NO. 812-337-9739

April 25, 1978

Individual M

Indianapolis, IN 46205

Dear Ind. M :

When I learned that you had tried to telephone me I felt that you wanted some statement concerning the conclusions that were reached after a thorough investigation based upon your December 20, 1977, letter to Ind. N

There is complete agreement, after investigation, that the cancer which afflicted your husband could not have been caused by the radiation source in the laboratory where he worked.

I understand that about five years ago, perhaps in 1972 or 1973, Ind. A contacted the State Board of Health in Indianapolis and reported his concern that the radium source in the physics laboratory where Ind. A had some duties might be a source of danger.

Following Ind. A's report a person from the State Board of Health did make an investigation.

Following the investigation, the report was made to your husband that the source of radioactivity was such that Ind. A's exposure would have been so slight as not to cause any problem at all.

There is nothing that I can add to the conclusions that resulted from the investigation made by the State Board of Health employee some years ago, which was made directly to your husband.

I thought I would write you this letter so that you would not have to telephone again. Of course, if you do want to call about something that is not made clear to you by this letter, I would be happy to talk to you.

Very truly yours,

Individual S

University Counsel

cc: Ind. O

Indianapolis, Indiana
46205
May 31, 1978

Individual S
University Counsel
Indiana University
304 Bryan Hall
Bloomington, Indiana 47401

RE: Letter to Ind. M
April 25, 1978

Dear Ind. S :

Regarding your letter of April 25, 1978, in reference to my late husband Ind. A, I have read and re-read it and analyzed it and like Ind. R's letter, find it illogical on the following basis because there is a misconception via misinformation that you apparently are not aware of but, the truth is my husband handled the Radioactive materials more than Ind. B, therefore his exposure was more than Ind. B. I am well aware of where you got the information, but, as the saying goes, the truth will always come out. My husband was never checked by you or Ind. R, he couldn't have been because he had no film or badge. He wasn't even there when Ind. R did the survey, he had already been home sick a year with the Cancer.

I have a paper I am enclosing amongst others, I found in my husband's notes and records, as he was a very pragmatic and methodical person. (I too am a retired teacher) note enclosed paper by Ind. B's own admission, my husband had taught Physics labs for him. I quote "The present Technician has taught Physics labs when the instructor was absent." end of quote. Ind. A built demonstration for Indiana State Fair each year. I want credit given him for his work. I knew for a fact he taught classes, as do many others. Ind. X formerly Secretary in office, (I think for Ind. Q) she is now retired knows about Ind. A and his work. Ind. F, Chemistry,

Ind. I who took Ind. A's place knows, Ind. W IUPUI Security, Ind. G, Charge of Maintenance as do others, some of which told me they are afraid to put anything in writing because of their jobs. Ind. B was afraid of the Radioactive materials. He told me at Mortuary (my Son heard it) it was too dangerous to have around. Ind. B was lost when my husband died. Ind. A even asked for safer storage for it. He was very thorough in this work and taking care of equipment. See paper on "Suggestions for a More Efficient Physics Department."

Ind. A had the interest and welfare of others at heart and in his memory, I am hoping to see that others don't suffer through negligence. Ind. A is not here to defend himself or the truth but, I certainly intend to see that the truth is known about him handling the Radioactive materials and teaching class is known and he is given credit for his work. Also I hope to help others receive proper safety badge. Making feast of one and fowl of another is certainly not admirable for we should all remember, we are born but not buried yet and we don't know what might happen to us before we die.

Are you cognizant of the fact that Ind. B even called my husband up in the hospital when he was just becoming alert after 2 days in shock from a radical operation on his bladder. See paper in regard to it. He told Ind. A there was a lab demonstration that was not prepared and he wanted it and to tell him where to find each piece and how to put it together. Sick as my husband was he told

Ind. B and I have 2 witnesses to substantiate, one was a Purdue retired man and his wife. It was the week of May 12, they were having a lab on "Artificial Radioactivity" my husband had been operated on May 13. It was in 1971 the first time in hospital, he had already had 2 other operations.

Both Ind. R and you have admitted my husband was exposed but apparently you didn't know the true facts of which I am advising you. You no doubt have a copy of Ind. N's I wrote asking questions, in fact he asked me to write a letter with questions, so he could start an investigation. You will note Ind. Z's letter that the questions have not been answered instead they have been evaded. Its very clear why because it was outright negligence. The persons who are responsible will have to answer to God on judgement day and their own conscience. I'm hoping that by calling this matter to attention that it will help protect others, as I know it will not bring my husband back nor make up for the nearly 7y rs. of terrible suffering he went through,, it was pitiful. Even after 17 blood transfusions they couldn't stop the blood he was losing. Cancer had spread over his body. Note on paper the Board of Health man "it was strong enough to harm" end of quote. "WHY DID THEY REMOVE IT" Ind. D said an I quote "Just say I didn't want the stuff around" end of quote.

I have given Purdue and IUPUI a chance to answer my questions that's more then they did for my husband, they didn't give him a chance to even have a badge to be checked for Radiation Exposure.

I couldn't even get Purdue to donate blood from blood Bank until I pushed it. Nothing have been offered by either. If we hadn't had Medicare & Blue-Cross-Blue Shield, we would have lost our home and our savings WHAT I HAVE LOST THERE IS NOT ANYTHING IN THIS WORLD CAN REPLACE, MY WONDERFUL HUSBAND A GOOD, CLEAN CHRISTIAN MAN.

WHY DID Ind. B HAVE A MONITORING BADGE? and not my husband especially after he requested one?

Please do me the courtesy of clarifying your statement and I quote "There is complete agreement, after investigation, that the Cancer which afflicted your husband couldn't have been caused by the Radiation source in the laboratory where he worked" end of quote. I have been told 3 different stories as to who removed it and they don't match as I have checked them out.

Now that you know the truth. that my husband did handle the Radioactive material more then Ind. B was around it all the time besides, even teaching the class by Ind. B's own admission to substantiate it, see paper on it, you will have to evaluate ~~your~~ over and I want such evaluation. As I said my husband isn't here to speak for himself and to defend the truth, but, I certainly intend to speak and defend him... and try to help protect others.

I feel by writing this letter, I can state and convey more quickly and clearly then telephoning you.

