1341

EASTMAN KODAK COMPANY

PLEASE ADDRESS REPLY TO KODAK PARK WORKS

ROCHESTER 4, NEW YORK

TELEPHONE GLADSTONE 8-1000

September 19, 1962

Mr. Robert E. Brinkman
Senior Reviewer
Isotopes Branch
Division of Licensing and Regulation
United States Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Brinkman:

Your letter of May 3, 1962 (L and R:IB:DEH;31-461-21), suggested that an updated application be submitted by Eastman Kodak Company which would consolidate information on the facilities, radiation detection equipment, and other aspects of our radiological safety program.

Enclosed are two copies of a detailed discussion of our program which has been prepared by Mr. R. F. Scherberger of Eastman Kodak Company's Radiation Protection Committee. This discussion covers our operations under by-product material license numbers 31-461-10, 31-461-20, and 31-461-21. Should you feel that clarification or amplification of any of the topics discussed in this report would be desirable, please address your inquiries directly to Mr. Scherberger.

We hope that you will find this report helpful in processing our applications for by-product material licenses and amendments.

Very truly yours,

Wm L. Sutton, M.D.

WILLIAM L. SUTTON, M. D.
Secretary
Radiation Protection Committee
Eastman Kodak Company

Please address replies to:

Richard F. Scherberger
Laboratory of Industrial Medicine
Eastman Kodak Company
Kodak Park Works - Building 2
Rochester 4, New York

A/35

WLS:bw

40000

Kodak

August 3, 1962

RADIATION PROTECTION COMMITTEE

Functions:

The Radiation Protection Committee was formed in 1950 to supervise the use of radioactive materials in Kodak Park (Eastman Kodak Company's largest plant and principal user of radioactive material), and has as its prime function the protection of people and products from the effects of ionizing radiation. The committee acts in a staff capacity, furnishing advice and guidance to the actual or potential users of radioactive material in Kodak Park, but its decisions on matters of radiation safety have the complete backing of Kodak Park management and must be respected by all operating divisions.

No radioactive material or device capable of generating ionizing radiation may be purchased without the approval of the Radiation Protection Committee. The signature of the Secretary (presently W. L. Sutton, M. D.) must appear on all requisitions for such material or devices before the Purchasing Department will act (all Kodak Park purchases are made through the Purchasing Department).

The Committee receives and reviews written and oral reports concerning periodic area, equipment, and personnel monitoring surveys. Before disposal of any equipment or materials the Committee must approve. A further Committee function is the enforcement within Kodak Park of various pertinent state and federal laws, codes, or rules concerning radiation safety.

The Kodak Park Radiation Protection Committee also serves in an advisory capacity to the Medical Director of Eastman Kodak Company (James H. Sterner, M. D.) and thus exerts an influence of radiation safety practices of other company plants in Rochester.

Membership:

The members of the Committee have been selected to represent the company groups most interested in radiation safety: Management; Laboratory of Industrial Medicine; Physics Division of the Research Laboratories; and Manufacturing Experiments Division (particularly interested in protection of product).

H. Murray Cleare. - Mr. Cleare received a B. S. degree in Physics from the Georgia Institute of Technology. He has been employed from 1951 to the present by Eastman Kodak Company in the Radiographic Department, Physics Division, Research Laboratories, and has been engaged in research in the fields of photographic radiation dosimetry and the use of radioactive materials. He is a radiation safety officer for the Eastman Kodak Company, and the radiation safety supervisor for the Research Laboratories registered with the New York State Department of Labor. He became a member of the Radiation Protection Committee in July, 1962.

David W. Fassett, M. D. - Dr. Fassett's formal training has been as follows: A. B. 1933, M. D. 1940 New York University, Internship and Fellowship--Department of Medicine, New York University 1941-45.

Medical training included a one year series of lectures on the biological effects of x-ray radiation and radium therapy including lectures by Dr.

