VETERANS ADMINISTRATION
HOSPITAL
4150 CLEMENT STREET
SAN FRANCISCO, CALIF. 94121

1539

May 9, 1979

IN REPLY
REFER TO:

Lic. No. 04-00421-05

William J. Walker, Jr., Ph.D.
License Management Branch
Division of Fuel Cycle & Material Safety
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Walker:

In response to your letter dated February 7, 1979, requesting necessary additional information in support of our renewal application (Lic. No. 04-00421-05), we hereby submit the following responses. Our numbered responses correspond with the numbered questions in your letter. These additions will be incorporated into the updated Radiation Safety Manual and copies will be sent throughout the institution.

1. Our Hospital Isotope Committee already includes a member of hospital management. Thomas B. Bradley, M.D. is Associate Chief of Staff for VA Medical Center SF and also happens to be Chief of Hematology. He represents management and is able to facilitate communication between the Isotope Committee and the Director.

2. A hospital memo has been sent out from the director's office explicitly delineating the purposes and duties of the Hospital Isotope Committee. (Ref. Attachment No. 1).

3. According to Section 19.12 of 10 CFR Part 19, "all individuals working in or frequenting any portion of a restricted area shall be kept informed . . .". To this end, those affected personnel at VA Medical Center are instructed as follows: Any new employee who shall be employed in or frequenting a "Radiation Area" is directed to the Radiation Safety Officer for orientation. The RSO outlines the Radiation Safety Program and presents a 45 minute coordinated slide and tape show covering "Principles of Ionizing Radiation and Basic Radiation Protection" and Prenatal Radiation Exposure". After the presentation the RSO makes comments applicable to the new employee's situation and answers any questions.

   The Radiation Safety Officer holds a thorough meeting with every radioisotope-utilizing laboratory at least every 6 months. At this time, the RSO meets with the lab staff and discusses any problems to date, inspects all records, inspects the working environment, recommends improvements for better radiation safety,

reviews the license and applicable portions of 10 CFR 20 and educates the lab personnel as to the new radiation protection products on the market as well as the latest advances in Radiobiology.

Occasionally the Radiation Safety Officer will hold educational conferences in order to facilitate the dissemination of information to groups of employees. For non-laboratory workers, such as supply personnel who frequent radiation areas, such conferences are held at least once a year. A Radiation Safety Newsletter (No. 1 is enclosed) is published covering various important topics. (Ref. Attachment No. 2).

Lastly, the RSO is always available for consulting on matters of radiation protection.

4. See guide to "Volatile Procedures Using Radioisotopes" written by the Radiation Safety Officer. (Ref. Attachment No. 3).

   A. All therapeutic quantities of I-131 are shipped directly to Nuclear Medicine Service where they are processed as per procedures in "Volatile Procedures Using Radioisotopes". The Radioisotope is brought to the patient's room sealed in two lead containers. The patient is administered the dose orally and will remain in the room until exposure and contamination hazards have been reduced to an acceptable level. All contaminated articles are disposed of as nuclear waste and urinalysis is performed as soon as possible to assay any uptake of I-131 by the technician.

   B. Bioassay Program for VA Medical Center SF as of April 1979. (For I-125 or I-131.)

      VA Medical Center's bioassay program for working with I-125 in unsealed form will essentially follow the recommendations of NRC Regulatory Guide 8.20 with the following exceptions.

      i. After a worker is exposed to a condition as delineated in Table I of the guide, he/she is required to do a urinalysis immediately following the pr edure. Thus, one arrives at a more accurate estimate for instantaneous whole body burden.

         If any radioisotope ingestion is detected in the urine then the worker will be directed to Nuclear Medicine Service where a thyroid count will be done at least 6 hours post-procedure.

If a worker is exposed to Table I conditions on a continual basis, thyroid counting will be done every two weeks. If the level assayed in the urine or thyroid exceed the action levels as calculated from page 8.20-5, the worker will be put into a diagnostic phase whereby thyroid counting will be done at least once every two weeks until thyroid activity is less than the action levels.

ii. Since radioiodine uptake is a cumulative effect, a sizeable thyroid burden is possible through time even if conditions remain under the levels in Table I. (NRC Guide 8.20).

Therefore, our policy is to do at least a quarterly thyroid uptake count on all personnel who work with volatile or dispersible radioactive iodine, regardless of activity.

C. Patients whose conditions warrant hospitalization even with an administered dose less than 30 millicuries of I-131 are relegated to SDTU (Special Diagnostic Treatment Unit) where they are given a private room with a private bath. (Unless care is needed at another special care unit.)

Restrictions will, of course, be less severe than in the case of thyroid carcinoma treatment (up to 100 mCi given). The restrictions required will depend on an initial survey by the Radiation Safety Officer. Generally, in this case, the major restrictions will exist in the first 48 hours post-administration as most of the dosage will be excreted in the first 48 hours.

Exposure from the patient's body shall be maintained ALARA, but in no case shall it exceed 5 rems per year for the attending staff and .5 rems for visitors.

Determinations will be made as to whether changed linen, eating utensils or excreta should be collected and whether gloves or isolation gowns will be worn if contacting the patient.

Restrictions will be lifted as the I-131 administered physically decays and is biologically eliminated. In general there will be no restrictions when body activity has dropped to 8 mCi or when the exposure rate at 1 meter reads 1.8 mR/hr. VA's radiation safety program utilizes the recommendations from NCRP report No. 37 "Precautions in the Management of Patients who have received Therapeutic Amounts of Radionuclides."

5. VA Medical Center's policy for tritium bioassay will essentially follow the guidelines put forth by the NRC except that our minimum limits for Table I are 10-100 times lower. The reason being that our bioassay method will effectively detect a 5 microcurie

whole body tritium ingestion. While this level of tritium is not hazardous, detection of low levels of ingested radioisotope is a good indication of unsafe laboratory technique or conditions which could potentially get worse.