Yours very truly

Individual M

RICHARD G. LUGAR
INDIANA

8107 DIRKSEN OFFICE BUILDING
WASHINGTON, D.C. 20519

INDIANA OFFICE:
ROOM 447
46 EAST OHIO STREET
INDIANAPOLIS, INDIANA 46204

United States Senate

WASHINGTON, D.C. 20519

COMMITTEES:
AGRICULTURE, NUTRITION, AND FORESTRY
BANKING, HOUSING, AND URBAN AFFAIRS
SELECT COMMITTEE ON INTELLIGENCE

June 6, 1978

Individual M

Indianapolis, Indiana 46205

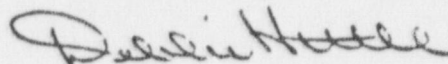
Dear Ind. M :

Thank you for contacting Senator Lugar's Indiana office regarding the nuclear facilities at Purdue University in Indianapolis. I was glad to have the opportunity to discuss this matter with you.

I am presently in contact with officials at the Nuclear Regulatory Commission in Washington, D. C. regarding your inquiry. I hope to receive a complete response from them within four weeks. I will contact you as soon as I have any information to report.

Again, thank you for contacting the Senator's Indiana office. Should you have additional questions or information regarding this matter, please do not hesitate to write or phone me at Room #447, 46 East Ohio Street, Post Office Box 44122, Indianapolis, Indiana 46244, (317) 269-5555. Be assured, your request will not go unattended.

Sincerely,



Debbi Hittle, Director
Constituent Services

dh



Detroit Diesel Allison
Division of General Motors Corporation

Indianapolis Operations
P. O. Box 894
Indianapolis, Indiana 46206
Phone: (317) 244-1511
Cable: GM COMM IND A

June 29, 1978

Individual M

Indianapolis, Indiana 46205

Dear Ind. M :

Enclosed are copies of correspondence which seems to indicate that the former Allison Division of General Motors did indeed donate to Purdue University some radiological equipment.

Sincerely,

Individual AA
Manager, Public Relations

Enclosures

afh

Exhibit N
Page 1 of 5

PURDUE UNIVERSITY

OFFICE OF THE ASSOCIATE BUSINESS MANAGER
LAFAYETTE, INDIANA 47907

February 13, 1969

Allison Division of General Motors
Post Office Box 894
Indianapolis, Indiana 46206

Gentlemen:

The President and the Trustees of Purdue University wish to acknowledge with grateful appreciation your gift to the Department of Physics and Manufacturing Technology, Indianapolis Campus of:

- 1 - Special crystal puller
- 1 - Beta Gage - Model L & G VC - LI with ohmart cell
- 1 - Beta Gage - Model L & G VC - LI with ohmart cell
- 1 - Mercuri Potassium Measuring system - Model P & V-400-2
- 1 - Mercuri Potassium Measuring system - Model P & V-400-2

Private support from corporations and friends is a continuing source of strength to the University. Your gift will help in satisfying the expanding needs of education.

Yours very truly,

Individual BB
Associate Business
Manager



CENTENNIAL 1869-1969

Exhibit N
Page 2 of 5

File 13
PURDUE UNIVERSITY

INDIANAPOLIS CAMPUS
1201 EAST 38TH STREET
INDIANAPOLIS, INDIANA 46205

January 31, 1969

Individual CC

Manager, Community Relations
Allison Division of General Motors
Post Office Box 894
Indianapolis, Indiana 46205

Dear Ind. CC :

Due to changes in administrative assignments and personnel our formal acceptance of the items listed below was overlooked. Please accept my apology for this oversight.

I wish to formally acknowledge receipt of this gift from Allison Division of General Motors on behalf of Purdue University Indianapolis Campus at this time. As indicated in my earlier letter, the crystal puller has been transferred to the Lafayette Campus. The other items are being used here in Indianapolis. We sincerely appreciate the generosity shown by your company. It is through this kind of cooperation and support from industry that the University is able to provide first-rate opportunities for our laboratory students.

Equipment Description

<u>Item</u>	<u>Tag Number</u>
Special Crystal puller	207709
Beta Gage - Model L & G VC-LI with ohmart cell	205951
Beta Gage - Model L & G VC-LI with ohmart cell	205952
Mercuri Potassium Measuring System - Model P & V-400-2	204860
Mercuri Potassium Measuring System - Model P & V-400-2	204861

Thank you again.

Sincerely yours,

Individual Q

Dean and Director

August 23, 1968

Individual Q
Purdue University
Indianapolis Regional Campus
1201 East 38th Street
Indianapolis, Indiana 46205

Dear Ind. Q :

Allison has received approval for the donation of the following equipment to Purdue University per your request:

<u>Description</u>	<u>Tag Number</u>
Special crystal puller	207709
Beta Gage - Model L & G VC - LI with ohmart cell	205951
Beta Gage - Model L & G VC - LI with ohmart cell	205952
Mercuri Potassium Measuring system - Model P & V-400-2	204860
Mercuri Potassium Measuring system - Model P & V-400-2	204861.

Shipping instructions must be furnished our Ind. DD
will arrange for shipment to the authorized destination.

Sincerely

Individual CC
Manager, Community Relations

PURDUE UNIVERSITY

INDIANAPOLIS REGIONAL CAMPUS
1201 EAST 36TH STREET
INDIANAPOLIS, INDIANA 46205

June 28, 1968

Individual CC

Manager, Community Relations
Allision Division of General Motors
Post Office Box 894
Indianapolis, Indiana 46206

Dear Ind. CC :

This is to confirm Purdue University's interest in the following list of equipment which we understand is available:

<u>Description</u>	<u>Tag Number</u>
Special crystal puller	207709
Beta Gage - Model L & G VC - LI with ohmart cell	205951
Beta Gage - Model L & G VC - LI with ohmart cell	205952
Mercuri Potassium Measuring system - Model P & V-400-2	204860
Mercuri Potassium Measuring system - Model P & V-400-2	204861

The crystal puller will be transferred to the Lafayette Campus and the last four items will be utilized at the Indianapolis Campus.

Within the next week or ten days we expect to receive the license necessary to accept the radioactive Beta Gages.

Sincerely yours,

Individual Q

Dean and Director

Indianapolis, Indiana
46205
December 20, 1977

Individual N

Purdue University
Faculty of Science
Indianapolis, Indiana 46205

Dear Ind. N :

As you know, I lost my darling husband November 22, after a nearly 7yr. battle with Cancer of Bladder, which had spread throughout his body. As you know Ind. A worked for many years with Radium-Beryllium and never had any protection (a monitoring badge to be checked for radiation) he even asks Ind. B for one and was told that he (Ind. B) could only get one film (badge) which is unbelievable, that a University as big as Purdue and known the world over, could only supply 1 monitoring badge to check how much Radiation the person was absorbing into his body. The badge is called a Dosimeter.

