

Radiation Badge Representative Reference Manual



Vanderbilt Environmental Health & Safety

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www.safety.vanderbilt.edu

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Badge Representative Responsibilities

Badge distribution each month or quarter

Each badge representative is responsible for ensuring that employees in their department assigned a badge receives a new badge every month or quarter and the old badge is returned by the 5th of the following month. You will receive your new badges by the third week of the month. **Mark off the names of the individuals on the packing slip as you collect the badges. Please make sure the packing slip is included with the badges you are returning to VEHS. Note any deletions on the packing slip.**

All old badges must be returned to Vanderbilt Environmental Health & Safety (VEHS), (Attention Carly Crowell) by the fifth of each month. If the fifth falls on a weekend, then the badges will be due the following Monday. The badges can be mailed to U-0211 MCN 2665, or delivered to U-0211 MCN or 008 Peabody Education Library. VEHS will return all badges to Landauer. VEHS will charge a \$10.00 late fee for each badge not returned by the 5th of the month. This fee is in addition to the \$3.00 fee Landauer charges for unreturned badges. If you have any unused badges, leave them in the sealed bag and mark them "unused". Your department can be credited for any badges that have not been used as long as they are still in the sealed bag and marked unused. Please note that VEHS must be notified any time there is a change in badge representatives to ensure the badges are getting to the appropriate person.

Badge Reports

1. Monthly Badge Reports will be mailed to the badge representative and must be posted in an area accessible to employees who have been issued badges. These reports must be kept current.
2. Annual Radiation Dose Reports must be distributed to employees. The badge representatives must obtain a signature from each employee who receives a report and the signature list must be maintained on file.
3. Anyone who receives a radiation badge may request a copy of their dose reports at any time. Only written, signed requests for badge reports will be processed.

Billing

The badge representatives are responsible for ensuring that all dosimetry bills are paid in a timely fashion. Tardiness or failure to pay a bill could result in other penalties.

Badge Representative Alternate

Each badge representative must designate an alternate badge representative who will perform the functions of a badge representative whenever he or she is not at work (ie. due to illness, vacation). The alternate must satisfy the training requirements of a badge representative. If the badge representative quits, the alternate will provide continuity.

Badge Forms

Each badge representative should have a copy of all the forms listed below. Except for the packing slip, all forms are available on our web site (www.safety.vanderbilt.edu). The badge representative should review all forms for completeness before sending them to VEHS. The forms can be faxed (3-4951), mailed (U-0211 MCN 2665), or brought to our office (008 Peabody Education Library).

1. Radiation Dosimeter Registration Form – A new employee needing a badge will need to complete the **Radiation Worker Registration** form. This form will also need to be signed by the Badge Representative or alternate. If the employee has ever been monitored for radiation anywhere other than Vanderbilt, they will also need to fill out one copy of the **Past Exposure History Release Letter** for each location where they were monitored. VEHS will review the application to determine if a badge will be issued.
2. Changes
If there are any changes that need to be made: name change, department change, etc. the employee needs to fill out the Replacement/Change Radiation Monitoring Badge form.
3. Packing Slip
If an employee leaves Vanderbilt or no longer needs a badge, the badge representative should inform VEHS by either sending the *packing slip* with the employee's name and badge number marked through, or by sending a signed memo with the employee's name and badge number by fax or through campus mail.
4. Pregnancy
An employee may voluntarily declare her pregnancy in writing, by completing the Declaration of Pregnancy form. Completed declaration of pregnancy forms need to be forwarded to the Occupational Health Services office located in 640 Medical Arts Building

Occupational Dose Limits

EXPOSURE IS LIMITED TO THE LESSER OF EITHER:		
The Total Effective Dose Equivalent (TEDE)	5 rem/yr	(0.05 Sv/yr)
<i>or</i>		
The sum of the Deep Dose Equivalent (DDE) and Committed Dose Equivalent (CDE) to any individual organ or tissue other than the lens of the eye	50 rem/yr	(0.50 Sv/yr)
Shallow Dose Equivalent Whole Body (SDE, WB)	50 rem/yr	(0.50 Sv/yr)
Shallow Dose Equivalent Maximal Extremity (SDE, ME)	50 rem/yr	(0.50 Sv/yr)
Lens Dose Equivalent (LDE)	15 rem/yr	(0.15 Sv/yr)

DOSE FOR WORKERS UNDER 18 YEARS OF AGE:

For workers under 18 yrs of age the limit is 10% of the above limits.