Harrison Martland on specific actions of radium with reference to production of bone tumors and included lectures on x-ray physics and the physical chemical properties of radium. Practical training was given in x-ray and radium therapy. Since 1948 Dr. Fassett has attended various lectures on the biological effects of radiation at the Atomic Energy Project of the University of Rochester. Since 1949 he has had responsibility for all medical problems connected with industrial hygiene and toxicology for Eastman Kodak Company including those from physical agents such as ionizing radiation. He has been a member of the Kodak Park Radiation Committee since its origin in 1950. During this time Dr. Fassett had frequent personal experience with carrying out and interpreting monitoring studies for many types of radiation including industrial and medical x-rays, beta ray gauges, x-ray diffraction equipment and sealed sources containing Radium and Cobalt-60 as well as monitoring for safety in use of tracer quantities of isotopes.

C. R. Fordyce Ph. D., Chairman - Dr. Fordyce received his Ph. D. in Organic Chemistry at Cornell University in 1929. He was employed in the Kodak Park plant of the Eastman Kodak Company since 1929 as follows: Chemist in the Research Department, 1929-1930; Experimental work in the Chemistry of Cellulose Derivatives, 1930-1944; Assistant Director, Manufacturing Experiments Division from 1944-1947; Director, 1947-1958; Technical Advisor to the General Manager, 1958 to present.

Since 1958 he has been a member of the Radiation Committee of Kodak Park as a management representative. He has also been closely connected with the problems of protecting manufacturing operations in Kodak Park from contamination by radioactive fallout, and in that capacity is a member of the National Association of Photographic Manufacturers Committee on Radioactivity.

James Lees - Mr. Lees is a graduate of the Rochester Institute of Technology in Electrical Engineering. He has worked for Eastman Kodak Company for 26 years, most of that time in the Manufacturing Experiments Division where he is a senior development engineer working on controls and electronic instruments. He started working on the problems associated with radium in photographic materials in 1942, and his involvement with this work increased with the start of atom bomb testing in 1945. Since 1951 a great deal of his time has been spent devising tests and instruments to determine the effect of radioactive fallout particles on Kodak raw materials and products and to control these effects. His work has included the institution of a nation-wide monitoring system to detect radioactive contamination in air and water at various Kodak plants and at the plants of principal raw material suppliers. He has an extensive knowledge of the instrumentation required to detect low-level radiation and supervises the use and maintenance of various laboratory type counting systems within the company and its subsidiaries. He has been a member of the Kodak Park Radiation Committee since its origin.

Richard F. Scherberger - Mr. Scherberger received a B. S. degree in Chemistry from Niagara University (1950) and an M. S. from the University of Rochester (1957). In 1958 he completed New York University's Radiological Safety course 480-A (a two-week course in radiation protection and health physics) and in the same year took a one-week course in radiological health instrumentation at the University of Rochester's Atomic Energy Project. He has attended two radiological safety conferences co-sponsored by Canisius College and the New York State Department of Labor. He has had 12 years experience as an industrial hygienist with the Laboratory of Industrial Medicine of Eastman Kodak Company. He received on-the-job training in health physics over the past 5 years

and has attended an in-company lecture series taught by Dr. Sutton and representatives of the Physics Department of the Kodak Research Laboratories. He is responsible for the routine maintenance of radiological safety records, and an inventory of radiation sources, performs wipe tests as prescribed by AEC regulation, performs area surveys, and supervises the personnel film badge monitoring program for which this company contracts with Nuclear Chicago Corporation. With Mr. Cleare he calibrates field survey instruments used in the company's protection program. He became a Committee member in July, 1962.

William L. Sutton, M. D., (Secretary) - Dr. Sutton received his M. D. degree from Stanford University School of Medicine (1953) and was an AEC fellow in Industrial Medicine at the University of Rochester, receiving his M. S. in 1955. At the Atomic Energy Project of the University of Rochester he had one year of training in health physics, radiation protection, and radiation biology. He spent a years residency in Industrial Medicine at Eastman Kodak Company (1955-56). He has now had seven years experience in radiation protection as a member of the Laboratory of Industrial Medicine of Eastman Kodak Company. He has been Secretary of the Kodak Park Radiation Protection Committee since 1956. Dr. Sutton supervises the Industrial Hygiene Laboratory of the Laboratory of Industrial Medicine, which furnishes industrial hygiene services, including health physics, for Eastman Kodak Company.