There are many questions unanswered, but I want them answered.
There were 2 violations (See MCRP REPORT NO 432)

1. Why wasn't Ind. A given a monitoring badge, particularly after he asked for it. Ind. B had one.
2. Why was the monitoring badge for?
3. It should not have been kept in the Lab. preparation room in a glass storage case. Why?
4. It has been removed I found out. Why?
5. When was it removed?
6. Who ordered it out?
7. What about some gifts from Allison's that contained Radio-active materials? It was in sub-basement and Ind. A had to keep it checked for leakage. I know, I saw it there, just like I saw the Radium-Beryllium in Ind. A's Lab. preparation room in a glass door storage cases.

Ind. D (I understand is licensed by Atomic Energy Commission) told me there were no Radio-active materials there and Ind. A had never worked with any, he denied it, when they were working with (Ind. A) having classes in Nuclear classes when Ind. D was there. After telling Ind. D I was talking with Ind. U and that he (Ind. D) had ordered it out, he admitted it was true about the Radium-Beryllium. He would not tell me when nor why he ordered it out. I am trying to locate the Physic Technician who took Ind. A's place because I think he should be checked for his sake for radiation.

Indianapolis, Indiana

46205

April 8, 1978

Individual R

Division of Radiological Health
State Board of Health
Indianapolis, Indiana 46206

Dr. Individual A
Physic Technician
Purdue University now
known as INDUI
Retired (required) full time
July 1, 1970
Returned Sept. 1970
part-time until out in
Winona Hospital April 24-71
Cancer of Bladder found
Deceased November 22, 1977

Dear Ind. R

I have read and re-read and analyzed your letter of January 25, 1972 to my late husband many times. I find it illogical on the (following basis. You are saying that Ind. A who had no film (protection) to be checked for radiation absorption in his body, couldn't have exceeded getting 10 millirems per year and yet saying Ind. B who had film (protection) to be checked for radiation absorption was getting about 64 times more then Ind. A. Are you cognizant of the facts that Ind. B even had Ind. A help him in demonstration in class lecture, also had Ind. A hold meter rod! I wish to know the formula by which you reached such equations that would be derivative from your survey, also how strong was the source? It is illogical because of the following. I might add that I think it was your own hypothesis. Also are you cognizant of how many years Ind. A handled it and was a much older man then Ind. B, since about 55-
1. Ind. A had no film for monitoring amount of radiation he was absorbing, so how could you know even approximately how much, Ind. B had a film and Ind. A's life was just as valuable as Ind. B. Note see quotes on NCRP report #32. The Radiation Protection Program - its on page 24 #68 in book. It is Radiation safety of students, instructors and others in educational institutions is primarily the responsibility of the instructor using the radiation source.
2. Ind. A even asked for a film (protection) as told by Ind. B that he/ Ind. B could only get one.
3. How came Ind. B had that one? I re-iterate my husband's life was just as valuable as Ind. B's.
4. Ind. A prepared demonstration emptied waste waters etc.
5. Ind. B even had Ind. A help him in class lecture with demonstration, also had him hold meter rod. This I know for a fact.

Exhibit P

Page 1 of 3

6. The Radium - Beryllium was kept in Ind. A's Lab. preparation room all the time where he prepared all his physics demonstrations. It was in the glass storage case. I saw it many times. You called it a stock room.

7. Why was it ordered out, by whom and when? There must be a reason.

Ind. D who denied it was there at first or that Ind. A had worked with it, until I confronted him with Ind. U statement it had been ordered out. When Ind. D was here the Thursday morning Nov. 22. (Ind. A died that night) he just shrugged his shoulders when I asked him again and said "Well just say I didn't want the stuff around." Ind. B said at Thursday when I asked him "my son was sitting beside me" said "It was too dangerous to have around", he barely finished the sentence, I think I caught him offhanded, as one would say it was the slip of the tongue.

8. When was the last survey made prior to one stated in your letter?

9. Ind. A had been home unable to work for nearly a year (he was unable to return) after April 28, 1971, so you couldn't have checked him because he wasn't there, had never had a film to be checked by.

10. Ind. A also had to keep some things given to Purdue by Allison's (they were in sub-basement, I saw them too) for radiation leakage. Did you check them?

The truth is Radium-Beryllium was there when Ind. D was there because they were having classes in Nuclear Physics. When we found all the information out from the Government Sent. of Documents, we became concerned about Ind. I who took place when he retired from full time. I called and that's when we found out it had been removed from Ind. U. I then contacted

Ind. D. Being thoughtful and concerned about others was just one of Ind. A's wonderful traits of his wonderful character. He was a kind, thoughtful good Christian man. Loyal, honest & hard conscientious worker. Anyone who knew Ind. A should consider a privilege and honor to be counted amongst his friends. I consider it an honor and privilege to be his wife and carry his name.

Mrs. Ind. B knew a couple of hours after they found Cancer of Bladder as she talked to me at Winton Hospital the day it was found. I told her Ind. A would have to have 3 more operations (he had 4 operations) within 3 weeks. I told her when they scheduled, one was to be a Radical. The Surgeon told me it would be dangerous, but he thought

Ind. A would get along OK. His Bladder was full of malignant Tumors and 2 Diverticulus in wall of Bladder full of Malignant Tumors, that's why they had to do the Radical. He went into shock, for 2 days he didn't know much what was going on and the third day when he began to be alert, Ind. B called to tell him there was a lab demonstration not prepared and asked him to tell him where each piece was and how to put it together! Its unbelievable but, there were 2 friends (one a retired Purdue person) in the room with Ind. A and me. We were all stunned when we heard Ind. A telling Ind. B where to

find each piece and how to put each piece together to make demonstration and how to do it! Ind. A had answered the telephone, had answered the telephone, I would certainly have told him. Ind. A was so sick and couldn't be bothered, also that he was a Physics instructor and it was part of his job to know. That's how important Ind. B

considered Ind. A to his work even expected him to work in the hospital, but didn't value Ind. A otherwise to get him a film. I have suffered a great loss of my husband through negligence, and Ind. A spent nearly 7 years of suffering. It was pitiful he became

helpless and I had to take care of him like a baby. But I think God he answered my prayers and gave me the strength to do it.

If I can help keep others from the same fate, I'll thank God every night & do so for Ind. A's memory. Ind. B could call Ind. A in

hospital to do his work, but he never could come to see him.

