STANFORD UNIVERSITY Stanford, California 94305-8006

HEALTH PHYSICS
Environmental Safety Facility
Oak Road
Phone: (415) 723-3201

Roland A. Finston, Ph.D.
Director
(415) 725-1404

May 4, 1987

United States Nuclear Regulatory Commission
Region V Office
1450 Maria Lane
Suite 210
Walnut Creek, CA 94596

Attention: Robert D. Thomas
Chief, Nuclear Materials Safety Division

Reference: License 04-23242-01
Docket 030-20404

Dear Sir:

Enclosed are two copies of a supplement to the Stanford University Radiation Protection Manual, 1982 edition, which we have prepared to include updated procedures related to radiation protection. The updated procedures include noting that the V.A. program is now licensed by the N.R.C., details on training, survey requirements, incident reporting, records, waste disposal information, and other relevant information. We have also included a new index to the Manual.

The update changes no policies previously discussed with the N.R.C. and much of the material presently is included in the "boilerplate" of the Hazards Evaluations. Thus we will be able to reduce the verbiage in the evaluations, which should make them more readable. The update was an interim step until we can complete a revision and issue a new Manual.

Please call if you have questions.

Sincerely,

Roland A. Finston

Roland A. Finston, Ph.D.
Radiation Safety Officer

FEE EXEMPT

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04-23242-01

STANFORD UNIVERSITY
HEALTH PHYSICS
ESF, OAK ROAD
STANFORD, CA 94305-8006

NRC Reg V

ACD 5/19/87

May 5, 1987

James W. Fletcher, M.D.
Director, Nuclear Medicine Services (115)
Dept. of Medicine and Surgery
Veterans Administration
Washington, D.C. 20420

Subject: Supplement to Stanford University Radiation Protection Manual, 1982 Edition: A matter germane to Palo Alto V.A.M.C. NRC License

Dear Dr. Fletcher:

We enclose for the purpose of forwarding to the Region V NRC office four copies of an Index and Supplement to the Radiation Protection Manual which is applicable at P.A.V.A.M.C. under its NRC license. Please note and forward two (or more?) copies to the NRC in our behalf, along with the explanatory cover letter.

Thank you for your assistance.

Sincerely,

Roland A. Finston

Roland A. Finston
Radiation Safety Officer

RAF:lc
Enclosure

5/11/87

JAMES W. FLETCHER, M.D.
Director, Nuclear Medicine Service (115)
Veterans Administration
Washington, DC 20420

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INDEX
*SUPPLEMENT (1987) references denoted by "S"

April 17, 1987

SUPPLEMENT TO 1982 EDITION OF RADIATION PROTECTION MANUAL

PREFACE:

This supplement to the 1982 edition of the Stanford Radiation Protection Manual (RPM) provides updated, additional information on policies and procedures and interpretations of license conditions which have occurred since the manual was last revised. We have also appended an errata sheet for the 1982 edition. We suggest that you make the corrections noted in your copy of the Manual and dispose of the errata sheet. The Supplement does not replace the Radiation Protection Manual which is still valid. A revised "INDEX" is enclosed to assist you in locating correct information.

Any questions should be addressed to the Health Physics Department, Environmental Safety Facility, Oak Road, Stanford CA, 94305-8006. Twenty-four hour emergency phone service, call (415) 723-3201.

Roland A. Finston

Roland A. Finston, Ph.D.
Director, Health Physics
(Radiation Safety Officer)
(415) 725-1404

October 1, 1982

STANFORD UNIVERSITY
RADIATION PROTECTION MANUAL
1982

ERRATA

NOTE:.....CORRECTIONS AND ADDITIONS: items are UNDERLINED_____

1. Page 14:

   columnar headings should be over quantities..... μCi,

   bottom.."Also":...Cobalt 57

2. Page 24:

   top "DAILY LIMITS TO SEWER"*

   columnar headings should be over quantities....μCi,

   bottom: "*NOTE: "For... H-3 as DNA BASES, Project limit is 100 μCi/day.
   I-125 and I-131 Limit is 100 μci/month

3. Page 73:

   bottom..."in the plastic"....bag

4. Page 81:

   "are to be restricted to less than the legal limits (See Regulations below).

COMMENT: Questions have been raised about the meanings of "R", rad, and "rem". These are defined in the Manual, definition section; however, in the campus context where X rays, gamma rays and beta particles are concerned, the units are nominally equivalent, i.e. exposure to 1 R results in deposition of 1 rad dose which as a dose equivalence of 1 rem. (For alpha and neutron doses this is not true because the quality factor must be determined and used to multiply the absorbed dose to obtain the dose equivalent in rems.)