Julian H. Webb, Ph. D. - Dr. Webb received his Ph. D. in Physics from Wisconsin University in 1929. He is head of the Physics Division of Kodak Research Laboratories. He spent two and one-half years on the Manhattan Project, University of California, Berkeley California, and at Oak Ridge, Tennessee, during which time he gained a considerable training and experience in radiation safety work, measurement standardization, monitoring techniques, and calculations basic to the use and measurement of radioactivity. The training he obtained in these fields was of the on-the-job type rather than formal courses.

Dr. Webb is familar with the biological effects of radiation through his experience on the Manhattan Project combined with studying literature on the subject that has been published during the past fifteen years. He has used directly, and supervised the use of, radioisotopes in the Kodak Research Laboratories for the past fifteen years. He has been a member of the Kodak Park Radiation Committee since its formation in 1950, and his function on this Committee has been the supervising of methods for the protection of personnel against radiation hazards.

..DIATION PROTECTION PROGRAM

Responsible Organization and Personnel:

The Company has assigned responsibility for the radiation protection program to the Industrial Hygiene Laboratory of the Laboratory of Industrial Medicine in the belief that this organization's experience and capabilities in evaluating health hazards in the industrial environment apply equally well to radiation hazards. Pertinent records concerning each radiation source are kept in the Laboratory of Industrial Medicine. Contained therein is such information as: activities involving source; wipe test results; and personnel and monitoring data. Our protection procedures are designed to conform with such applicable regulations as New York State Code Rule 38 and Title 10, Part 20 of the Code of Federal Regulations.

W. L. Sutton, M. D., Staff Physician in the Laboratory of Industrial Medicine and Secretary of the Kodak Park Radiation Protection Committee, supervises the Radiation Protection Program which is operated under the guidelines established by the Committee. Dr. Sutton reports to D. W. Fassett, M. D., Director of the Laboratory of Industrial Medicine and also a member of the Radiation Protection Committee.

The entire medical program of the company is under the direction of James H. Sterner, M. D., who is consultant in Industrial Health to the U. S. Atomic Energy Commission, Washington, D. C., 1948 to the present time. He is a member of the main committee of the National Committee on Radiation Protection from 1955 to present. He was Medical Director of Clinton Engineer Works, Tennessee Eastman Corporation (Manhattan Project) 1943-45, and was a member of the Radiological Safety Section on the Medical Legal Board of Operation Crossroads (Bikini), 1946. He was a member of the interim Medical Advisory Board, U. S. Atomic Energy Commission 1945-47, and is a member of the Radiation Research Society 1952 to present. Since 1960, he has been a member of the Advisory Committee for Biology and Medicine of the AEC, and is a member of the Committee on AEC Fellowships in Industrial Medicine. He is a member of the New York State General Advisory Committee on Atomic Energy (1959 to present), and he was Chairman of the Expert Committee on Medical Supervision in Radiation Work for the World Health Organization Conference in Geneva, September 28, to October 3, 1959.

The normal day-to-day activities of the program are carried out by Mr. R. F. Scherberger (see Committee Membership) but in his absence may be performed by the Company's senior Industrial Hygienist, Mr. Franklin A. Miller, who has similar radiation training and experience to Mr. Scherberger. Mr. H. Murray Cleare of the Physics Division of the Eastman Kodak Research Laboratory is frequently employed on a consultant basis in this program.

Procedures for Enforcing Radiation Protection Program:

The Radiation Protection Program as carried out by personnel of the Industrial Hygiene Laboratory of the Eastman Kodak Laboratory of Industrial Medicine is described in detail in the following paragraphs.

Permissible levels of radiation. For many years Eastman Kodak Company has operated its Radiation Protection Program under the philosophy that any unnecessary exposure to ionizing radiation should be avoided. Since 1950, in those controlled areas where radiation exposures could not be completely avoided, we have used as the maximum permissible exposure to radiation workers a weekly dose of 30 milliroentgens. This was considerably more conservative than those levels originally permitted under the standards recommended by the National Bureau of

Standards and of those detailed in the Federal Register Title 10, Part 20, and is still less than one-third the currently accepted limit for workers in controlled areas. It should be emphasized that our film badge program has revealed only one area where workers accumulate exposures even approximating our permissible level of 30 mr. per week.