DOSE TO AN EMBRYO/FETUS:

For the fetus of a declared pregnant woman (DPW) the limit is 0.5 rem (5 mSv) for the entire gestation period. *This limit only applies to a DPW.* A DPW is defined as a woman who has voluntarily informed her employer, **in writing**, of her pregnancy and the estimated date of conception. Declaration forms and counseling are available from the Occupational Health Services and Environmental Health and Safety offices. Forms should be submitted to the Occupational Health Services office.

ALARA:

The above limits are the Maximum Permissible Doses (MPDs) allowed by regulations. However, all doses should be maintained As Low As Reasonably Achievable.

Exposure received as a patient during medical exams and exposure received from natural background are not to be included within these limits. Dose limits given are those of the Nuclear Regulatory Commission and the State of Tennessee.

Who Is Monitored

Personnel monitoring badges must be worn by anyone who may exceed 10% of the maximum dose limits. Badge application forms may be obtained from the Environmental Health & Safety Department. Badges are not issued to persons who are exposed only to low energy beta radiations nor, ordinarily, to individuals who work with less than 100 μCi of other isotopes. Monitoring badges cannot detect low energy betas (less than 0.25 MeV) from isotopes such as ^3H , ^{14}C , ^{35}S , ^{45}Ca , and ^{63}Ni . Radiation badges are also usually not issued to individuals who use less than 4 mCi of ^{125}I because the radiation levels from this isotope are relatively insignificant. These isotopes are internal hazards only; their presence in the body is detectable only with bioassay procedures.

Ring badges are issued when there is a potential of high exposure to the hands such as to individuals who work with millicurie amounts of ^{32}P , to personnel in Nuclear Medicine, to brachytherapy source handlers, and to users of x-ray equipment who may receive high exposures to their hands.

Permanent copies of personnel dosimetry reports are maintained by the Radiation Safety Section. Copies are also distributed monthly or quarterly to the various departmental badge representatives. The RSS will also notify you if you exceed a certain percentage of the maximum permissible dose.

Responsibilities Of Badge Users

1. Your radiation badge must be worn at all times when you are working with or in the vicinity of sources of ionizing radiation.
2. The badge reading is a legal record and must reflect occupational exposure only. Therefore the badge shall be worn only by the person to whom it was assigned, shall not be tampered with or experimentally irradiated, and shall not be used to measure any radiation exposure you may receive as a medical patient.
3. Monitoring badges are issued at monthly or quarterly exchange frequencies. Badges are distributed and collected by departmental badge representatives. It is your responsibility to exchange your badge on time with your badge representative.
4. Persons required to be badged must have complete records of their occupational exposure for the current year, i.e. no "gaps" are allowed in their personnel dosimetry records. If a badge is lost, a replacement badge must be obtained from the Environmental Health & Safety Department and a Missing Badge Report completed so that an estimated exposure may be assigned.
5. Badges should be worn on chest, collar, or belt so as to indicate "whole body" exposure. If a lead apron is worn the badge should be worn at collar level outside the apron so that exposure to the head is monitored.
6. Ring badges should ordinarily be worn on the palm side of the hand to best monitor the exposure received from handling radionuclides. If wearing gloves to prevent contamination to the hands, the ring badge should be worn *under* the gloves.
7. Do not leave badge in direct sunlight or near a source of heat. At the end of the work day badges should be left in a location where they will not be exposed to radiation.
8. If you work at locations outside Vanderbilt where you receive occupational exposure to radiation, you must be badged by all employers. Notify the Radiation Safety Officer at Vanderbilt and at the other locations. The maximum permissible occupational dose limits apply to the sum of the doses received at all locations.
9. Examine your personnel dosimetry reports on a regular basis to assure that your readings are ALARA (As Low As Reasonably Achievable).

Badge Forms

These forms are all available from the VEHS web site.

Radiation Dosimeter Registration Form
Past Exposure History Release Letter
Replacement/Change Form
Declaration of Pregnancy
Undeclaration of Pregnancy Form
Vanderbilt Past Exposure Request Letter

**Vanderbilt University
Radiation Worker Registration Form**

Before working with radiation sources, a radiation worker must satisfy the training requirements as outlined in the Vanderbilt University Radiation Safety Manual.

(Signature required on reverse side.)