I. LICENSE AGENCY

The licensing authority for the Veteran Administration Medical Center, Palo Alto is the the U. S. Nuclear Regulatory Commission, Region V Office, Walnut Creek, California. The Radiation Safety Officer for the V.A., named in the license, is Dr. Roland A. Finston. Stanford Health Physics supplies radiation protection services at the V.A. Medical Center and the Radiation Protection Manual is that used at Stanford. The programs are nearly equivalent, but there are important differences. Hazards Evaluations of individual Controlled Radiation Activities (CRAs) will note specific requirements which apply to a project. Copies of licenses and regulations are available at Stanford Health Physics.

II. PROJECT DIRECTORS (SEE R.P.M., SECTION II, "RESPONSIBILITIES AND ADMINISTRATION OF RADIATION CONTROLS".)

A. Stanford

At Stanford, a Project Director of a CRA must be qualified to be a Principal Investigator (PI) under a grant or contract. This usually means that the Project Director must hold an academic appointment. For those activities which are funded by grants or contracts, the PI must be the Project Director. Delegation of tasks and authority for radiation safety to another person in a project must be formal (i.e. specified in the project authorization) to be reviewed (and be subject to approval) by the responsible Committee. It is to be recognized that the PI remains ultimately responsible for safety in a project and must be listed as project director. The Panel on Radiological Hazards expects that any PI who utilizes radiation sources should become knowledgeable about hazards of radiation and controls of hazards, including policies and procedures regulating such hazards. The Project Director must directly participate in the initial and annual reviews.

Specific additional requirements for PIs of projects involving Human Uses of radiation sources are included in the Manual.

B. V.A. Medical Center

The Project Directors at the V.A. must be senior supervisory personnel, but are not required to hold faculty status at the University. Other information regarding PI status described in the paragraph above is applicable to the V.A.

III. PROTOCOLS AND OBSERVATIONS OF EXPERIMENTS

A. Projects are required to submit copies of current protocols involving use of radionuclides to Health Physics for inclusion with the information sent to the appropriate committee.

B. The Licenses to use radioactive materials require that significant experiments (i.e. using greater than "C" levels of materials; see "SURVEYS", below, for definition of "C" levels) being performed for the first time or by new users be observed by a Health Physicist. This will be done as a part of the initial and periodic project reviews.

IV. REPORTS OF INCIDENTS (SEE R.P.M. SECTION VII, "EMERGENCIES")

NEW PHONE NUMBER FOR 24 HOUR EMERGENCY ASSISTANCE: 723-3201

DEFINITION: A radioactive spill is to be considered "minor" if the amounts of material involved in the spill is less than the amount specified as an LAS in Table 3.1 of the R.P.M.

Spills which involve amounts of radioactivity greater than LAS levels are to be reported to Health Physics without delay. In addition, a record of the cause, response (clean-up and survey), and actions to prevent repetition are to be included in the Lab Radioisotope Journal.

V. TRAINING (SEE R.P.M., SECTION III, "AUTHORIZATION TO OBTAIN AND USE RADIATION SOURCES")

A. Training PRIOR to USE

1.Formal Training:

ALL persons must receive training prior to being allowed to use radionuclides, including basic radiation protection training by Health Physics.

A STATEMENT OF EXPERIENCE must be supplied to the responsible Radiation Safety Committee for persons who wish to use radionuclides. Personnel without substantial experience and/or previous formal courses in radiation protection must complete a seven hour course in radiation protection offered by Health Physics. Experience and training will be evaluated by Health Physics. Personnel whose training and experience meets standards set by the Panel on Radiological Hazards may complete examinations related to Basic Principles and/or University (VA Med Center) Procedures as an alternative to the course.

2. On-the job Training
Specific on-the-job training given by the Project Director, or his/her designate is required for each user on each protocol involving different uses of different radionuclides. The training shall also encompass the

specific survey techniques and record keeping methods in the lab. The completion of such on-the-job training is to be logged into the Radioisotope Journal.

3. Refresher Training

Each project shall hold a staff meeting (at least annually) wherein the status of radiation safety, including the contents of the Hazards Evaluation, are reviewed. A record showing the date, attendees and topics discussed will be filed in the Lab Journal. A copy of the record is to be sent to Health Physics. (The annual refresher training replaces the former five-year retraining requirements.)

VI. RAPID PURCHASE ORDERS (NEW)

The University has established a new (1984) system of purchase orders for low cost items, less than $500. The Rapid Purchase Order system EXCLUDES purchases of hazardous materials, such as radioactive materials. Continue to order all radioactive materials through Procurement Services, identifying the CRA number on the requisition.