Exhibit P

Individual M

Page 2 of 3

References from ..

NCRP. report # 32 Radiation Protection in Educational Institutions
National Council on Radiation Protection and Measurements June 1, 1966
the measurements have since been lowered because of the hazards.
It has been found that even smaller doses do damage over a latent
period of even 25 yrs.

The target of being the blood forming organs, tissues and the target
the Kidneys (as in Bill's case).

RCRP Report #38 Protection Against Neutron Radiation
National Council on Radiation Protection and Measurements 1971
Library of Congress Card Number 73-138550

The maximum dose equivalent to 12 rems in one year shall be permitted
only when adequate past and current exposure records exist so that
such a dose will not cause the individual to exceed his age prorated
allowance.

Laboratory Experiments in College Physics third edition
Cicero Henry Bernard Blaisdell Pub. Co. 1965

Modern College Physics 1962
Library of Congress Catalog card No 62-11794
Page 831

The effects of acute radiation exposure over the whole body are
about as follows.

20-50 r, some blood changes.

100-250 r severe illness but recovery within 6 months.

400 to fatal to 50% of the persons affected (this is called the
medial dose.

MLD or LD 50).

and 600 r fatal to all.

Permissible Dose from external Sources of Ionizing Radiation
Handbook 59

U.S. Department of Commerce National Bureau of Standards

Recommendations of the National Committee on Radiation Protection
On January 8, 1957, the National Committee on Radiation Protection
and Measurements issued a Preliminary Statement setting forth its
revised philosophy on Maximum Permissible Radiation Exposures to man
. Since that time several of the NCRP subcommittees have been actively
studying necessary revisions of their respective handbooks.

These studies have shown the need for (1) clarification of earlier
statement and (2) modification or extension of some of the concepts
in that statement.

Furthermore the International Commission on Radiological Protection
has made minor changes in their recommendations. page 1
Definitions

Controlled area- A defined area in which the occupational exposure
of personnel to radiation or radioactive material is under the
supervision of an individual in charge of radiation protection.
This implies that a controlled area is one that requires control and
access, occupancy, and working conditions for radiation protection
purposes.

If we hadn't had Medicare, Blue Cross, Blue Shield, we could have
lost our home everything financially. Just from Jan. 1, 1977
to November 22, 1977 hospital, medicines, Doctor's Chemotherapy
ambulances, and nurse was over \$17,000.00. The greatest loss was
the loss of my wonderful husband. All the money in the world cannot

STATE OF INDIANA



INDIANAPOLIS

STATE BOARD OF HEALTH

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, Indiana 46206

January 25, 1972

Individual A
Indianapolis, Indiana

Dear Ind. A :

I visited the Physics Department of IUPUI and made a complete survey of the radium source including a setup of the source as it was used twice a year. The radiation dose to you from your employment including exposure in the stockroom from the storage container and your exposure incurred from the use of the source could not have exceeded 10 millirems per year. Measurements taken during this survey indicated that Ind. B's exposure would be about 64 times your exposure from setting up the experiment.

The only exposure of consequence from this radium source would be the gamma ray exposure which is precisely the same as x-ray exposure. There are no radiation gases or particles that are inhaled from a source such as this. Radium sulfate mixed with barium sulfate are placed in the source container and the container is then welded or soldered. The least pin hole into the container would allow radon gas to leak out of the container. This never happened because Ind. EE in past years, or myself last week could detect no radon leakage with appropriate instruments.

Your exposure which I estimated to be a maximum of 10 millirems per year compares with an allowable exposure of 5000 millirems per year for occupationally exposed workers, and this exposure has never been shown to cause any detectable injuries. The lease dosage which I am aware of being associated with specific injury is 20,000 millirems which appeared in a few cases to cause thyroid nodules many years after young children were exposed.

Ten millirems corresponds with an average routine chest x-ray. Background in Indianapolis contributes an average of 125 millirems per year and in Denver, Colorado contributes 250 millirems per year to all inhabitants.

I am deeply sorry for your physical condition and for the fact I can offer no assistance but I can only report what I found during the survey and relate my findings to the present day knowledge of radiation exposure.

Very truly yours,

Individual R
Acting Director
Division of Radiological Health
633-6340 6330152

STATE OF INDIANA

FEB 10 1978

STATE BOARD OF HEALTH
AN EQUAL OPPORTUNITY EMPLOYER



INDIANAPOLIS

Address Reply to:
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, IN 46206

February 8, 1978

Individual D
Professor of Physics
38th Street Campus
IUPUI
1125 East 38th Street
Indianapolis, IN 46205

Dear Ind. D :

About five years ago I received a telephone call from a Ind. A , who worked in a maintenance capacity at the 38th Street Purdue University Extension. Ind. A had been diagnosed as having cancer of the bladder. Individuals A and M had done a great deal of reading and had found reports that radioactive materials in bladders were associated with an increase in bladder cancer. There was a radium source in the Physics Laboratory where Ind. A had some duties. Ind. A was informed that there was almost no likelihood of the Ra source being involved, but I would check it out.

I proceeded the next day to the Physics Laboratory, met a Individual B and made a complete evaluation of the radium source.

The source was stored in a lead storage container and kept on a bottom shelf in a room in the Physics Department used for storing laboratory materials. The radiation exposure in the environs of the source was minimal, less than one mr/hour to anyone performing normal operations near the source (maintenance, retrieval and storage of materials, and janitor service). The source was used a few times a year maximum for a laboratory experiment. When the source was used in the laboratory, the Professor would remove the source with forceps and place it in a container for a certain period after which he replaced the source in the storage room. I do not recall Ind. A's part in the source usage. I do recall that he stood behind the Professor at all times when the source was out of the storage container. The Professor wore a personnel dosimetry device which measured a few mr after each usage. As the Professor was much closer to the source than Ind. A , his exposure would be higher than Ind. A's . The source container was found not to be contaminated with random daughters.

February 8, 1978

Technical discussion: Radium is usually surrounded with metal containers when incorporated into a source for usage. This incorporation is called encapsulation; and as the radium is usually placed inside two tight capsules, it is termed as doubly encapsulated. The first daughter product of Ra-226 is Rn-222, which is a gas and fills up all space in which it resides like any other gas. Rn-222 decays principally via to Po-218, Pb-214, Bi-214, Po-214, Pb-210. The decay scheme has minor branches and goes three more steps to stable Pb-206; however, the above will suffice for this discussion. The first pinhole in the encapsulation of this radium source would allow some Rn-222 to escape. The Rn-222 is difficult to detect in small amounts but the daughter products are very readily detected and there were no Rn-222 daughter products detectable on the above discussed source; hence, the source did not leak. The only exposure possible with such a source is the associated gamma activity.