6. We have, in Nuclear Medicine Service, a 10 curie Americium 241 sealed source, which is used for x-ray fluorescent studies. Exposure rates at different distances and angles have been documented and checked with a thin end window GM probe instrument calibrated to Co-60). All relevant copies of literature are enclosed. (Ref. Attachment No. 4).

7. TLD finger rings are employed by all nuclear medicine technicians as well as research personnel who directly manipulate high activity sources.

8. Syringe shields are used for all preparation and administration of doses except where their use would compromise the patient's well-being.

9. We are implementing the reception of after work hours shipments in Nuclear Medicine Service instead of the boiler room. Radioisotope packages will be brought directly by the carrier to Bldg. 203, Room GB-51 in the department. GB-51 is a short-term holding room for radioisotopes, approximately 70 sq. ft. in area, and is accessible only to Nuclear Medicine Personnel. The radiation Safety Officer inspects and processes all received shipments on the next working day.

10. All leaking or damaged packages are to be reported to the Radiation Safety Officer immediately. He will fill out "unusual occurence report" (enclosed), decontaminate and contact NRC if applicable. Also, carriers will be notified immediately and a damage report sent to them within 10 days (also enclosed). (Ref. Attachment No. 5).

We hope these responses will meet your requirements.

Ralph R. Cavalieri

RALPH R. CAVALIERI, M.D.
Chairman, Medical Isotope Committee

VETERANS ADMINISTRATION HOSPITAL
4150 Clement Street
San Francisco, California 94121

Attachment No. 1

1530

HOSPITAL MEMORANDUM
Janaury 31, 1978

No.
Symbol: 11

SUBJ: Medical Isotope Committee

1. Definition: In accordance with Section 35.11(b), of Title 10, Code of Federal regulations, "Human Uses of Byproduct Material," a Medical Isotope Committee is hereby established. The Committee will include physicians expert in internal medicine, hematology, therapeutic radiology, and a person experienced in assaying radioisotopes and in establishing radiation safety protection policies and practices against ionizing radiation.

2. Membership:

Chief, Nuclear Medicine Service (Chairman)
Chief Scientist, Nuclear Medicine Service
Chief, Hematology Section
Chief, Pharmacy Service
Consultant in Radiation Therapy
Consultant in Biophysics
Radiation Safety Officer
Associate Chief of Staff for Research (ex-officio)

3. Responsibilities and Duties: The Medical Isotope Committee is responsible for the safe use of all radioactive material within this institution. The Committee's specific responsibilities include:

a. The Committee shall be familiar with all pertinent NRC regulations, the terms of the radioisotope license, and information submitted in support of the request for the license and its amendments. In addition, it will ensure that the license is amended, when necessary, prior to any changes in facilities, equipment, policies, procedures and personnel.

b. It will review and grant permission for, or disapprove, all uses of radioactive byproduct material (both experimental and routine uses) within this institution in conformance with NRC regulations, specific conditions of the institutional license and its amendments, and with regard to established hospital radiation safety procedures and guidelines.

c. The Committee will insure that all individuals who work with or have occasion to be in the vicinity of radioactive materials have sufficient training and experience to enable them to perform their duties safely and in accordance with NRC regulations and conditions of the institutional license.

d. The Committee will formulate and review the institutional radiation safety training program.

e. The Committee will recommend remedial action to correct any deficiencies identified in the institutional radiation safety program.

f. The Committee will maintain written records of all committee meetings, actions, recommendations and decisions. It will receive and review records and reports from the Radiation Safety Officer and/or other individuals delegated with responsibility for health and safety practices in this institution.

4. Administrative Procedures:

a. The Medical Isotope Committee will hold regular meetings once every calendar quarter. Additional meetings may be called by the Chairman to conduct urgent business. A minimum of five members constitutes a committee quorum.

b. The minutes of each meeting will be recorded by the Chairman or his designee. Copies of minutes and other records of action or recommendations by the committee are distributed to each member for changes and final approval. Approved minutes will be filed with the Secretary of the Hospital Research and Education Committee, the Hospital Director and Chief of Staff.

c. Methods of Control over Procurement of Radioisotopes: The Radiation Safety Officer is responsible for recording the quantities of radioisotope byproduct material ordered, procured, and maintained at this hospital. The following procedure is designed to avoid exceeding the possession limit as set by the license.

(1) Purchase orders for radioisotopes are routed to the Radiation Safety Officer before the order is placed. If the RSO determines that the person ordering the material has been approved by the Isotope Com- and the quantity of material ordered is within the permissable license allowance for that particular isotope, he approves the order and forwards it to the Purchasing Office. If the quantity ordered does exceed the limit, he notifies the Chairman of the Isotope Committee and the individual who initiated the order so that the purchase order can be changed to comply with the license possession limit.

(2) All radioisotope shipments received at this station will be examined by personnel who are approved by the Radiation Safety Officer as qualified to receive and examine such shipments. The quantity, and date of receipt will be recorded as prescribed by the RSO. This mechanism will provide assurance that the possession limit for the particular radionuclide is not exceeded. The RSO will prescribe the methods by which containers are examined (e.g. by wipe testing) to insure that no leakage of radioactive material has occurred.

d. Maintaining Inventories: Records of the quantities of radioactive materials on hand at this institution will be maintained and kept current by individual users. The records will be reviewed at least monthly by the Radiation Safety Officer. Inventory records compiled from the user's records will be kept on file in the Radiation Safety Officer's office, Nuclear Medicine Service. These records are made available to the Medical Isotope Committee at each meeting.