VII. PERSONNEL DOSIMETRY (SEE R.P.M, SECTION V, "PERSONNEL PROTECTION -- RADIONUCLIDES, Personnel Monitoring")

A. Thyroid Survey Requirements

Persons exposed to I-125 are required to have initial and periodic thyroid surveys after working with volatile forms of radioiodine nuclides.

See the "Radiation Protection Manual" page 56.

Failure of any exposed persons (i.e. persons doing the labelling) to have the required thyroid counts is a serious violation of License conditions and may result in suspension or termination of an authorization.

1. Requirements to Obtain and Wear Dosimeters

Failure to obtain and wear body film badges and extremity dosimeters when handling activity levels exceeding 5 mCi of energetic beta emitters (e.g.P-32) or gamma emitters, including I-125, may result in suspension or (if chronic) termination of authorization of a project.

In some cases such dosimeters should be worn at 1 mCi levels, this need will be noted in the project authorization (e.g. CRA). Note that dosimeters must be returned in a timely manner.

When packages containing significant levels of activity (i.e. those requiring dosimetry) arrive, Health Physics will verify that a film badge account is currently established prior to releasing the package.

Note: Badges will not be issued to persons who have not completed required training. (See above.)

2. Informing Wearers of Results

Results of film badge monitoring must be circulated to wearers or posted where users can be informed of their doses.

3. Limitations of Dosimeters

Tritium, carbon-14 and sulfur-35 are nuclides that do not pose external radiation hazards; film badges will not detect the radiations from these nuclides. Film badges and ring dosimeters will detect radiations from mCi amounts of high energy beta emitters (e.g. P-32) or x-ray or gamma ray emitters (e.g. I-125).

4. Meaning of dosimeter readings:

Health Physics often receives calls from persons concerning their film badge readings. Either the person has worked with radiation sources and there is a "zero" reading, or the person has not worked with a source and has a recorded reading of 10-15 millirem.

The "zero" reading means that the net density of the film did not exceed the background control film reading by more than 0.01 density units. Since the response of the film is very dependent upon energy the minimum dose to produce such a reading varies with the kind and energy of radiation. The detectable levels are as follows:

a) I-125 and low energy X rays or gamma rays minimum dose is about 5 millirem

b) Cr-51 -- 10 millirem

c) High energy X ray or Gamma rays (of the order of 600-1000 keV) -- 10-20 mrem

d) High energy Beta particles (1.7 MeV max) -- 30 mrem

The reading process is subject to statistical variations which at low readings are a significant percentage of the reading. The readings are also biased to minimize the chance occurrence of false positives which means that many of the measured readings at very low doses are lower than the "true" level by amounts equal to the minimal detectable level.

The accuracy improves rapidly as the dose increases and the true dose nearly equals the reading at 100 millirems for gamma doses or 150 millirems beta dose. Nonetheless, occasionally false positive doses do occur at or near the minimum detection level.

TLD ring dosimeters also have a minimum detection limit; experience has indicated that the minimum accurately detectable dose to gamma or X rays is between 20-40 millirems. For Beta rays, the vendor indicates that the minimum detection limit is approximately 30 millirems.

Again, false positive readings will occur at low levels because the reading process is subject to statistical fluctuations similar to those of counting very low radioactive samples.

The interpretation of beta versus gamma (i.e. non-penetrating versus penetrating) radiations is not possible using a single chip of TL material as is found in the finger dosimeter. Hence, the dose is assigned arbitrarily based upon on a Health Physics evaluation of the kinds of sources and types of procedures carried out in the lab. If a particular dose is inaccurately interpreted, advise Health Physics.

5. Changes in Film Badge Records

Changes of readings of film badges is only allowed with the written approval of the State of California Department of Health Services. Extensive documentation is required to obtain such approval, thus it is not unusual to have a note entered in the personal record giving a plausible explanation of a small perceived inaccuracy of a recorded dose (where the explanation has been obtained from the individual) but leaving the dose on record, because there is insufficient evidence to have the dose purged from the record. Misuse of film badges, such as to monitor the dose in a primary X-ray beam or a high intensity gamma cell even though no person is in the radiant field, causes a false overexposure which requires reports to be written to the State. Call Health Physics, if you desire to make such measurements. Health Physics can often provide special dosimeters for such purposes. Dosimeters contaminated with radioactivity or left accidentally in a radiation field should also be so identified when returned for processing, because the resulting exposure may not be discounted or corrected without State approval.

VIII. VENTILATION REQUIREMENTS

The average velocity across the face of a fume hood when working with volatile radioactive materials is to be 100 feet per minute. For design purposes, i.e., new facilities, the face velocity should be 150 feet per minute through a minimal work opening (usually about 1/2 of the full opening or 15 inches) or 100 feet per minute through the fully open sash. These latter flow velocities are recommended by industrial

hygienists and by regulatory bodies for working with volatile carcinogens, including radionuclides. The first standard, i.e., 100 feet per minute, is mandated by the Nuclear Regulatory Commission for working with radioiodine.