No radium or radon daughters could have escaped from the source and been ingested by Ind. A (or anyone else). He would have received a small increase in his background radiation. Being as conservative as possible, I recall telling him that his maximum exposure could have been 10 mr/year; and as the background in Indianapolis is around 100 mr/year, exposures in this range were of no concern. Ind. A did not appear to understand the technical discussion. I sent a letter to the University and to Ind. A with my findings. (In moves and three secretaries since this event occurred, the file letter has disappeared).

The Indiana University Medical Center Physicists reported to me that they had transferred the subject source to a container for burial, and the container was shipped with a routine shipment to a licensed disposal site (either Sheffield, Illinois, or Morehead, Kentucky). This was fully consistent with the Indiana University Medical Center policy of getting rid of their own radium and changing to materials without the inherent problems of radium (the gaseous daughter product and the potential for contamination).

To the best of my knowledge this paper represents an accurate statement of the "Ind. A Incident." If anyone has questions, have them call this office.

Sincerely,

Ind. R, Chief
Radiological Health Section
Division of Industrial Hygiene
and Radiological Health
AC 317/633-0150

FEB 21 1978

PHYSICS DEPARTMENT (38th Street Campus • Downtown Campus)
1201 East 38th Street • 46205 • (317) 923-1321

February 17, 1978

Individual L

Radiation Safety Officer
Indiana University School of Medicine
1100 West Michigan Street
Indianapolis, IN 46202

✓ Re: Individual A

Dear _____

✓ According to the Purdue Personnel Office (Ind. FF)
✓ Ind. A was first employed by what was then the Purdue extension in
✓ Indianapolis on 2/18/46 as an Administrative Assistant. Later, on
✓ 9/1/54, he became a Demonstration Assistant at which time he assumed
duties in Physics. He was associated with other units of the campus,
at least Audio Visual, for most employment. In Physics he set up
lecture demonstrations used by the instructional staff and disbursed
lab equipment to students. On occasion he fabricated simple pieces
of equipment and repaired those items which were broken. Ind. A
✓ retired on 6/31/70 but was employed temporarily from 9/21/70 to
6/28/71 by the Physics Department. During this time his main function
was to help the new Physics Technician become familiar with his job.

✓ Ind. A's wife has raised questions about possible exposure
to radiation to Ind. A from a radium source which existed in the
department during a portion of the time he was employed. A source
was stored in a lead container on a shelf in room KB129 which is a
lecture preparation room. Ind. B used it once or twice a
✓ year in KB129 to irradiate samples of silver and indium which were
then given to students for lab experiments. It is possible that it
occasionally was in KB122 or KB129, student labs, but I doubt it.
✓ The students then measured the half-life using scintillation counters
and photo-multiplier tubes. By the time I came to Indianapolis,
this experiment was no longer in use so I don't recall seeing Ind. A
use the source. Apparently Ind. A had no direct involvement
✓ with the source but certainly was present when it was used and physi-
cally transferred the lead pig from the shelf to a preparation table.
Ind. B wore a film badge which was monitored by Purdue and

as far as I know never received any detectable radiation or at least no significant dose.

When I came to Indianapolis I requested that any radiation sources or mercury samples be stored and not used until I could review safety procedures for them. I had no reason to believe that they had been a hazard but thought this a prudent procedure for a new chairman. Subsequently, I was told by Ind. A's replacement that no radioactive sources were being used and that any sources in the department were stored in the basement. I requested a radioactive sign be placed on the door. Ind. A's replacement turned out to be unsatisfactory and the current technician, Ind. U, was hired. He found the lead container on a shelf in KB129 and told me. At that time I surveyed the faculty, found no interest in radioactivity as a teaching aid, and requested Radiation Safety to remove it as a convenience to me. This was done sometime in 1975.

Ind. A requested that the State Board of Health monitor his possible exposure to radiation. This was done by Ind. R, Chief of the Radiological Health Section. As outlined in Ind. R's letter enclosed, Ind. A's exposure was not detectable. Even assuming the maximum possible exposure within the limits of the measuring device, Ind. A's exposure was less than 1/10 of the background radiation from natural sources.

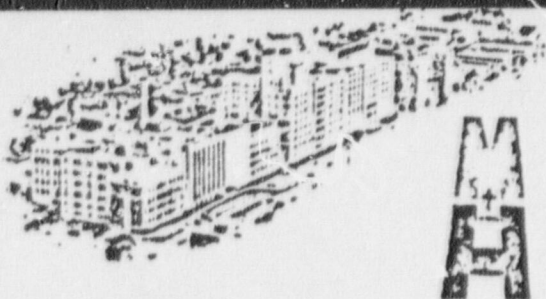
I sympathize with Ind. M on the death of her husband recently. I am also sorry that neither she nor her husband seemed capable of understanding that the chance of his bladder cancer being associated with the Physics Department are incredibly remote. We do have a responsibility to provide Ind. M with complete information and help her understand it so your involvement is appreciated by this department. I hope you are aware that Individuals A & M have been provided with complete technical information and a layman's explanation for a long time. This includes a complete letter in 1971 from Ind. R, a knowledgeable and impartial representative of the State Board of Health.

Sincerely yours,

Individual D

cc:

Enclosure



FEB 28 1978

METHODIST HOSPITAL
OF INDIANA, INC.

DEPARTMENT OF RADIOLOGY
PHYSICS SERVICES DIVISION

February 24, 1978

Individual L

Radiation Safety Officer
Indiana University School of Medicine
1100 West Michigan Street
Indianapolis, Indiana 46202

Dear Ind. :L

The following comments are directed to the questions raised in your letter of January 20, 1978:

1. I do not recall the exact date that Ind. D contacted me regarding the radium-beryllium neutron source located in the Physics Department.
2. Prior to Ind. D's notification the Radiation Safety Office was unaware that this particular source existed at the 38th Street Campus.
3. Following Ind. D's notification, Ind. H was sent to the 38th Street Campus to pick up the radium-beryllium source and bring it to the Radiation Safety Office.

After conferring with Ind. R, the source was disposed of by sending it to Nuclear Engineering Company for subsequent burial. For shipment purposes, the source was packaged in the center of a solid waste drum. No further action was taken.

If I can be of any further assistance in this matter, please let me know.