5. Methods of Evaluating Proposals for the Use of Radioisotopes: All proposals for the use of radioisotopes in this hospital must be evaluated by the Medical Isotope Committee, particularly to ensure conformance with NRC regulations, provisions of the license, and with regard to radiation safety for human subjects and working personnel. The Medical Isotope Committee will recommend approval or disapproval of the proposal and report its decision to the Hospital Research and Education Committee, according to established VA procedure.

6. RECISSION: Hospital Memoranda No. 59-70.

7. EXPIRATION DATE: 1 May 1980.

HOSPITAL DIRECTOR

DISTRIBUTION

Type B

Attachment No. 2

1530

RADIATION SAFETY

NEWSLETTER 1

V.A. HOSPITAL

San Francisco, CA

This is the first in a series of newsletters on Radiation Safety. It is intended to be brief, providing only the most general guidelines. Specific questions will be answered by the Radiation Safety Officer at ext. 461.

RADIATION DOSE LIMITS:

A. There are three commonly used units in Radiation Safety.

1. The roentgen (R, formerly r) is a unit of radiation exposure for x- and gamma radiation. It measures the amount of ionization produced by photon radiation in a given sample of air at STP. It is defined as being 1 esu of ions of either sign produced by the above radiation in 0.01293 gram of air at STP. The roentgen measures total exposure. Total exposure is the product of the exposure rate times the period of exposure.

2. The rad (radiation absorbed dose) is a measure of local energy deposition per unit mass of absorber by ionizing radiation. The rad is applicable to all types of ionizing radiation, i.e., alpha, beta and gamma. Local energy deposition in an absorber depends upon the amount of ionization occuring in the absorber for the type of radiation in question. The rad depends upon the type of radiation, type of absorber and the intensity of the radiation field.

3. The rem (roentgen equivalent man) is related to the rad as follows:

rem = RBE x (# rad)

RBE (relative biological effectiveness) is tabulated for different types and energies of radiation. For beta and gamma, RBE = 1. Alpha emitters are rarely used in a medical environment. RBE measures the relative effect that a given dose of radiation produces when compared to a standard dose of x- or gamma radiation in a living system.

Each of the above units have common usage in a radioisotope lab. Most survey meters are calibrated in milliroentgen/ hour (mR/hr). Personnel dosimetry device reports are given in rem. The rad is used to measure cumulative dose in a living system.

B. Title 10 of the Code of Federal Regualtions (T10CFR) has specific legal requirements which must be followed. There are two methods by which a radiation worker's dose may be limited.

METHOD A: Accumulated doses for different parts of the body will be limited to the following:

1. Whole body, head and trunk, active blood forming organs, lens of eye, or gonads--1.75 rem/calendar quarter.
2. Hands and forearm, feet and ankles--18.75 rem/calendar quarter
3. Skin of the whole body-- 7.5 rem/calendar quarter

A separate NRC Form 5 must be kept for each of the above three categories of exposure for each separate radiation worker.

METHOD B: A radiation worker may be exposed to a maximum whole body dose of 3 rem per calendar quarter provided his accumulated whole body dose does not exceed,

$$MPD = (5 \text{ rem}) \times ([\text{Age in years}] - 18)$$

at the end of the year for which his MPD is calculated. Exposure under this method requires that NRC Form 4 be kept for each radiation worker.

C. Exceptions to the above two methods of limiting a radiation worker's dose accumulation are as follows:

1. Persons under 18 years of age are not allowed to receive doses in excess of 10% of those listed in Method A above.

2. Pregnant women are restriced to a total dose os 0.5 rem for the period of gestation.

3. Nonradiation workers (the general public) are restriced to a dose of 0.5 rem per year.

4. Medical doses are not counted as part of a radiation worker's accumulated occupational dose.

5. An emergency dose of 25 rem will not be counted against a radiation worker's MPD account. This emergency dose can occur only once in a person's lifetime and must be for the purpose of performing a lifesaving function.

D. A WORD OF CAUTION. Age calculated MPD values are only guidelines. It is good safety practice to limit one's exposure to any hazarous compound to the smallest degree possible. It is good Radiation Safety to limit exposure to values well below the legal maximums. Overexposure must be reported promptly to the Radiation Safety Officer. Methods for determining accumulated dose will be discussed in a future newsletter.

RADIOISOTOPE REFERENCE SHEET

DEFINITIONS

1. Radioactivity: Some atoms have an unstable nuclear configuration due either to their nature or to cyclotron bombardment. Such atoms (radioisotopes) are said to be radioactive and achieve stability by emitting radiation. Such spontaneous emission is radioactivity.

2. Curie: A curie is a measurement of the radioactivity of a substance. The greater the amount of curies, the higher the proportion of atoms in the material which are radioactive. Curies is directly proportional to milliroentgens/hr (mR/hr) (See Radiation Safety Newsletter 1). A curie is actually a very large quantity and most laboratories employ millicurie (one-thousandth of a curie) or microcurie (one-millionth of a curie) quantities. Do not confuse millicurie (mCi) with microcuries (μCi).

3. Half-life: The half-life of a radioisotope is the time it takes for half of the radioactive material to decay away. A shorter half-life, therefore, means greater activity.

   NOTE: A shorter half-life does not necessarily mean higher energy emissions. Half-life refers to the rate at which the present radioactive material decays to stability.

4. Beta and Gamma radiation: Most radioisotopes employed in laboratories decay by either beta or gamma radiation. Beta radiation is non-penetrating and is easily stopped by a sheet of paper, except very high energies such as P^{32}. Its range in air is limited. Hazards arise only if beta-emitting isotopes are ingested, either by breathing or through the skin.

   Gamma radiation is penetrating radiation and as such, presents an external exposur hazard. This hazard is greatly dependent upon the energy of the gamma rays which are different for each isotope. Gamma rays have virtually unlimited range in air.