IX. SURVEY REQUIREMENTS (ALSO, SEE R. P. M. SECTION V, "RADIATION PROTECTION -- RADIONUCLIDES, Radiation Surveys")

A. Required Documented Surveys by Project Personnel

Users are required to conduct surveys at the following frequencies:

	Campus	VAMC
Areas where "C" levels of radionuclides are handled:	monthly	monthly
Areas where "B" levels of radionuclides are handled:	weekly	weekly
Areas where "A" levels of radionuclides are handled:	daily	daily
Areas where "C" levels of radionuclides are stored :	quarterly,	monthly
Areas where "B" levels of radionuclides are stored :	every 2 months,	monthly
Areas where "A" levels of radionuclides are stored :	every 2 weeks,	every 2 weeks

"Stored" means no handling operations are going on.

"C" levels are activities less than/or equal to 100 times the LAS quantities, SEE TABLE 3.1 in the RADIATION PROTECTION MANUAL.

"B" levels are activities greater than "C" levels, but less than or equal to 10,000 times the LAS quantities, SEE TABLE 3.1 in the RADIATION PROTECTION MANUAL.

"A" levels are activities greater than "B" levels.

NOTES:

1. The proper instrument and survey techniques must be used. For H-3 use smear techniques; wipe surfaces at least 100 square centimeters in area and count the smear in a suitable counter (e.g. liquid scintillation system). Surveys for I-125 contamination should be made either by smears or with a survey meter equipped with a NaI scintillation probe, preferably with a thin crystal. (Note: A GM survey meter equipped with a thin-end-window probe cannot detect levels of I-125 at less than about 1 microcurie.) Surveys for contamination from C-14 or S-35 in unrestricted areas, floors, for example, should be made with smear techniques as described above. This is necessary because the contamination limits for unrestricted areas are lower than those permitted in the restricted area and the survey meter has a limited sensitivity.

2. A record of each required survey must be maintained in the Lab's Radioisotope Journal.

3. The survey is to include a sketch of the lab with measured radiation levels recorded in mrem/hr, and removable contamination levels recorded in microcuries or disintegrations/ 100 square centimeters. (Sketches of rooms are provided by Health Physics during the project reviews to serve as a basis for the internal survey program.)

4. The instruments used for the survey are to be identified, giving the serial number and also the date of the survey and the name of the surveyor.

5. A "User Survey Log" is to be completed for each room and posted therein. An entry is to be made on the "Survey Log" after each survey to indicate that the required survey was performed (this will be checked by the surveyor from Health Physics during routine audit surveys); the written survey is to be filed in Project's Radioisotope Journal.

6. Surveys are to be done at the end of a work day. Survey "areas" may be designated portions of labs where materials are stored or handled.

7. The survey shall also include a limited inspection for radiation hazards and violations of good practice. The sketches which are provided by Health Physics have a check list of items to be reviewed on the reverse side.

8. The locations of measureable radiation or contamination are to be indicated.

9. Corrective actions shall be taken when the following limits are exceeded.

a. CORRECTIVE ACTION SHALL BE TAKEN WHEN RADIATION IS FOUND TO BE EQUAL TO OR GREATER THAN 2 mREM/HR AT 1 FOOT FROM A SOURCE*.

* When personnel are routinely present in an area (for example, desk locations, etc) radiation levels should not exceed 0.2 mR/hr.

The usual corrective action would be to supply shielding or remove the source to a greater distance from occupiable areas.

b. CORRECTIVE ACTION SHALL BE TAKEN WHEN CONTAMINATION*** IS FOUND TO BE GREATER THAN:

Type of Area	Type of Radioactive Material		
	Low risk** beta or gamma ray	Beta or gamma ray	alpha
Unrestricted (including floors in radioisotope labs)	2200 dpm/cm^2	220 dpm/cm^2	~~22~~ 20 dpm/cm^2
Restricted (e.g work surfaces/ storage containment in radioisotope labs)	22000	2200	220

In a telephone conversation on 1/22/88, Dr. Roland Finston stated that the units on this table should be dpm/100 cm^2 and that the α release limit should be 20 dpm/100cm^2. - B.A. Riedlinger

** low risk materials include H-3, C-14, S-35, Tc-99m, Cr-51; NOT I-125, P-32, which are in the "beta or gamma ray" category. (Check with Health Physics for proper categories of other nuclides)

*** For fixed contamination the limits may be multiplied by 5.

The corrective action is to clean the area.