Sincerely,

Individual J
Radiation Physicist

RADIATION SAFETY OFFICE

March 16, 1978

Memorandum To: Individual O , Chairman
Radionuclide Radiation Safety Committee

From: Ind. L , Radiation Safety Officer

Subject: Individual M's Letter

In response to Ind. M's letter of December 20, 1977, I contacted Ind. D , Ind. K , and Ind. J regarding the questions raised. The following is a summary of the information I have received (see enclosures).

The radioactive source in question was an 11.5 mg ²²⁶Radium-Beryllium source calibrated on July 22, 1957. Radium is a naturally occurring radionuclide for which there are presently no federal rules or regulations regarding the possession, use, or transfer of such material. State regulations regarding the use of radium were not promulgated until October 20, 1971, approximately four months after Ind. A retired.

During the time that Ind. A was employed by the Physics Department on the 38th Street Campus, Purdue University was responsible for the source and subsequent radiation safety policies and procedures. The I. U. Medical Center in conjunction with IUPUI did not formally become responsible for the 38th Street Campus until May 29, 1974.

In view of these facts the I. U. Medical Center can only address itself to the questions regarding the disposal of the Ra-Be source.

When Ind. D became chairman of the Physics Department he requested that any radiation or mercury sources be stored and not used until he could review safety procedures for them. Ind. D stated "he had no reason to believe that there had been a hazard but thought this a prudent procedure for a new chairman. ...At that time I surveyed the facility, found no interest in radioactivity as a teaching aid, and requested Radiation Safety to remove it as a convenience to me."

Ind. J stated that prior to Ind. D notification the Radiation Safety Office was unaware that this particular source existed at the 38th Street Campus. Upon notification the Radiation Safety Office transferred the Ra-Be source to their facilities. After conferring with Ind. R Chief, Radiological Health Section, Indiana State Board of Health, the Radiation Safety Office disposed of the source via Nuclear Engineering Company, to a licensed disposal site.

Finally, Ind. M raised a question concerning some gifts from Allison's that contained radioactive materials. To date no one seems to know what she is referring to.

May 11, 1978

Individual GG , Attorney
Stuart, Branigin, Ricks and Schilling
Lafayette Life Building
Lafayette, IN 47902

Dear Ind. GG :

This report is prepared in response to your verbal request of March 30, 1978. I have checked our files pertaining to the use of a radium source at the Indianapolis 38th Street Campus and can provide the following details:

1. The source was an Atomic Energy of Canada Ltd. Model RN-10 radium-beryllium source containing 11.5 mg of radium as radium-carbonate sealed in a double-walled monel capsule with silver solder. It was engraved with the identification number N-10-39.
2. The source was shipped to the West Lafayette Campus on July 29, 1957 via RR express from Ottawa, Canada in lead shipping container number Sc-4-3 on Purdue University PO Number 17313. At the time of shipment the exposure rate was 70 mR/hr at the surface of the container and 4 mR/hr at 1 meter.
3. The source was transferred to the Indianapolis Campus in September, 1958 for use in the modern physics section of Physics 262.
4. Ind. B was initially specified as the authorized user of the source. In April, 1961, Ind. HH was approved to use the source, but only under the direct supervision of Ind. B. In May, 1961, Ind. II's name was added as an authorized user. At no time was Ind. A authorized to work directly with the source.
5. Film badges were provided from the West Lafayette Campus whenever requested by Ind. B. At no time were any restrictions placed on the numbers of film badges provided. Indeed, the records show that for some years, 4 badges at a time were provided to Ind B for use by the personnel there.

May 11, 1978

6. The University Radiological Control Committee established specific rules pertaining to the use and storage of the source on the Indianapolis Campus. A copy of these rules is enclosed. I have verified from the minutes of the Radiological Control Committee that these rules were first officially approved on April 25, 1958, and a record of such is given in the minutes of the University Radiological Control Committee for that date. Additional policies were developed in 1966 and are enclosed for your review.
7. Periodic leak tests were made of the source to assure that the capsule had not lost its integrity, permitting the radium itself to leak out. The source was never found to be leaking. (Leakage is defined as 0.005 μCi or more of removable activity on the surface of the source). I have records of eight such leak tests performed between 1960 and 1970. My files indicate that additional such tests were made by Ind. JJ of IUPUI when the 38th Street Campus was put under the jurisdiction of Indiana University beginning in 1973.
8. I have reviewed the film badge records for the Indianapolis Campus. We have such records covering the period from 1960 to 1970 which is the period of interest. During that time interval, film badges were provided for various individuals including Ind. B and several other individuals for whom he requested badges. Occasional low exposure values were recorded on the badges from time to time. For Ind. B himself, I have found a total dose from 1960 through 1970 of 0.755 rem (or an average of about 0.075 rem/year). For reference, the maximum permissible dose for occupational workers is 5 rem/year (50 rem per 10 years). Normal background radiation is about 0.1 rem per year.
9. In May, 1968, Ind. B and Ind. T applied for approval to use several Ohmart Nuclear density gauges which were donated to the school by the Allison Division of General Motors, Indianapolis. These gauges contained sealed strontium-90 sources and were self-contained, shielded units. Because Ind. B never submitted an actual proposal for using these sources, they were approved for storage only until such time as a proposal was submitted. Consequently, these sources were stored in an approved, posted, designated area in the basement of the building but not actually used.

May 11, 1978

10. An individual from the Indiana State Board of Health Radiological Health Section visited the 38th Street Campus and reported, in a letter to Ind. A in January, 1972, that his (Ind. A's) exposure rates associated with the use of the source could not have exceeded 10 millirems per year.

If you require any additional information, please let me know.

Sincerely,

Individual K

Radiological Control Officer

Enclosures - 2

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS DIVISION
P.O. BOX 93, OTTAWA, ONTARIO

0536

Purdue University,
Department of Pharmacy,
Lafayette, Indiana.
Attn: Mr. B. G. Dunavant.

SHIPPED FROM: OTTAWA, Ontario.
DATE SHIPPED: July 31/57
SHIPPED VIA: RR Express, collect
A.E.P. NO.: 431373
B-18 NO.:
PORT: Port Erie, Ontario.