RADIOISOTOPE INFORMATION:

Isotope	Half-life	Max. Emission(KeV) Beta	Gamma	V.A. License Possession Limits
H^3	12.3y	18		2 curies
C^{14}	5.7 $x10^3$y	155		300 mCi
P^{32}	14.3d	1700		200 mCi
S^{35}	86.7d	170		100 mCi
Ca^{45}	165d	250		100 mCi
Cr^{51}	27.8		320	100 mCi
Tc^{99m}	6.0h		140	1 curie
I^{125}	60.2d	30	35	200 mCi

Isotope	Half-life	Max. Emission (KeV) Beta	Gamma	V.A. License Possession Limi
I^{131}	8.05d	610	360	300 mCi
Xe^{133}	5.3d	350	80	2 curie

UNITED STATES GOVERNMENT

Attachment No. 3

Memorandum

DATE March 14, 1979

TO All Research Personnel

1539

FROM Radiation Safety Officer (115)

SUBJ: Volatile Procedures Involving Radioisotopes

With the recent proliferation of iodinations and other volatile procedures, there is an increased risk of contamination.

The most important rule regarding such procedures: ALL VOLATILE, MILLICURIE-LEVEL, OR HAZARDOUS PROCEDURES MUST BE CONDUCTED IN A FUNCTIONING FUME HOOD.

BEFORE PROCEDURE

1. Open all packages containing millicurie-level or volatile material in a functioning fume hood. The hood should be lined with absorbant covering and changed periodically. You should be wearing gloves.

2. Assume that all secondary shipping containers (lead pigs, plastic containers, etc.) for volatile compounds are contaminated already. This frequently occurs during isotope processing at the company.

3. Usually the highest activity is handled when the final source container is opened. Always assume that the outside of this container is contaminated once it is opened, and handle accordingly.

4. Perform wipe test and/or meter survey of the shipment, record results, and send Radioactive Shipment Receipt Report to the RSO's office within 24 hours. This is outlined in the hospitals Radiation Safety Manual.

5. Remember to change gloves if a "clean" item is to be handled after the opening procedure.

6. Attempts to forsee what problems might occur during the experiment, including spills, and store the appropriate materials close to the work area. Some examples would be extra gloves and absorbent covering, radioactive warning tape, wipes, plastic bags, forceps, decontamination solution ("Count-Off" from NEN or "Isoclean" from Amersham) and spray foam for spillage containment (very effective). If a spill can be contained immediately, extensive contamination is less likely.

7. If you are planning to iodinate, take 5 drops of SSKI the day before and one hour before the procedure. This will effectively block thyroid uptake of radioactive iodine. Dilute the SSKI in water before ingesting.

8. Make a dry run. Before certain hazardous procedures are initially run, it is helpful to make a dry run without radioactivity or at reduced levels. This will identify exactly which materials and methods are needed, and space and time requirements. Most likely routes of exposure or contamination may be identified and adjustments to the procedure may be made to reduce the hazards.

9. Finally, make sure that everyone involved in hazardous or volatile procedures reads this memo thoroughly and file away or post this in a readily accessible location.

DURING PROCEDURE

1. Wear lab coat buttoned up, gloves, film badge and/or TLD finger ring (if applicable). TLD or thermoluminescent detectors are the most accurate type of dosimetry currently available. Their employment is very beneficial in determining short range radiation dosage to the hand from high activity or high energy sources (such as during an iodination). They are available free from Radiology Service, but as they are expensive, you must contact the Radiation Safety Officer first to discuss applicability in your situation. Both types of detectors will detect all commonly-used radioisotopes except H-3, C-14, and S-35. The minimum threshold energy for detection for the two dosimeters is 20 keV for gamma emitters and 200 keV for beta emitters.

2. DO NOT LEAN INTO THE HOOD! You are subjecting yourself to contamination when you pass the plane of the sash.

3. For iodinations, keep solutions as basic as feasible. This will minimize the release of free iodine.

4. Most inadvertant contamination of laboratory surfaces is caused by contact with contaminated work gloves. Nearly all isotope work will involve some direct handling of open isotope containers (though this should be minimized). Whenever this occurs, assume the gloves are contaminated. Change them immediately if a "clean" item is to be handled. Never wear the gloves away from the immediate work area after handling and check them frequently with a GM survey meter left "on" near the work area but outside the hood.

5. For isotopes presenting an exposure hazard (millicurie-activity or high-energy emissions), some remote manipulation will be necessary. Be advised that: FOR EVERY TEN CENTIMETERS YOU MOVE AWAY FROM A RADIOACTIVE SOURCE, YOU DECREASE YOUR EXPOSURE BY A FACTOR OF ONE HUNDRED. The use

of tongs, forceps, pliers, etc., will lower radiation dosage to the hands and reduce contamination spread via gloves. Metal implements should be rubber tipped for a more secure grip. These tools are likely to be contaminated and should be checked and cleaned after each use. If this equipment is to be used continuously for this purpose, it should be labeled and stored separately.

6. ABSOLUTELY NO PIPETTING OF RADIOISOTOPES BY MOUTH. The potential for a sizeable internal deposition is so great that it is required that one uses a hand-operated suction device.

7. All volatile liquid or dispersible solid waste must be kept in sealed containers inside the hood and then subsequently disposed of in the nuclear waste room of this hospital.

AFTER PROCEDURE

1. If there has been a spill or accident, implement decontamination procedures as outlined in the last section of the Radiation Safety Manual. In addition, contact the office of the Radiation Safety Officer, GB-67 Department of Nuclear Medicine, extension 461, as soon as possible. Do not spread contamination.