Our criteria for unrestricted areas are guided by CFR Title 10, Part 20, and amendments, as well as by the recommendations of the Federal Radiation Council.

Control of purchase of sources of ionizing radiation. Special procedures are detailed to establish a uniform method of obtaining approval from the Kodak Park Radiation Protection Committee when a purchase is made of any item or material which may be a source of ionizing radiation.

The Kodak Park Purchasing Department makes all purchases of items used in Kodak Park. Before this Department will act on a purchase requisition for a radioactive material or for devices capable of emitting ionizing radiation, a copy of the requisition is forwarded to the Secretary of the Radiation Protection Committee for approval and signature. Such approval is also required prior to dismantlement and/or disposal of radioactive material or radiation devices.

A notation is also made on the purchase order (a copy of which goes to the Kodak Park Receiving Department) asking that the Receiving Department notify Mr. Scherberger when the material is received and prior to delivery to the ordering department.

Most common types of radioactive materials and radiation emitting devices are listed in the Purchasing Department's written procedures.

Inspection of radiation sources upon arrival. This inspection includes tests for leakage of sealed sources and measurement of external radiation levels, check of interlocks and other safety features, and placement of prescribed warning signs.

Selection and education of supervisory personnel and radiation workers. All Kodak Park applications for by-product material licenses designate the individual users in Item 4 to be "personnel designated by Kodak Park Radiation Protection Committee, W. L. Sutton, M. D., Secretary." In each department using radioactive material, the Committee selects at least two individuals, normally members of supervision, to be responsible for radiation safety in the every day use of such material.

The qualifications which the Committee expects of radiation workers varies considerably. For example, we would expect those individuals doing maintenance work on a beta ray guage containing 118 millicuries of Krypton-85 to have a minimum knowledge of radiation safety. Dr. Sutton or Mr. Scherberger would discuss with such individuals the nature of the sources used in the gauge and would aid in the preparation of the operating procedures required by CFR Title 10, Part 20, Section 20 206b. On the other hand, Mr. Raymond Miller, the person who is responsible for radiation safety in our Isotope Laboratory where unsealed radioactive material is used, received his initial training in the Manhattan Project at Los Alamos in 1944-45, and at the Oak Ridge X-10 Area from 1945-46. He has taken courses at the Oak Ridge Institute of Nuclear Studies both in 1961 and in 1962. In the opinion of the Committee he is eminently qualified to deal with the problems in radiological safety inherent in his job

A radiation safety supervisor has also been appointed for each department using radioactive material or radiation devices. This individual may be the department's Safety Engineer or a person in the department whose work makes him familar with radiation problems. Formal lectures covering a) basic radiation theory, b) health physics, and c) radiological safety procedures, have been given to this group by Dr. Sutton, Mr. Cleare, and others. The radiation safety supervisor is the normal contact between the Laboratory of Industrial Medicine and the individual using the radiation device or material.

Radiation measuring instruments. The following instruments are available for radiation monitoring and evaluation of wipe tests for leakage detection.

I. Survey instruments.

Number of Units	Type or Model Number
1	Victoreen Model 440 Low Energy Survey Meter
1	Victoreen Model 356 Alpha Survey Meter
1	Nuclear-Chicago Model 2586 Beta Gamma Survey Meter
5	Nuclear-Chicago Model 2612 Portable Survey meters with P15 and P16 tubes
1	Jordan Model AGB-10-SR Ionization Chamber
2	Victoreen Model 70 R-Meter
1	Victoreen Model 570 R-Meter
2	Victoreen Minometer II Charger-Reader
1	Atomic Associates Inc. (on order Sept. 24) Model TSM-91-B Tritium Monitor

II. Laboratory Instruments.

3	Tracer Lab CE-14 Low Background Beta Counters
1	Nuclear Measurements Model PC-3A Proportional Counter
1	Nuclear Measurements Proportional Counter Converter Model PCC-11A with Tracer Lab SC-33A Scaler.

Laboratory Instruments cont.