B. Problems Related to Surveys

1. Reporting Changes in Laboratory Usage

Users are required to inform Health Physics promptly of changes in rooms as radioactive laboratories or storage areas, i.e., discontinuation of usage or additional rooms, so that audit surveys can be performed by Health Physics. Release of such rooms for other unrestricted use depends upon removal of contamination to acceptable levels. The NRC requires that all discontinued labs at the VAMC be reported to the regional office.

2. Calibration of New or Repaired Survey Meters

Inform Health Physics when an instrument has been repaired or when new survey instrument is obtained, so that the instrument can be calibrated as is required under the license.

3. Survey meters are frequently mistreated resulting in damage to the G.M. tube.

Health Physics recommends that Project Directors orient lab personnel

in the proper use of survey instruments, including how to avoid damaging or contaminating the instruments. Health Physics maintains a list of recommendations for survey instrumentation; project personnel are free to contact Health Physics about instruments. Note: Our criteria include resistance to jamming, sensitivity, ability to detect various kinds and energies of radiation, reliability and ruggedness, availability of parts and service, and cost.

The Physics Department, Van de Graaff Engineer, maintains a small stock of parts for those instruments which are commonly used on campus He can be contacted (3-4617) for repair service.

4. Findings of P-32 and I-125 contamination in microfuges.

Contamination from P-32 and I-125 (or other nuclides) results from use of poorly capped microfuge tubes and/or the failure of lab personnel to check and clean the microfuge after use.

To alleviate this problem and reduce experiment error, some isotope users are utilizing tighter-sealing tubes marketed by Eppendorf, BioRad, and a screw top model from Sarstedt. The Sarstedt model (catalog a.2.692 for 1.5 ml) is particularly effective at preventing leakage as it employs an O-Ring seal in the cap. (Stocked in University Stores as of 3/87)

While such tubes are more expensive than standard models, they are worth the consideration of labs using significant amounts of isotopes such as P-32 and I-125. In all cases, however, an effort must be made to check centrifuges for spills following their use and to decontaminate them accordingly. All centifuges which may be contaminated should be labelled with standard "Radioactive Materials" labels.

C. Measuring Dose Rates from Beta Doses

The Radiation Protection Manual cites a correction factor (of 5) to be used to multiply GM "mR/hr" readings to correctly estimate the absorbed dose rate in mrad/hr from high-energy (greater than 1 MeV maximum) beta spectra. We have recently reviewed the assumptions which lead to estimation of this factor and find that for many of the thin-end-window GM survey instruments in use on the Campus the factor is incorrect. The ElScint readings will be approximately correct, i.e. 1 "mR/hr" = 1 mrad/hr (correction factor = 1). Many of the "pancake" GM probes (2 inches in diameter) will tend to over-respond, i.e. a reading of 1 "mR/hr" will be less than 1 mrad/hr (correction factor less than 1). Side-window tubes and end-window tubes with different diameters will will respond differently. The principal function of a GM survey meter when applied to survey of high-energy beta emitters is to be an indicator of the presence of material. The "dose rates" measured are not likely to be highly accurate. Application of the meter readings to

assessment of dose rates from low-energy beta spectra (less than 0.5 MeV maximum) is very doubtful.

D. Limitations of Survey Meters for Measurement of Low Energy Beta and Gamma Emitters

H-3 and I-125 (in levels of activity less than 1 microcurie) are not readily detectable with GM-Survey methods. For H-3 the "acceptable" survey technique may be smear surveys using a liquid scintillation counter; for I-125 use of a NaI scintillation detector, which has a high efficiency for measuring low-energy photons, is necessary to screen potentially contaminated items. Projects which routinely utilize millicurie quantities of I-125 in labelling will be expected to have a suitable scintillation type of survey meter available. To survey for C-14 or S-35 contamination in unrestricted areas, including floors in labs, it is necessary to use smear techniques such as those described for H-3 surveys, above.

X. RADIOACTIVE WASTES (SEE R.P.M., SECTION IV, "DISPOSAL, TRANSFER AND ACCOUNTABILITY")

A. Definition

"Radioactive wastes" include any items which contain radioactivity distinquishable as being above background levels, where the material has been measured with an instrument sensitive for the nuclides being assayed, set on its most sensitive scale and with no interposing shielding.

Radioactive wastes may be interpreted as follows:

H-3 C-14, S-35 and I-125 are not readily detectable with GM-Survey methods at the limits which must be met for release of the items to unrestricted areas. Hence, items which are in the work area where these or similar unsealed materials are present must be assumed to have been contaminated, unless they are assayed by an acceptable method. For low-energy beta emitters the "acceptable" technique is smear surveys using a liquid scintillation counter; for I-125 use of a NaI scintillation detector is necessary to screen potentially contaminated items. Proven decontamination techniques may be used for cleaning items with low-levels of contamination, this can reduce the need for item-by-item surveys.