2. Volatile compounds and dispersible solids which do not have to be refrigerated or frozen must be kept in a hood and properly labeled. Those materials which must be refrigerated or frozen will be sealed in a primary and a secondary container. Two containments are necessary due to the heavy air circulation found in cold storage units. Regardless of the storage locale, those isotopes which present an external radiation hazard will be shielded such that there is less than a 5mR/hr exposure rate at contact of the shield.

3. Special storage considerations must be taken with HIGH ACTIVITY TRITIATED COMPOUNDS. Firstly, many tritiated compounds are volatile or dispersible and must be handled accordingly. Examples are tritiated water, tritiated aromatic compounds, solid tritiated borohydrides and electron detectors used in gas chromatography. Secondly, tritiated compounds tend greatly to exchange their tritium with hydrogen in surrounding surgaces. MIGRATION THROUGH PLASTIC is therefore to be expected due to its high hydrogen content. Tritium compounds, therefore, should be stored in glass or metal as a primary or secondary containment. There have been many instances of freezer or refrigerator contamination due to improper tritium storage. Freezer ice absorbs this volatile tritium contamination readily and should be checked periodically by wipe testing.

4. Wash hands thoroughly.

5. After all high-activity or volatile procedures, survey your entire body, equipment, work area, and surrounding work area (floors, benches, sinks, etc.) for contamination. Use a GM survey meter or wipe test (for H-3, C-14 or S-35 experiments). You will have slight contamination on the

sleeves of your lab coat. Treat accordingly. Also expect some contamination within the confines of the hood and bear this in mind before transporting equipment such as lead shielding out of the hood. Anything reading over background levels besides the hood or the designated "hot" sink warrants decontamination.

6. Internal ingestion of radioisotopes is an important aspect in terms of radiation hazards, particularly with beta emitters. This is because the radiation emissions are able to act on the body more efficiently at the cellular level. After an experiment utilizing volatile compounds, it is imperative to quickly assay the body's accumulation of the isotope by inhalation or skin absorption.

   Urinalysis will effectively detect a 5 microcurie whole body radioisotope ingestion. This is for a 1 ml aliquot of urine in 10 mls of Aquasol or any water compatible scintillation fluor. For detecting gamma emitters in a gamma well counter (1 ml of urine) the effective threshold is about 1 microcurie. This is because you do not have to contend with the problems of quenching and other efficiency detriments.

   Urinalysis will be done on all radioisotope workers employing at least microcurie amounts on a regular basis. For those utilizing radioisotopes sporadically, urinalysis will be done immediately following any major procedure. Urinalysis is absolutely required following any multi-millicurie or volatile procedure. Any 1 ml urine sample which reads 100 cpm or more over a background sample warrants investigation and should be called to the attention of the Radiation Safety Officer. Count the samples for the isotopes which you work with and long enough to achieve 95% reliability. In addition, any person whose bioassay for radioactive iodine reads 100 cpm or more over background will report to the RSO as soon as possible for a 15 minute thyroid scan to check for any thyroid uptake of radioisotope. RSO's Office-Nuclear Medicine, Bldg. 203, Rm. GB-67, extension 461.

7. If you have iodinated, take 5 drops of SSKI the day after your experiment.

8. ALL VOLATILE RADIOISOTOPES TRANSPORTED TO THE NUCLEAR WASTE DISPOSAL ROOM (Bldg. 6, Rm. 10) MUST BE SEALED IN AIR-TIGHT CONTAINMENT.

Thank you very much for your continued cooperation.

Christopher J. Jang

CHRISTOPHER J. JANG
Radiation Safety Officer

Attachment No. 5

UNUSUAL OCCURRENCE REPORT

1530

Date of Incident:

Date of Report:

Location of Incident:

Personnel Involved:

Laboratory Head/Radiation Safety Person:

Contaminating Substances:

Places of Contamination:

Decontamination Procedures:

Results of Radiation Survey:

Need NRC be Notified: Yes_____ No_____

RECOMMENDATIONS:

CHRISTOPHER J. JANG
Radiation Safety Officer

NOTICE

IN CASE OF

BREAKAGE, DAMAGE OR SHORTAGE

BREAKAGE OR DAMAGE

AIR FREIGHT, EXPRESS OR TRUCK DELIVERY

1. Notify the local agent of the transportation company immediately requesting examination.
2. Hold damaged goods with container and packing until examining agent has made an inspection report.
3. Send this report to Atomic Products Corp. along with the completed form on the reverse side of this paper.
4. We will send you instructions for the return of the damaged material.
5. We will replace the damaged material (subject to stock situation) and file claim from our end.

PARCEL POST SHIPMENT

1. Notify us by means of Report form on reverse side.
2. RETAIN item(s), container and packing until you receive instructions from ATOMIC PRODUCTS CORP. or U.S. POSTAL SERVICE.

UPS

1. Contact local UPS office regarding damage.
2. Retain container and packing.
3. Each UPS office has different methods of handling these occurrences and will advise you of procedure.
4. Notify us by means of reverse side form.
5. We will send you instructions for the return of the damaged material.
6. We will replace damaged material. UPS will inform us who is to file claim.

SHORTAGE

1. Recheck contents against quantities shown in shipped column. The apparent shortage may have been marked as an intentioned short shipped item and is on back order.
2. Inspect closely all packing material as small items may have been overlooked in packing material.
3. Notify us immediately giving us details and return this form with your letter.

NOTE: Unless the above procedures are followed and we are notified within 10 days we cannot accept responsibility.

DAMAGE REPORT

1530

Customer Name _____

Address _____

City _____

Person to Contact _____

Dept./Div. _____

Phone # _____ Ext. _____

Your purchase order number _____

Our invoice number _____

Date of receipt of shipment _____

Number of packages received in shipment _____

Parcel Post insurance #, if any _____

Name of delivering carrier _____

Person contacted at carrier _____

_____

Describe Damage _____

_____

_____

_____

_____

_____

_____

_____

DEVICE

MANUFACTURER & DISTRIBUTOR:

Kevex Corp.