Number of Units	Type or Model Number
1	Tracer Lab SC-18B Super Scaler with Model TGC-2 and TGC-12 counting tubes
1	Tracer Lab SC-33A Scaler used with either Type 6001 steel housing with 1007 T tubes or TCG-2 tube in steel block housing.
6	Landsverk Dosimeters plus 1-24 K Charger
1	Laboratory assembled Alpha Scintillation Counter
1	Nuclear Chicago D-47 Gas Flow Counter (with both thin end window tube and windowless tube)
1	Tracer Lab Super Scaler with automatic sample changer and thin-end window GM tube
1	Tracer Lab SB-19 Utility Scaler with thin-end window GM tube
1	Tracer Lab P20-DP Gamma Scintillation Detector (used with super scaler)
1	Eberline Instrument Company Model RM 3 Radiation Monitor (live operated)

Our most commonly used field survey instruments are all equipped with built-in calibration sources. Moreover, all survey instruments are also routinely calibrated against an external 20 milligram radium source in the Research Laboratory's Radiographic Department. Standards are also available for calibrating the laboratory instruments.

In addition to the instruments mentioned above, which are all available either in Manufacturing Experiments Division, the Research Laboratories, or in the Laboratory of Industrial Medicine, many departments utilizing radioactive material or devices emitting ionizing radiation have their own monitoring equipment, principally the Model 2612 Survey Meter or equivalent instrument.

Routine area surveys and leakage tests. With the exception of gauges using Krypton-85, we are required by our AEC licenses to perform wipe tests for leakage on all sealed sources* used at Kodak Park. This is done routinely every six months. The wipe is made with a small 1 1/8 inch circle of lens cleaning tissue held with a pair of rubber tipped tongs. This tissue is subsequently placed dirty side up in a planchet and one drop of 12% sucrose solution is placed on the tissue, which is then dried under an infrared lamp. The sample is then counted on a Nuclear Chicago D-47 Gas Flow Counter using either a thin end window or a windowless chamber. The results of these tests are normally only a few counts per minute; however, in those rare instances where the counts are noticeably higher, the count is corrected for efficiency and geometry and reported in terms of microcuries. Copies of the wipe tests report are kept on file in both the Industrial Hygiene Laboratory and in the file of Dr. Sutton, who is also Secretary of the Radiation Protection Committee. In areas where a more specific hazard is recognized (for example, in our Isotope Laboratory or in an area where an unsealed natural polonium-210 source is in use) bench top wipe tests are taken more frequently by personnel in the area and sent to the Industrial Hygiene Laboratory for evaluation.

Routine area surveys include: 1) review of radiation safety practices, written and actual; 2) check on proper posting of form AEC-3 and other appropriate warning signs or labels; 3) recording of names of exposed personnel; and 4) when appropriate, measurement of external radiation intensities as well as air sampling for air-borne contamination. Such surveys are done in both restricted areas and in environs.

Film badge monitoring program. Prior to August 1961, Kodak carried on its own film badge monitoring program with the development and evaluation of the film being done by Mr. H. Murray Cleare of the Research Laboratories' Radiographic Department. Since August, 1961, we have contracted with Nuclear Chicago Corporation for their film badge service,and the badges are routinely worn by all personnel whose jobs offer a possibility of over-exposure to ionizing radiation. The only group which normally accrues an exposure on their film badges are those personnel working with thorium and with glass containing this material in our Apparatus and Optical Division's Glass Plant. In this group, for example, during the first six months of 1962, the largest accumulated exposure was by an individual who weighs out the raw material; during this six month period, his badge indicated a total dose of 377 milliroentgens or about 15 mr. per week. The next highest exposure in this group was about 1/2 this level, and no other exposures in our plants approximate the magnitude of these accumulated by Glass Plant personnel.

Bio-assay procedures. Among our many areas where licensed by-product materials are used, there are only four where bio-assay procedures would be appropriate. These include: 1) two areas where Carbon-14 is used very infrequently and in very small quantities; 2) our Isotope Laboratory where a variety of labeled chemicals are employed; and 3) our Glass Plant where thorium oxide is used in fairly large quantities. We have recently contracted with the New England Nuclear Corporation for their Carbon-14 Breath Analysis Service. Special arrangements can also be made with the University of Rochester's Atomic Energy Project. For example, John B. Hursh, Ph. D., of the AEC Project at the University of Rochester will in the near future make whole body measurements on our workers using thorium oxide. Arrangements have also been made with

* Wipe tests for leakage are not normally done on installed tritium markers.