CIAL MARKING

FORMER ORDER NO.	P & S NO.	AUTHORIZATION	MEASUREMENT TIME	CHEMICAL FORMULA	FILE NO.
17313	8189	N/A	July 29th, 1957	Ra CO ₂ Beryllium	8189
PHYSICAL FORM		CONCENTRATION		SHIPPING CONTAINER	CLASSIFICATION
Pelletized mix		1 curie/gram		Sc-4-3	RR

QUANTITY			CATALOGUE NO.	DESCRIPTION
ORDERED	SHIPPED	S.O.		
1	1	-	RR-10	One only Radium Beryllium Neutron source containing 11.5 mgs of Radium. It is sealed in a double walled monel capsule with silver solder and the outer sheath has a raised eyelet. Engraved: R-10-39 Ratio Ra:Be 1:8 Further details on source description sheet. AECL certificate to follow.
1	1	-	Sc-4-3	Lead Shipping Container for the above.
				(ORDER COMPLETED)

11.5 mgs
TOTAL QUANTITY (MGMS-GMS-E)

PLEASE UNPACK CAREFULLY

MANY BREAKAGES RESULT FROM TOO HASTY UNPACKING AND SHORTAGES OFTEN ARISE FROM GOODS BEING THROWN OUT WITH PACKING MATERIALS.

BACK ORDERED ITEMS WILL BE SHIPPED AS SOON AS POSSIBLE.

DO NOT RETURN MERCHANDISE WITHOUT OUR PERMISSION.

RADIATION

AT SURFACE OF CONTAINER MRH

AT ONE METER MRH

PACKED AND SEALED BY

WITNESSED BY

RETURNABLE SHIPPING CONTAINER

SERIAL NO. TYPE VALUE

EASE NOTE: THIS CONTAINER REMAINS THE PROPERTY OF ATOMIC ENERGY OF CANADA LIMITED. YOU WILL BE CHARGED FOR ITS FULL VALUE UNLESS IT IS SHIPPED WITHIN 21 DAYS OF YOUR RECEIVING IT TO.

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS DIVISION

Revised 10/5/62

PURDUE UNIVERSITY
BIONUCLEONICS DEPARTMENT
ISOTOPE LABORATORY

Bionucleonics
Ref. No. 21595

For Individual N

Dept. Pharm at Indpls.

Date 2-6 1968

	ITEM ()		ITEM ()		ITEM ()
P. O. No.	26916 26916		26916		26916
Isotope	¹⁴⁶ La		⁶⁰ Co		¹³⁷ Cs
Compound	Std. source		Std		Std source
Quantity (mc)	.5 mc		.5 mc		.49 mc
Conc (mc/ml)	-				
Volume or Weight	-				
Specific Activity					
Time of Assay	5-28-67		8-7-67		7-20-67
Total solids (mg/ml)					
Normality					
Radiochemical Purity					
Lot No.					
Supplier	Cenco		Cenco		

Additional Information

awaiting radioactivity source ¹⁰⁹Co 2-6-68

(Shipped to Indianapolis Center 2/12/68 - 22)

Intensity of Radiation at Surface of Shield 21 mr/hr

Completed by Individual KK

Received by Individual K

Exhibit X

Page 1 of 1

APPLICATION FOR RADIOISOTOPE PROCUREMENT

1. Names of all persons to use Isotope:

Individual B	Dept. Physics	Phone 923 1321
Individual T	Dept. Physics	Phone Ext. 214
		923 1321
		Ext. 261
	Dept.	Phone

(All persons whose names appear above must, if they have not already done so, submit a blood count, Isotope Form A-2, and AEC Form 4.)

2. Location of use: Bldg. Kramert (Indianapolis) Room(s) 122 ^{LAB} (LOCK IN VAULT!)
B 23 A

(For areas of usage not already approved, a complete description of facilities and equipment must be attached.)

3. Isotope Strontium 90 Chemical Form for Bremstrahlung Amount(mc) 1000 mc ^{2X}

4. Supplier Ohmart Nuclear Gages Catalog No. Model BG & LBG Sp. Act. _____

5. Proposed use: Instrumentation Course - NOTE: SHOULD REQUEST
LICENSE TO POSSESS SOURCE ONLY, WILL NOT

USE UNTIL IT CAN BE DETERMINED THAT ELECTRONICS WORK
AND THAT IT CAN ACTUALLY BE UTILIZED FOR COURSE

6. Waste Disposal Procedure: Self contained, there should be no waste. For disposal
the Ohmart Corporation suggests return of the source.

7. Remarks: Allison # 205952 Date Desired June 15, 1968

8. Signed: Individual B Date: 5-27-68
(Person responsible for Radiological Control. Must be of professorial rank)

9. Send completed forms to: Ind. K, Bionucleonics Department, Pharmacy Annex.
Note: An application should be submitted for each isotope and/or chemical form.
Stores requisition (Purdue University Form 8) must accompany this application.

DO NOT WRITE IN THIS SPACE

Approved (after) Committee action: _____ Date: _____
(prior to) (Radiological Control Officer)

Committee action: _____

Remarks: Isotope for the Instrumentation Course

In Stock: _____ No _____ Yes _____ No _____

Order From: _____

Catalog number: _____ Price _____

Identification Key
for
Investigation Report
on
Purdue University & IUPUI

September 12-14, 1978

Individual

Name

A	William H. Roberts, Physics Lab. Tech. (Deceased)
B	Golden A. Flake, Physics Professor (Retired)
C	Gregor M. Novak, Physics Instructor, IUPUI
D	Forrest T. Meiere, Chairman, Physics Dept., IUPUI
E	Frank E. Nordby, Evening Administrator, IUPUI
F	David Bonner, Chemistry Lab. Tech., IUPUI
G	Thomas Langley, Chief Custodian, IUPUI
H	(Requested confidentiality)
I	Thomas J. Duncan, former Physics Lab. Tech., IUPUI
J	Robert T. Anger, former RSO, IUPUI
K	Paul L. Ziemer, Radiological Control Officer, Purdue Univ.
L	John S. Kent, RSO, IUPUI
M	Mrs. Thelma Roberts
N	William A. Neville, Dean, IUPUI
O	Henry N. Wellman, M.D., Chairman, Radionuclide Radiation Safety Committee, IUPUI
P	Dean Beltz
Q	Jack M. Ryder, Former Dean & Director, Purdue, Indianapolis Campus
R	Hal S. Stocks, Chief, Radiological Health Section, Indiana State Board of Health
S	Clifford Travis, University Counsel, Indiana Univ.
T	H. Richard Leuchtag, former Physics Instructor, IUPUI
U	James Eisenhut, Physics Lab. Tech., IUPUI
V	Inadvertently not assigned
W	John R. Gilbert, Security Division, IUPUI
X	Mrs. Carey, former Secretary, IUPUI
Y	Mr. Van Blair, Physical Plant Dept., IUPUI
Z	Dr. John G. Wiehaupt, Associate Dean for Academic Affairs, IUPUI
AA	Donald G. O'Brien, Manager, Public Relations, Allison
BB	F. R. Ford, Associate Business Manager, Purdue Univ.
CC	Jack F. Patterson, Manager, Community Relations, Allison
DD	Wayne O. Ross, Allison
EE	Henry Briggs, formerly with State of Indiana