MODEL DESIGNATION:

Kevex Scan II

ISOTOPE:

Americium 241, 10 Ci

USE:

X-ray fluorescence determination of amount and distribution of natural iodine in thyroid.

DESCRIPTION:

X-ray fluorescence is obtained with the 60 KeV radiation from an Americium 241 source, with the excitation radiation emitted in a focused beam through a multihole focused lead collimator; and the characteristic radiation is detected by a solid state detector. This arrangement of excitation source, collimator and detector is combined into an integrated assembly, denoted the "scan head," which is attached to the scan arm of commercial rectilinear scanners. The source and collimator are surrounded by a tungsten shield. The shutter for turning the beam "on" and "off" contains a tungsten insert, which is part of the shield. Visible indication of the shutter position (open or closed) is the physical position of the shutter. A light indicating the position of the shutter is available as an option. Another option available is a key-lock for locking the shutter in the closed position.

SEALED SOURCE:

Amersham/Searle sealed source Model AMC.W233, containing up to 10 curies of Americium 241, is used in the device. According to information from the manufacturer of the source:

1. The Americium 241 is in the form of an inert, leach-resistant ceramic which passes all standard tests for leakage-immersion and wipe tests in unencapsulated state.

2. The radioactive material is doubly encapsulated in stainless steel, sealed by welding.

3. Each source is labeled as to nuclide, activity, and serial number.

4. Tests demonstrated a USASI classification of C44444.

RADIATION LEVELS:

The manufacturer states that, with a source of 10 curies of Americium 241, the maximum radiation level at the surface of the source-collimator assembly is 2.5 mr/hr with the shutter closed and 200 mr/hr with the shutter open.

LABELING:

Labeling is as required by the AEC and Agreement States.

RADIOLOGICAL SAFETY BROCHURE:

The manufacturer sends with each device a brochure on radiation safety features of the device and recommended procedures for safe use of the device.

SERVICING:

The manufacturer provides services such as installation, consultation, any special maintenance which might be required, and repairs.

LICENSING:

Normal leak test intervals are recommended.

DRG. No. BRC 10197/S

THIRD ANGLE PROJECTION

Keevey.

USED ON

NOT FOR PUBLICATION
THE INFORMATION ON THIS DRAWING IS NOT TO BE COMMUNICATED EITHER DIRECTLY OR INDIRECTLY TO THE PRESS OR TO ANY PERSON NOT AUTHORISED TO RECEIVE IT.

JOB No.

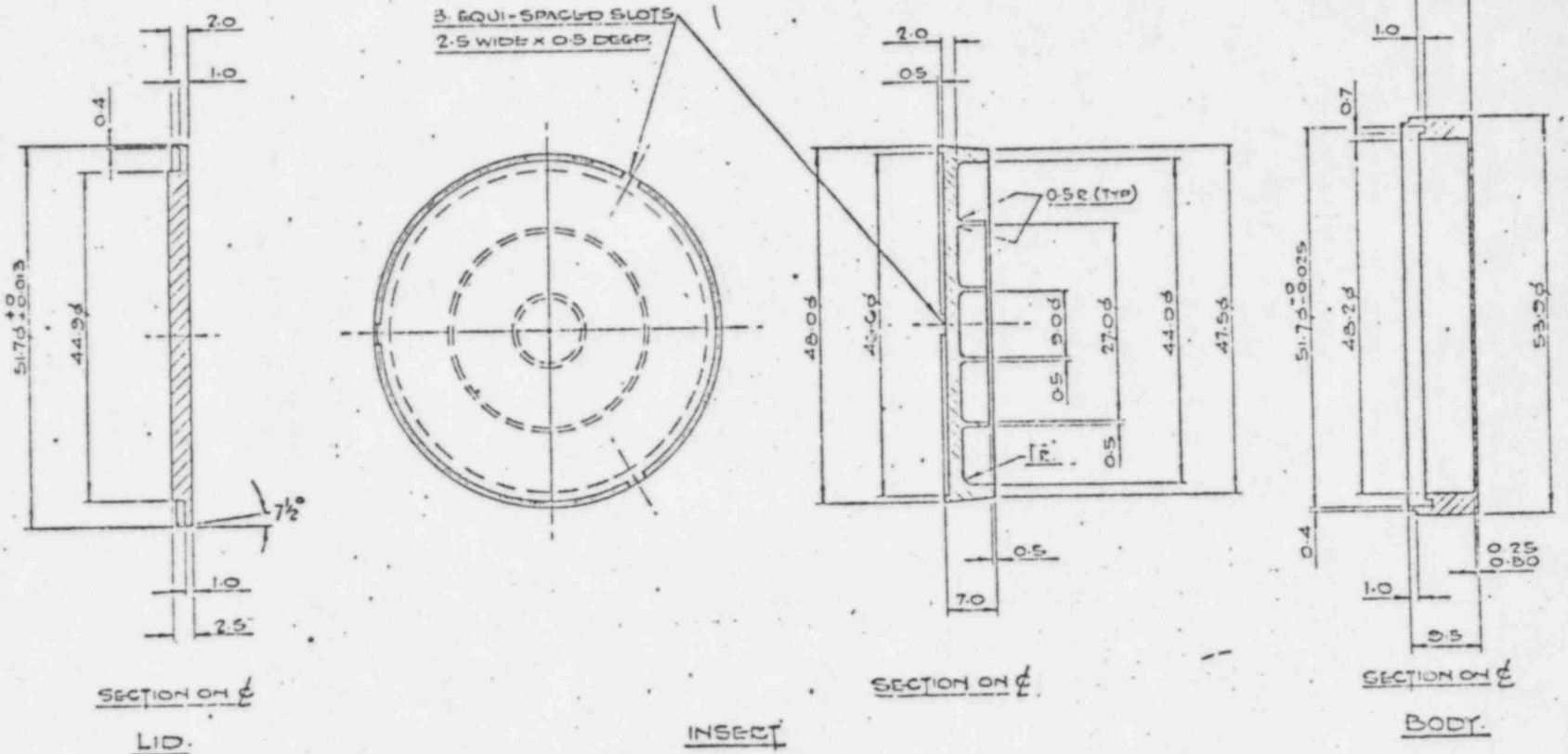
PROJECT No.