If the items have not been decontaminated and assayed, they are to be treated as radioactive -- hence, reduce the number of items requiring surveys by keeping radioactive work areas free of unnecessary items.

B. Storing Radioactive Wastes to Decay

To store radioactivity to decay in the lab, it is necessary to have an approved protocol describing the radioactive materials to be treated in the laboratory by decay. The application must specify the areas used to store wastes, as well as the methods used to monitor decayed wastes. In-lab storage to decay will be limited to radionuclides with half lives less than 19 days.

NOTES: The NRC requires wastes to be stored a minimum of 10 half-lives. The survey shall be such that the radiation is indistinguishable from background. All radiation warning labels are to be removed or obliterated before disposing of waste into general trash. The Lab Radioisotope Journal shall include a section of records showing placement of items in storage (dates, activity, nuclides), and surveys of clearance (date, measurements of each container, background reading, instrument ID, indication of label removal, disposition of materials, name of surveyor.)

C. Segregation of Wastes by Half-life in Preparation for Disposal Through Health Physics

Segregate all radioactive wastes by half-life of the nuclides in the wastes as follows: (Only 1 class is permitted in a dry waste container).

Classes:

1. H-3 and C-14 only
2. Half-lives less than 19 days (e.g.P-32)
3. " " greater than 19 days but less than 65 days (e.g.I-125)
4. Half-lives greater than 65 days but less than 90 days (e.g. S-35)
5. Half-lives greater than 90 days

D. Bulk Liquid Scintillation Cocktail Wastes

BULK SCINTILLATION FLUID containing less than 0.05 uCi of H-3 or C-14, ONLY, per gram of fluid may be collected in gallon bottles. Higher concentrations or other radionuclides must not be put into these containers. Fluid concentrations will be monitored by Health Physics. All fluids with concentrations higher than the above limits will be returned to the originator.

Bottles must be stored in unbreakable secondary containers which are large enough to hold the entire volume of liquid in the event of breakage. The cardboard shipping box that the solvents came in should be retained for Health Physics to use to transport the bottles at the time of pick-up.

E. Wastes with Special Hazards

All PATHOGENIC OR INFECTIOUS MATERIALS must be deactivated prior to disposal as radioactive waste. Methods must be described by the project and reviewed and approved by the appropriate committee. Methods include autoclaving and treating with chemicals (formalin, carbolic acid, bleach, or similar materials.) Note that such wastes may be especially difficult to deactivate, when contaminated with I-125 or I-131 in volatile or labile forms, because heat and strong bleaches may drive off the radioiodine vapors presenting airborne hazards or contaminating equipment. The project staff should review the potential methods with Health Physics. Note that wastes have been treated for pathogens or infectious agents on the log sheet, persons handling such wastes need to be informed in the event that viable, residual organisms may be present.

SHARP ITEMS, contaminated with radioactive materials, are to be placed in specially identified "Sharps" containers, bearing radioactive warning labels. Waste logs shall be kept on the "sharps" containers.

LEAD must not be placed in dry radioactive waste boxes, because radioactive wastes may be processed by incineration and lead may not be incinerated since it produces toxic fumes.

F. Records of Sewer Disposal

Note also that each disposal to the sewer is to be logged giving date, activity, form, name of disposer. This information is to be placed in the Lab Journal; the properly completed "Daily Use Log" entries constitute an adequate record.

G. Denaturing of H-3 Labeled DNA precursors

Projects may submit (for appropriate approval) procedures to chemically denature H-3 labelled DNA bases. Upon approval the project may discharge the denatured products to the sewer under the normal H-3 activity disposal limits. (See Table 4.1 of the Radiation Protection Manual.)

H. Sewer "Compatable" Liquid Scintillation Fluor

Packard Instrument Co. "OPTI-FLUOR", Research Products International "BIO-SAFE", National Diagnostic "ECOSCINT", Westchem "ECOLITE", Beckman "READY-SAFE" scintillation fluids are considered by E.P.A. not to be hazardous waste. They may, therefore, be discharged to the sewer PROVIDED that the nuclide concentrations are less than the daily limits for disposal to sewer (see Table 4.1 of the Manual).

THESE ARE THE ONLY BRANDS OF SCINTILLATION FLUID THAT MAY BE DISPOSED OF THIS WAY. Check with Health Physics regarding claims of other manufacturers to validate that they may be disposed of similarly before disposing of them to the sewer.

NOTE: Be sure to run an adequate flow of water into the sink while disposing of the cocktail in order to prevent clogging of the drain.