A. Radiation Worker Identification Information (PLEASE PRINT CLEARLY)

Last Name: _____ First: _____ M.I.: _____

Date of Birth: _____ Social Security Number: _____ Sex (M/F) _____

Department: _____ VU Dept. Mailing Address: _____

Principal Investigator: _____ Dept. Phone # _____

B. Radiation Exposure Information

1. Fill out the back of this sheet completely, listing previous work locations where you were monitored for radiation exposure. ***In order for you to be permitted to work with radiation sources, Vanderbilt is required to have your occupational exposure history for the current year.***

2. Sources of radiation you will be exposed to while at Vanderbilt:

X-rays, location: _____

Radioisotopes, which isotopes? _____

Will you be working with activities exceeding 100 uCi/day? Yes No

Radiation monitoring badges may be issued to radiation workers who work with significant activities of high energy beta-emitters or gamma-emitters (these do not include ^3H , ^{14}C , ^{35}S , ^{45}Ca or ^{63}Ni); please refer to the policy described in the Radiation Safety Manual.

3. Will you be handling more than 1mCi of radioactive material at one time (except ^3H , ^{14}C , ^{35}S , ^{45}Ca , or ^{63}Ni) ?

Yes No

4. Will you be exposed to occupational radiation at locations other than at Vanderbilt?

Yes No

If yes, please indicate where: _____

(Signature required on reverse side.)

CUMULATIVE OCCUPATIONAL EXPOSURE HISTORY

1. MONITORING PERIOD	NAME & ADDRESS OF UNIVERSITY, HOSPITAL, ETC.	PHONE NUMBER
2. MONITORING PERIOD	NAME & ADDRESS OF UNIVERSITY, HOSPITAL, ETC.	PHONE NUMBER
3. MONITORING PERIOD	NAME & ADDRESS OF UNIVERSITY, HOSPITAL, ETC.	PHONE NUMBER

MY CURRENT YEAR TO DATE EXPOSURE HISTORY IS: [] _____ mrem / [] unknown

I hereby certify that the exposure history information listed above is complete to the best of my knowledge.

Radiation Worker's Signature

Date

Badge Representative Signature

Date

VEHS USE ONLY

PERMANENT BADGE NUMBER: _____ TEMPORARY (SPARE) BADGES ISSUED: _____

DEPARTMENT CODE: _____ FREQUENCY: M OR N WHOLE BODY: _____ (5 DIGIT #) SERIAL #: _____

BADGE COMPANY NOTIFIED. [] _____ RING: _____ (5 DIGIT #) SIZE: _____ SERIAL #: _____

DATE ENTERED IN SYSTEM: _____ MONTH OR QTR OF THE BADGE ISSUED: _____

REPLACEMENT/CHANGE RADIATION MONITORING BADGE

Name: _____ Badge #: _____ (5 digit #)

Social Security #: _____ Dept.: _____

Telephone number where you can be reached: _____

Original badge was worn for period from _____ to _____ (T1)

Replacement badge covers period from _____ to _____ (T2)

Reason:

Lost: Date Lost _____

Name Change: From: _____ To: _____

Change of department: From: _____ To: _____

Other: _____

Employee's Signature

Date

EH&S USE ONLY

Temp. badge issued: Body: _____ (5 digit #) Serial #: _____
Ring: _____ (5 digit #) Serial #: _____ Size: _____

Dose Estimate for Period T1 - based on the actual dose evaluated by Landauer and calculated proportionally as to the amount of time worn.

Percent of period replacement badge was worn ($P = T2/\text{wear period}$):

	Dose Equivalent (mrem)			
	Deep (DDE)	Eye (LDE)	Shallow (SDE)	Extremity (SDE)
Dose from Temporary Badge (T2)				
Estimate for T1 = [(1-P)(T2)]				
Total Dose (T1 + T2)				

COMMENTS:

Signature: _____

Date: _____

Safety Officer

TO: The Attention of the Radiation Safety Officer

SUBJECT: Declaration of Pregnancy

This is to notify you that I am pregnant and request protection under the State of Tennessee Regulations for the Protection Against Radiation regulation number 1200-2-5-.56.