DRAWN ZN
H.E.L.

TCD.

CHKD.

APPD.



MATERIAL & SPEC. VACUUM MELTED ST. STL. EN58J OR AISI 316L	FINISH CLEAN	TOLERANCES ±0·05	THE RADIOCHEMICAL CENTRE AMERSHAM BUCKS	CONTRACTOR		
REMOVE ALL BURRS	SURFACE TEXTURE ▽ UNLESS STATED	DIMS. IN MILLIMETRES	TITLE Double Welded 50–10Ci Am 241 Capsule 14mm Act. Dia.		DRAWING No. BRC 10197/S	
		SCALE 2:1			D.O.I./MOD	A ISSUE 1957 DATE

KEVEX SCAN II X-RAY FLUORESCENCE HEAD , RADIATION PROFILES WITH LOADING OF 10 CURIE AM 241 LOADING .

MEASUREMENTS MADE WITH EBERLINE MODEL E 510 , AMPEREX THIN END WINDOW PROBE (3.5 MG/SQ. CM). INSTRUMENT CALIBRATED 12/28/73 TO COBOLT 60 .

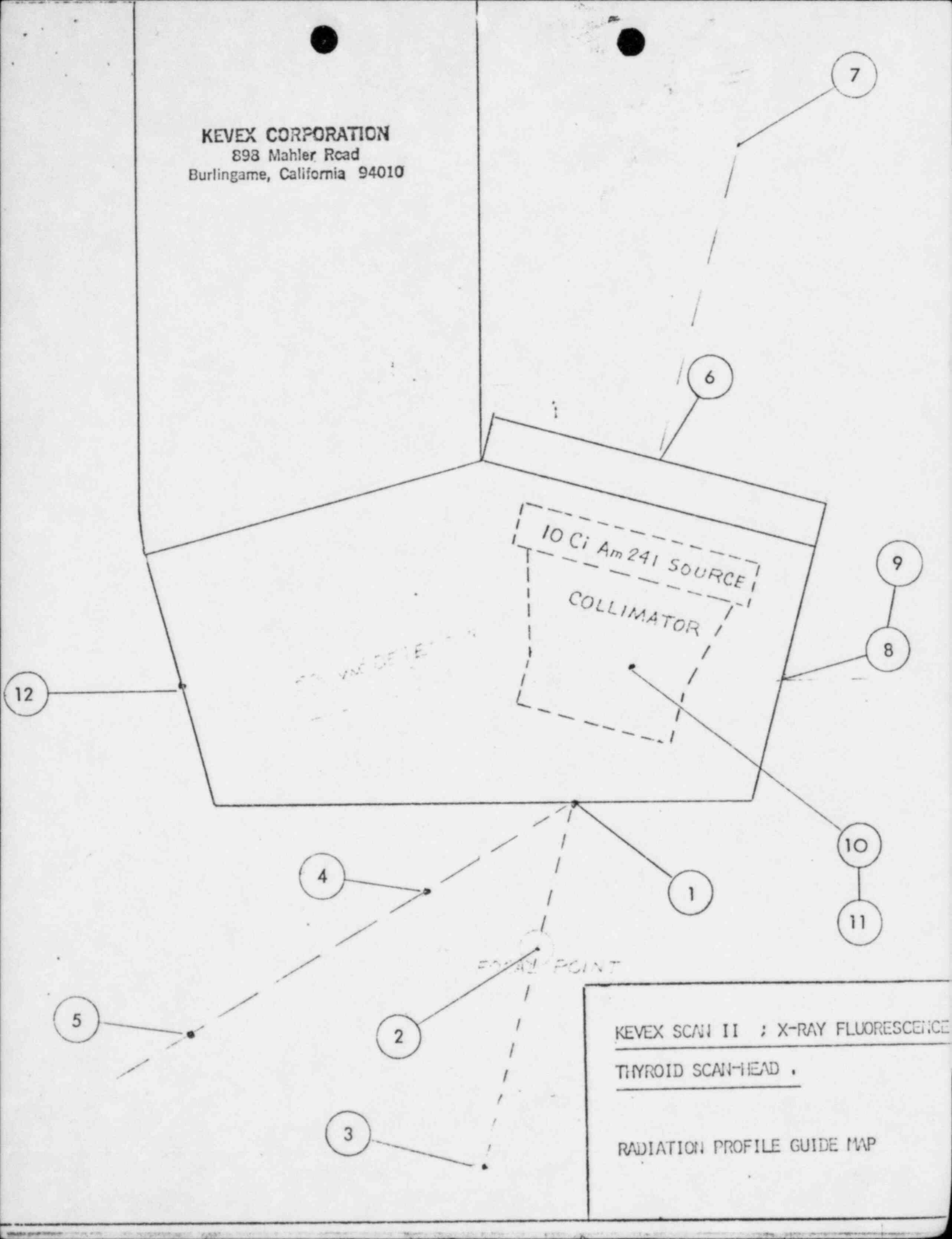
WITH REFERENCE TO NUMBERED GUIDE MAP , RADIATION LEVELS ARE AS LISTED :