I. Charges for Radioactive Waste at the V.A.M.C.

VA projects with University funding will need to enter their 12 digit University account number on the waste pick-up/log when it is sent to Health Physics. Likewise, such account numbers must be entered on yellow tags that are attached to animal waste when such materials are placed in the drum in Cold Room 1E-504.

VA projects without University funding must have a Purchase Order issued by the VA Supply Service prior to the pick-up. The VA prohibits furnishing the pick-up service before the P.O. is issued. The P.O. must clearly stipulate the kind of waste (dry, liquid scintillation, animals), the quantity (number of boxes, trays), and the room where the waste is located. Send the log sheet to Health Physics; continue to tape trays together and indicate the nuclide, activity and solvent for liquid scintillation cocktails. For animal wastes, indicate on the yellow tag: the nuclide, activity and date plus the CRA number and the phrase "VA P.O. applied for (date)".

J. Common Problems Observed Related to Radioactive Wastes

1. Radioactive waste in non-radioactive (general) trash containers.

This finding reemphasizes the need to survey items in and around radioactive work areas prior to disposing of the items. The State Department of Health Services may impose fines or charges for searching dumps when radioactive waste is improperly disposed to a sanitary land fill.

2. Failure to provide secondary containment for liquid scintillation bulk wastes or other liquid radioactive waste solutions.

This practice has led to several spills per year. Place all such bottles in secondary containment - e.g. pail or bucket made of a suitable material. (Health Physics will furnish such containers at cost.) Keep such waste in a well-ventilated area, e.g. a fume hood. Observe proper fire safety practices (Health and Safety can assist on the last item.)

3. Failure to properly record disposals of radioactive wastes on waste log sheets.

External radiation readings are found on boxes whose labels indicate presence of traces of H-3 only. Entries should be made at the time that materials are being disposed to maintain an accurate log.

See Radiation Protection Manual, pages 25-26

4. Box Flaps in Boxes

Waste box flaps should not be pushed down into the contents of the box. This makes retrieval of the flap difficult, and increases the potential for contaminating the box, one's hands and the lab.

5. Disposition of pink copies of waste logs

The pink copy of the log assists the Health Physics technician in identifying the correct waste container. The pink copy of the log sheet should be retained on the box until the waste has been picked up, since it is the only current inventory of the contents of the waste container.

6. Failure to deface "Radioactive Materials" warning labels on shipping containers prior to disposal.

See Radiation Protection Manual, page 70.

Use a marking pen or crayon to cross out these labels, since finding such a labelled box in the trash precipitates unnecessary emergency responses to check dumpsters, trucks and the sanitary landfill site.

7. Free standing liquids in dry radioactive waste containers.

This violation could result in suspension of the University's burial privileges at the disposal site. No bottles or vials containing liquids are permitted in dry waste boxes. Boxes are inspected; those found with liquids will be returned; repeat violations will result in suspension of projects, pending committee review.

XI. SECURITY (Change in policy adopted by Panel on Radiological Hazards 8/84.)

Continuing policy:

Whenever radioactive materials are stored in public areas, such as freezers, refrigerators, cabinets, etc. located in building corridors, said freezer, refrigerator, cabinet must be locked when unattended. Radiation levels emanating from such a storage area must not exceed any of the limits for uncontrolled areas (i.e. 2 mR in one hour or 100 mR in one week (168 hrs), or 500 mR in one year (8760 hrs).

Additional Requirements:

Individual amounts of radioactivity exceeding 10,000 times the "Low Activity Quantities of Radionuclides" (Radiation Protection Manual, page 14)** must be kept secured when not in use. All such items are to be kept in rooms which are locked when not occupied, or in locked containers in a room, or if the item is in a refrigerator or freezer in a locked container inside of the refrigerator or freezer (unless the refrigerator /freezer is already kept locked).

The Principal Investigator (PI) is responsible for auditing (inspecting) the item(s) routinely to ensure that all of the material is present or accounted for and that Health Physics is promptly informed of any discrepancies. A visual check of the volume or a check of the radiation level in a reproducible geometry with a survey meter are possible ways to perform the audit.

** Note that these quantities are capable of causing prompt serious injuries; hence, increased controls and audits are appropriate.

V.A. Medical Center

The Nuclear Regulatory Commission requires the any controlled area be secured (locked) when unoccupied. An Inspector will cite the institution when any radioisotope lab is found to be unlocked and unoccupied. If a lab is part of a suite or area which is locked, or access to which is under the direct observation and control by an individual (e.g. receptionist) who restricts access to the facility, the individual labs need not be locked.