My estimated date of conception was: _____

My estimated due date is: _____

I work in the department of: _____

and my work address/location is: _____

My immediate supervisor is: _____

and may be contacted at this phone number: _____

I may be contacted at this phone number: _____

Print Name

Social Security Number

Signature

Date

DIS Use Only

Departmental Code:		Estimated dose from conception to declaration:			_____ mrem DDE
	Badge #	Serial#	Date Issued	Issued By	Date Entered in Landauer
Permanent Badge#		N/A	N/A	N/A	
Temp. Replacement Badge					
Fetal Temp. Badge					

Request for Withdrawal from Declared Pregnant Radiation Worker Status

Instructions:

If you no longer wish to be monitored under the lower dose limit for a declared pregnant radiation worker, complete this form then submit it either by fax (6-0966) or in person to the Vanderbilt Occupational Health Services (OHS) office located in 640 Medical Arts Building.

Confidential

To: **Vanderbilt Occupational Health Clinic**

Subject: **Request for withdrawal from radiation monitoring as a declared pregnant worker**

This is to notify you that I no longer wish to be monitored as a Declared Pregnant Radiation Worker. Please reinstate my radiation dose limits to the limits for undeclared radiation workers as listed in the State of Tennessee Regulations for the Protection Against Radiation regulation number 1200-2-5-.50.

Name (printed)

Social Security Number

Signature

Date

Revised: 1/03/99

To: The Attention of the Radiation Safety Officer:

Subject: Dosimetry Records

Name: (print) _____ SS# _____

[] I am leaving Vanderbilt University on _____.

[] I worked in the department of _____ and was monitored for radiation exposure at Vanderbilt from _____ to _____.
(Month/Year) (Month/Year)

Please send my final dosimetry report to the address or fax number listed below:

Address: _____

Fax: _____

Pone: _____

Signature

Date

LANDAUER®

SAMPLE FACILITY
RADIATION SAFETY OFFICER
18930 SPRINGFIELD AVENUE
FLOSSMOOR, IL 60422

Landauer, Inc. 2 Science Road Glenwood, Illinois 60425-1566
 Telephone: (708)755-7000 Facsimile: (708)755-7016
 www.landauerinc.com



RADIATION DOSIMETRY REPORT

ACCOUNT NO.	STRIPS CODE	AWD	REPORT DATE	DOSIMETER RECEIVED	REPORT TIME IN WORK DAYS	PAGE NO.
103702	RAD	\$12345	7/17/98	7/13/98	5	1

1 PARTICIPANT NUMBER	2 NAME			3 DOSIMETER	4 USE	5 RADIATION QUALITY	6 DOSE EQUIVALENT (MREM) FOR PERIODS SHOWN BELOW			QUARTERLY ACCUMULATED DOSE EQUIVALENT (MREM)			YEAR TO DATE DOSE EQUIVALENT (MREM)			LIFETIME DOSE EQUIVALENT (MREM)			7 RECORDS FOR YEAR	8 INCEPTION DATE (MM/YY)			
	ID NUMBER	BIRTH DATE	SEX				DOF	LIF	SNF	DOF	LOF	SNF	DOF	LOF	SNF	DOF	LOF	SNF			DOF	LOF	SNF
FOR MONITORING PERIOD:							6/ 1/1998 - 6/30/1998			QTR 2			1998										
00191	ADDISON, JOHN 335235519 08/31/44 M			P	WHBODY	PN	90	90	90	90	90	90	100	100	100	200	200	200	6	6/80			
						P	60	60	60	60	60	60	70	70	70	170	170	170					
						NF	30	30	30	30	30	30	30	30	30	30	30	30					
14839	JORGENSEN, MIKE 471740096 10/04/68 M			P	WHBODY	IT	PARTIAL SHIELDING - NO EVALUATION POSSIBLE												6	1/90			
16784	THOMAS, LEE 384948378 11/22/64 M			P	COLLAR	P	40	40	40														
						P	M	M	M				M	150	150	370	370	370	6	2/86			
							M	40	40	M	40	40			80			620	6	2/86			
						U																	
00901	WALKER, JANE 587336640 06/09/60 F			P	RFINGR								30	30	40	100	100	150	6	1/90			
							ABSENT																
05061	ZERR, ROBERT 982448591 07/15/45 M			P	WHBODY		40	40	40	160	160	160	200	200	200	240	240	240	6	6/80			
							CALC																

1. Within your account, each individual is identified by a unique number that is permanent.
2. Participant's personal information consisting of name, ID number, birth date, and sex. This information can be suppressed on "duplicate reports: for privacy and/or posting needs.
3. Landauer dosimeter.
4. The use or location on the body for which the dose is given.
5. Radiation type, and in some cases energy.
6. Dose Equivalent Columns – Current or accumulated exposures for deep, lens or eye and shallow dose equivalents. Bimonthly service will not have quarterly accumulation.
7. Number of times a current year report was generated for a participant.