MEASUREMENT POINT	SHUTTER CLOSED	SHUTTER OPEN
1. SURFACE LEVEL OF SHUTTER	1.2 MR/HR	200 MR/HR
2. COLLIMATOR FOCAL POINT		180 MR/HR
3. ON COLLIMATOR AXIS DISTANCE 1 FT.	0.1 MR/HR	16 MR/HR
4. 45° OFF AXIS , 2 INCH DISTANCE (SYMMETRIC)		.8 MR/HR
5. 45° OFF AXIS ,1 FT. DISTANCE		.06 MR/HR
6. LID SURFACE ,ON SOURCE AXIS	2 MR/HR	2 MR/HR
7. ON SOURCE AXIS , 1 FT. ABOVE LID	.08 MR/HR	.08 MR/HR
8. SURFACE ("FRONT")	2.5 MR/HR	2.5 MR/HR
9. "FRONT", 1 FT. DISTANCE	.08 MR/HR	.08 MR/HR
10. "SIDE" SURFACE (SAME LEFT AND RIGHT)	1.5 MR/HR	1.5 MR/HR
11. "SIDES", 1 FT DISTANCE		.03 MR/HR
12. "REAR" , SURFACE	.4 MR/HR	.4 MR/HR

SURFACE AND 1 FT. LEVEL MEASUREMENTS WITH SHUTTER OPEN WERE MADE WITH NO SCATTERER IN BEAM PATH EXCEPT AIR SCATTER , WHICH APPEARS NEGLIGIBLE

ROOM BACKGROUND LEVELS MEASUREMENTS WITH SYSTEM REMOVED : .02 MR/HR

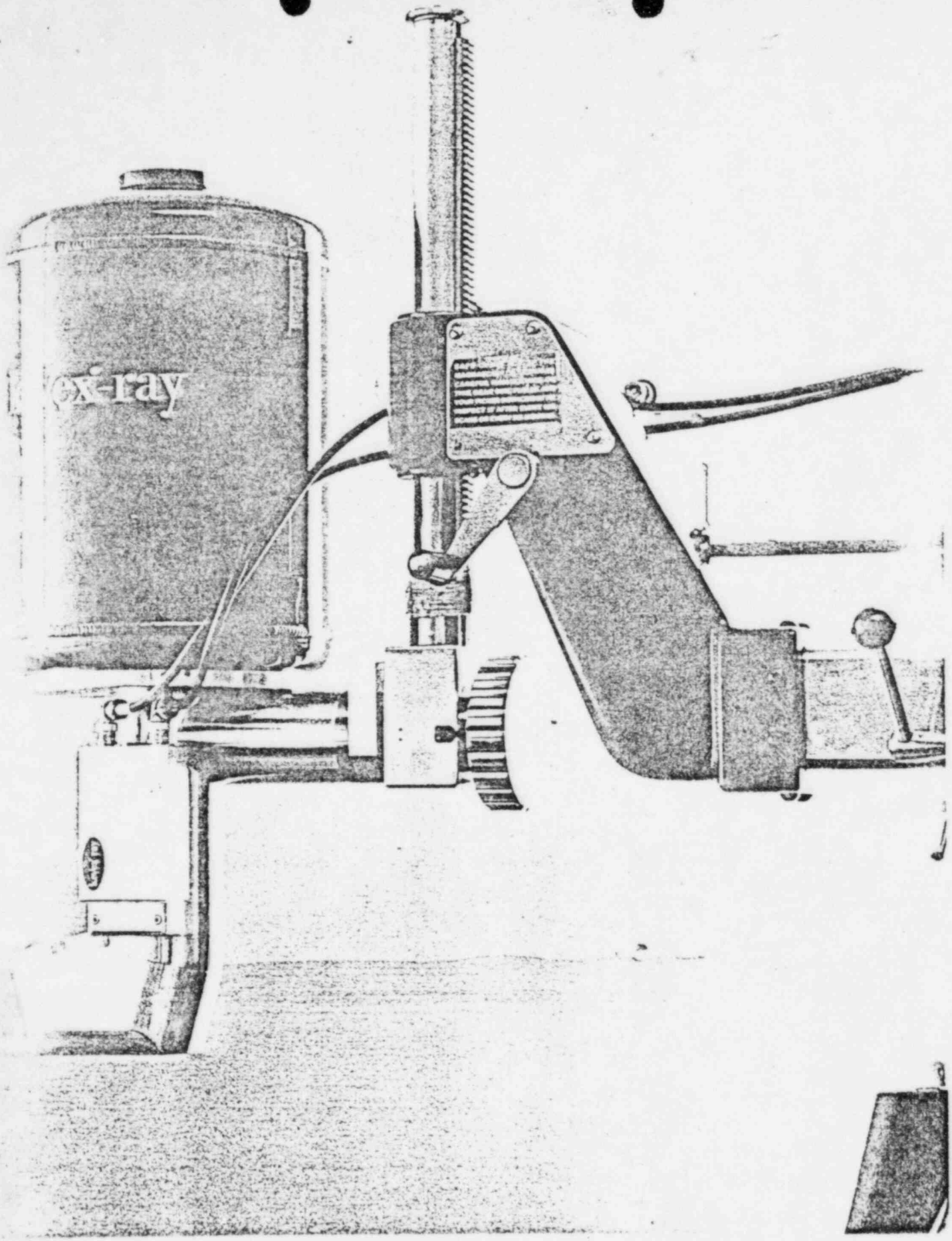
KEVEX CORPORATION
898 Mahler Road
Burlingame, California 94010



KEVEX SCAN II ; X-RAY FLUORESCENCE

THYROID SCAN-HEAD .

RADIATION PROFILE GUIDE MAP


ex-ray