FF	Jackie Horney, Personnel Office, Purdue Univ.
GG	John F. Bodle, Attorney
HH	Professor Bunde, former Physics Instructor, IUPUI

Identification Key

FF	Jackie Horney, Personnel Office, Purdue Univ.
GG	John F. Bodle, Attorney
HH	Professor Bunoe, former Physics Instructor, IUPUI
II	Gilbert Rainey, former Physics Instructor, IUPUI
JJ	Nelson Perry, former RSO, IUPUI
KK	E. Gutwein, Purdue Univ.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

NOV 17 1978

Purdue University
ATTN: Paul L. Ziemer, Ph.D.,
Radiological Control
Officer
West Lafayette, IN 47907

License No. 13-02812-04

Gentlemen:

This refers to the special inspection conducted by Messrs. J. A. Pagliaro and S. R. Lasuk on June 19, 1978, and to the investigation conducted by Messrs. G. A. Phillip and S. R. Lasuk of this office on September 12-14, 1978, of activities authorized by NRC License No. 13-02812-04 and to the discussion of our findings with you on October 13, 1978.

The inspection and investigation were conducted to evaluate the radiation exposure received by a former laboratory technician during his employment (1954-71) in the Physics Department of what was then known as the Indianapolis Extension of Purdue University, and consisted of an examination of pertinent records and procedures, personal observations and interviews with personnel. The investigation included consideration of the exposure the laboratory technician may have received from radium, which is not under the jurisdiction of the NRC, as well as the exposure he may have received from byproduct material. It was concluded that the total exposure the technician may have received from all radioactive sources during his employment did not exceed NRC regulatory limits.

During the investigation, certain of your activities appeared to be in noncompliance with NRC requirements, as described in the enclosed Appendix A. Since these items of noncompliance occurred several years ago and subsequent inspections have not identified any recurrences, no reply to this letter is required and we have no further questions regarding them at this time.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosed investigation report will be placed in the NRC's Public Document Room, except as follows. If this report contains information that you or your contractors believe to be proprietary, you must apply in writing to this office, within twenty days of your receipt of this letter, to withhold such

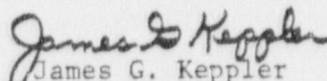
NOV 17 1978

information from public disclosure. The application must include a full statement of the reasons for which the information is considered proprietary, and should be prepared so that proprietary information identified in the application is contained in an enclosure to the application.

Also enclosed for your convenience is an Identification Key since names of individuals were not used in the report to avoid unnecessary possible embarrassment when the report is made available to the general public.

We will gladly discuss any questions you have concerning this investigation.

Sincerely,


James G. Keppler
Director

Enclosures:

1. Appendix A, Notice
of Violation
2. IE Investigation Reports
No. 030-00696/78-03
and No. 030-01609/78-01
3. Identification Key

cc w/encls:

Central Files

Reproduction Unit NRC 20b

PDR

NSIC

Appendix A

NOTICE OF VIOLATION

Purdue University

License No. 13-02812-04

Based on the investigation conducted on September 12-14, 1978, it appears that certain of your activities were in noncompliance with NRC requirements, as noted below. Item 1 is an infraction, and item 2 is a deficiency.

1. License Condition 16C requires that each sealed source be tested for leakage and/or contamination at intervals not to exceed six months.

Contrary to the above, leak tests of four sealed sources were not performed every six months during the period August 1968 to May 1973.

2. 10 CFR 30.41(c) requires that licensees transferring material verify that the transferee's license authorizes the receipt of the type, form and quantity of byproduct material to be transferred.

Contrary to the above, two 1 curie strontium 90 sealed sources were transferred to a licensee without verifying that the transferee's license authorized their receipt.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

NOV 17 1978

Indiana University - Purdue
University at Indianapolis
ATTN: Henry N. Wellman, M.D.,
Chairman, Radionuclide
Radiation Safety Committee
1100 West Michigan Street
Indianapolis, IN 46202

License No. 13-02752-03

Gentlemen:

This refers to an investigation conducted by Messrs. G. A. Phillip and S. R. Lasuk of this office on September 12-14, 1978 which included activities authorized by NRC License No. 13-02752-03 and to the discussion of our findings with you and Mr. John Kent of your staff on October 13, 1978.

This investigation was conducted to evaluate the radiation exposure received by a laboratory technician employed in your Physics Department when it was part of the Purdue University Indianapolis Extension. The investigation consisted of an examination of pertinent records and procedures, personal observations and interviews with personnel. The investigation included consideration of the exposure the technician may have received from radium, which is not under the jurisdiction of the NRC, as well as the exposure he may have received from byproduct material. It was concluded that the total exposure the technician may have received from all radioactive sources during his employment did not exceed NRC regulatory limits.

During the investigation, certain of your activities appeared to be in noncompliance with NRC requirements, as described in the enclosed Appendix A. Regarding Item 1, the request for and the issuance of Amendment No. 46, constitutes adequate corrective action. Regarding Item 2, your letter dated August 10, 1977, responding to a similar item of noncompliance identified during an inspection conducted on June 20-22, 1977, is considered an adequate response to this item. Regarding Item 3, which relates to the failure to prepare a record of the receipt of sources as a result of an organizational change in 1973, it is our understanding that your existing procedures provide for the recording of sources received. Consequently, no reply to this letter is required and we will examine your corrective action during a future inspection.

Indiana University -
Purdue University
at Indianapolis

- 2 -

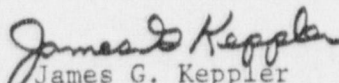
NOV 17 1978

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Also enclosed for your convenience is an Identification Key since names of individuals were not used in the report to avoid unnecessary possible embarrassment when the report is made available to the general public.

We will gladly discuss any questions you have concerning this investigation.

Sincerely,


James G. Keppler
Director

Enclosures:

1. Appendix A, Notice
of Violation
2. IE Investigation Reports
No. 030-00696/78-03
and No. 030-01609/78-01
3. Identification Key

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Central Files
Reproduction Unit NRC 20b
PDR
NSIC