XII. POSTING (SEE R.P.M., SECTION V, "RADIATION PROTECTION -- RADIONUCLIDES, Posting and Labelling Requirements".)

A. Foods in Labs Where Radionuclides are Used or Stored

AREAS WITHIN POSTED LABORATORIES WHERE FOODS ARE PRESENT MUST BE POSTED PROHIBITING RADIOACTIVITY,

AND

SUCH AREAS MUST BE AT LEAST 1 METER FROM RADIOACTIVE WORK AREAS OR OTHERWISE SEPARATED BY A PHYSICAL BARRIER.

B. Storage Area Log Signs

The primary purpose of the log sign affixed to radioactive materials storage areas is to provide guidance to persons when there is a spill or incident involving the storage area. The log sign may be used to provide an accurate log of the materials in the area, but this is not required. The sign should at least be used to simply indicate the nuclides and the maximum activities of the materials which typically may be present. An evaluation of the "maximum" quantities is to be made annually and the logs updated accordingly.

XIII. PREGNANCY AND THE RADIATION WORKER (SEE R.P.M., SECTION VI, "POLICIES, LIMITS AND REGULATIONS".)

Questions have frequently arisen regarding risks to the fetus due to in utero radiation exposure while the mother-to-be is working with radiation sources.

A. In general, exposures experienced by the mother-to-be in the context of most uses of radioisotopes on the Campus are well below the recommended guidelines of 0.5 rem to the fetus over full term. (The fetus will usually receive less dose than the mother-to-be).

B. The calculated risk associated with the fetus receiving a dose of 1 rem are believed to be less than 1 in 1000 additional risk of childhood cancer or birth defects. The normal risk of both defects is approximately 5 in 100 (at least 50 times greater). Thus the additional risk to the fetus carried by a radiation worker is small -- even when an exposure to one rem occurs, which has not happened on the campus to date.

C. Some additional risk to the fetus could occur if the mother-to-be inhales or ingests radioiodine. This could expose the fetal thyroid gland, which begins to function after about the 12th

week, to radiation from the iodine deposited therein. Also, exposure to a baby's thyroid could occur if a nursing mother inhales or ingests radioiodine, which then is excreted in milk.

D. In some cases it may be possible to take extra precautions to reduce the potential of exposure by wearing leaded aprons, using improved shielding, working more efficiently during exposure, wearing double gloves, etc. It may be practical to rotate those duties which have higher exposure potential to other persons -- however, this will depend upon the nature of the tasks to be performed in a lab and the availability and skills of the persons involved. This is a management option. There is no guarantee that an alternate assignment will be available.

Any worker exposed to ionizing radiations as part of their job who is pregnant, or planning to become pregnant, is urged to review the exposure potential and associated risks and methods of reducing exposure with their supervisor and with the Director of Health Physics.

XIV. RECORDS

A. Daily Usage Logs

When a shipment of radioactivity has been inspected by Health Physics, a "Daily Usage Log" sheet will be attached. Users are required to complete this sheet by making entries each day that the material is used. It will be acceptable for a project to use a different form or format, if the equivalent information is recorded. The sheets are to be maintained in the Lab Radioisotope Journal. It is not acceptable to maintain these records in individual experimenters' notebooks.

B. Summary of Records Which Must be Maintained by the Project in the Lab Radioisotope Journal

Note: Journal is to be available for inspection at any time during normal working hours; project staff should know where such records are kept. Records should be maintained until disposal is authorized by Health Physics. Call Health Physics to ascertain whether particular records may be discarded. The "Journal" shall be a consolidated record containing all of the relavent items kept in one or more volumes at one location.

1. Authorization

a. Copy of Current Authorization
b. List of Persons Authorized to use Radioactive Materials (specifying nuclides which persons can use)
c. Radionuclide Safety Data Sheets
d. Project Ordering/Receiving Procedures
e. Usage Protocols and Lab Safety Rules

2. Accountability

   a. Daily Usage Logs -- Each receipt, use, disposals (including sewer) and transfers.
   b. Quarterly Inventory Summaries -- The Users are responsible for updating the forms and returning them to Health Physics within 30 days of receipt.
   c. Disposals to Health Physics
   d. Wastes in Storage to Decay

3. Survey Records

   a. Project Lab Work (Storage) Area Surveys
   b. Project Surveys of Animal Work Areas
   c. Audit Surveys (by Health Physics)
   d. Surveys of Wastes held to Decay
   e. Surveys of spills
   f. Leak Tests of Sealed Sources
   g. Calibrations of Instruments

4. Personnel Exposures

   a. Film Badge Records
   b. Bioassay Records
   c. Investigations of Exposures

5. Training Records

   a. Dates of Training of Personnel to Perform Specific Radioisotope Protocols (training by project staff)
   b. Dates of Formal Radiation Safety Training
   c. Record of Annual Project Meeting on Radiation Safety (date, attendees, topics)

6. Incidents -- Spills, Overexposure, Losses of Materials