Dr. Joseph Howland at the University of Rochester Atomic Energy Project to perform bio-assays for Iodine-131 in order to monitor the use of this material in a contemplated experiment in our Isotope Laboratory. On several occasions in the past we have done analyses for Sulfur-35 in urine subsequent to experiments using this material in our Isotope Laboratory.

Waste disposal. We currently have three sources of soluble radioactive wastes in Kodak Park: 1) our Isotope Laboratory in Building 59; 2) our Biochemical Laboratory in Building 2; and 3) our Vitamin Synthesis Laboratory in Building 151. Disposals are made via laboratory sink drains which empty into the Kodak Park industrial sewer. The daily flow through this sewer approximates 20 million gallons, which is discharged into company owned settling tanks on the west bank of the Genesee River adjacent to the Kodak Park Works. Because of the very large flow in the industrial sewer system, the limiting factor for disposal of soluble wastes becomes the one curie per year maximum permitted under Part 20 for a 50 week year of 5 days per week. This means that 4 millicuries per day can be disposed of in the Kodak Park sewer. Because only negligible quantities of radioactive material are released via this system by either the Vitamin Synthesis Laboratory in Building 151 or the Biochemical Laboratory in Building 2, essentially the whole 4 millicuries per day is available for disposal by the Isotope Laboratory. The current practice of the Isotope Laboratory has been to hold its disposals under a total of approximately 10 microcuries per day which would be about 1/400 the permissible disposal rate. The practice currently followed by the Isotope Laboratory was initiated in an effort to keep the concentrations in the water going down the laboratory drain at about the level permitted (by Part 20) after final dilution. The present standards for permissible concentrations would require about 1,000 gallons per day to go down the laboratory sink, and the laboratory's current practices involve flows considerably greater than this.

Solid radioactive contaminated waste material from those Kodak laboratories generating such waste has consisted of very slightly contaminated laboratory debris such as paper towels, filter paper, etc., and this material has been buried in Kodak Park in large lined burial pits primarily designed for the burial of thorium oxide contaminated glass sludge from our Hawk-Eye Plant. Other more hazardous solid waste material, such as: large accumulations of luminous labels and buttons containing Radium-226, spent Polonium-210 strips from Staticmaster brushes, and similar material, is accumulated in a locked radioactive material storage vault and is eventually shipped for burial at Oak Ridge. The last (and only) such shipment was made in May, 1959, under our purchase order 16-549-27905, and was sent to Oak Ridge, Attention: Mr. E. J. Witkowski.

In our Hawk-Eye Plant thorium oxide is used in the preparation of optical lenses and consequently radioactive contaminated wastes may be generated any place in the production process where these lenses are ground or otherwise machined. This process has been very carefully studied and we believe that at the present time we are recovering essentially all waste generated in the process. This is assayed and buried in marked and surveyed burial pits in our Kodak Park dump. Pit construction and use conforms to CFR Title 10, Part 20, including paragraph 20.304.

Facilities:

In general our radiation sources are used by many scattered departments in ordinary light manufacturing operations and research . They are characterized by multiple low activity sealed sources (such as industrial thickness guages); small quantities of unsealed isotopes for tracer work; many radiation generators for medical and laboratory use; the source material thorium used in the production of relatively small quantities of special optical glasses.

We believe that the facilities provided in our plants for the use of radioactive materials are more than sufficient to allow the safe and efficient use of the type and quantity of materials now employed. For example, our Isotope Laboratory has been designed from the floor up as a safe, modern, installation. It contains separate rooms for low and high level radiation work, and a separate counting room and office. Constant face velocity hoods and an exhausted glove box are also provided. Complete descriptions of our installations and their facilities are retained in the radiation protection record files in the Laboratory of Industrial Medicine and are available for review as necessary.