8. The start of continuous Landauer service for a dosimeter.
9. Whole body exposures are carried for the person, rather than for individual whole body dosimeters. This example shows how a special dose calculation (EDE 1) can be applied to a participant who wears collar and waist dosimeters with a lead apron.
10. The dose for a dosimeter was from a calculation given by a customer, rather than from a Landauer dosimeter analysis.

Deep dose equivalent applies to external whole-body exposure and is the dose equivalent at a depth of 1 cm (1,000 mg/cm²).

Eye dose equivalent applies to external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 cm (300 mg/cm²).

Shallow dose equivalent applies to the external exposure of the skin or an extremity, and is taken as the dose equivalent at a tissue depth of 0.007 cm (7 mg/cm²) averaged over an area of one square centimeter.

Minimum Dose Equivalent Reported – Dose equivalents for the current monitoring period below the minimum reportable quantity are recorded as "M." The minimum reportable quantity depends on the dosimeter type and quality of radiation.

Notes – Messages explaining any abnormalities, comments, or imaging and reanalysis results will appear on a separate line below all dosimeter exposure information.

NOTICE TO EMPLOYEES

In "STATE REGULATIONS FOR PROTECTION AGAINST RADIATION", the Tennessee Department of Environment and Conservation has established standards for your protection against radiation hazards and certain provisions for the option of workers engaged in work under licenses or registrations issued by the Department.

YOUR EMPLOYERS RESPONSIBILITY

Your employer is required to-

1. Apply these regulations to work under the license or registration. Licenses and Certified Registrations contain special conditions which shall be considered in addition to these Regulations.
2. Post or otherwise make available to you a copy of the Regulations, licenses, registrations, and operating procedures which apply to work in which you are engaged, and explain their provisions to you.
3. Post any written notice from the Department that the Regulations have been violated and response to such notice

YOUR RESPONSIBILITY AS A WORKER

You should familiarize yourself with those provisions of the Regulations, and the operating procedures which apply to the work in which you are engaged. You should observe their provisions for your own protection and protection of your co-workers.

AREAS COVERED BY THESE REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels and safety interlock equipment;
5. Exposure records and reports;
6. Option for workers regarding the Department's inspection; and
7. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The Department's Regulations require that your employer give you a written report if you receive an exposure in excess of any

applicable limit as set forth in the Regulations or in the license. The basic limits for exposure to employees are set forth in Rules 1200-2-5-.50, 1200-2-5-.55 and 1200-2-5-.56 of the Regulations. These Rules specify limits on exposure to radiation and exposure to concentrations of radioactive material in air and water.

2. If you work where personnel monitoring is required and if you request information on your radiation exposures;
 - a. Your employer must advise you annually of your exposure to radiation, and
 - b. Your employer must give you a written report, following termination of your employment, of your radiation exposures.

INSPECTIONS

All licensed or registered activities are subject to inspection by representatives of the Department. In addition, any worker or representative of workers who believes that there is a violation of the Regulations or the terms of the employer's license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by sending a notice of the alleged violation to the Tennessee Department of Environment and Conservation, Division of Radiological Health, L & C Annex, 3rd Floor, 401 Church Street, Nashville, Tennessee 37243-1532. The request must set forth the specific grounds for the notice, and must be signed by the worker or the representative of the workers. During inspections, Department inspectors may confer privately with workers, and any worker may bring to the attention of the inspectors any past or present condition which he believes contributed to or caused any violation as described above.

POSTING REQUIREMENT

Copies of this notice must be posted in a sufficient number of places in every establishment where employees are employed in activities registered or licensed pursuant to Chapter 1220-2-10 to permit employees working in or frequenting any portion of a restricted area to observe a copy on the way to or from their place of employment.

These documents, including the Vanderbilt Radiation Safety Manual and the "State Regulations for Protection Against Radiation", are available to you in the Department of Institutional Safety Office, U-0202 MCN, phone number 615-322-2057.

**TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH**

NOTICE TO PREGNANT WORKERS

In “State Regulations for Protection Against Radiation” 1200-2-5-.56 the Tennessee Department of Environment and Conservation has established a dose limit of 0.5 rem to an embryo/fetus from occupational exposure during a woman’s entire pregnancy. A woman may declare her pregnancy by notifying the licensee and/or registrant in writing of the pregnancy along with an estimated date of conception so that the estimated dose to the embryo/fetus prior to the declaration of pregnancy can be determined. A woman cannot be required by her employer to make this declaration of pregnancy, and a woman may withdraw her declaration of pregnancy at any time. The decision to make a declaration of pregnancy and/or withdraw the declaration of pregnancy is strictly a woman’s choice and is entirely voluntary.

The dose to an embryo/fetus is determined by taking the sum of the deep dose equivalent to the declared pregnant woman, and the dose to the embryo/fetus from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman. The licensee and/or registrant using ALARA shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman.

If the dose to the embryo/fetus is found to be 0.45 rem or greater when a woman declares her pregnancy, then for the remainder of the pregnancy the embryo/fetus is permitted an additional dose not exceeding 0.05 rem.

Any woman who does not declare her pregnancy or withdraws her declaration of pregnancy shall be subject to the normal occupational dose limits outlined in “State Regulations for Protection Against Radiation” 1200-2-5-.50.

Your employer is required to provide guidance and instruction concerning prenatal radiation exposure to allow women who may become pregnant during their employment to make an informed decision on whether or not to formally declare their pregnancy. Additional information concerning prenatal radiation exposure may be obtained by contacting the Department of Environment and Conservation, Division of Radiological Health at (615) 532-0364.

To declare your pregnancy at Vanderbilt:

Complete the *Declaration of Pregnancy Form* and submit it either by fax (6-0966) or in person to the Vanderbilt Occupational Health Services (OHS) office located in 640 Medical Arts Building. Forms are available from the OHS office, the Environmental Health & Safety (VEH&S) office, or can be downloaded from the VEH&S web site at www.safety.vanderbilt.edu. If you have any questions, please call OHS at 6-0955.

**EMERGENCIES
INVOLVING RADIOACTIVE MATERIALS**

For assistance contact:
Environmental Health & Safety @ 322-2057
or the EHS emergency pager @ 951-2200

EMERGENCY	HAZARD	ACTIONS
SPILLS	With millicurie amounts, radiation contamination hazards may be significant.	<ol style="list-style-type: none"> 1. Alert all people in area. 2. Confine spill immediately. 3. For major spills: Barricade area and notify Environmental Health & Safety. 4. Proceed with decontamination, referring to procedures in the Radiation Safety Reference Manual. Carefully survey area and all personnel.
PERSONNEL CONTAMINATION	Decontaminate promptly. Hazard is greatest if there are open wounds.	<ol style="list-style-type: none"> 1. Flush wounds eyes. Wash skin with soap water. 2. Prompt action is necessary to minimize uptake and radiation dose. 3. Notify Environmental Health & Safety. 4. Do not leave Vanderbilt with contamination on skin or clothing.
AIRBORNE RADIOACTIVITY	Contamination easily spread. Uptake of radioactivity is possible.	<ol style="list-style-type: none"> 1. Shut off source of radioactive contamination if possible. 2. Notify others to vacate area. 3. Shut windows and doors. 4. Call Environmental Health & Safety. 5. Call Plant Operations to shut off air conditioning.
ACCIDENTAL UPTAKE OF RADIOACTIVITY	Hazard varies with amount of uptake and toxicity of radioisotope.	<ol style="list-style-type: none"> 1. Contact Environmental Health & Safety immediately. 2. Depending on isotope and chemical form, there may be a number of actions that can reduce uptake. See Radiation Protection Reference Manual.
FIRES	Internal hazard from airborne radioactivity. All surfaces in area may become contaminated.	<ol style="list-style-type: none"> 1. Notify all persons in area and activate fire alarm. 2. Notify Security and Environmental Health & Safety. 3. Attempt to extinguish fire only if radiation and fire hazards are relatively minor. 4. Firefighters require protection against skin contamination and inhalation hazards.

**RULES OF DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH
CHAPTER 1200-2-5
STANDARDS FOR PROTECTION AGAINST RADIATION**

1200-2-5-.03 EXPOSURE OF INDIVIDUALS TO RADIATION IN RESTRICTED AREAS

(1) Except as provided in (2) of this rule, no licensee or registrant shall possess, use, receive or transfer sources of radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from all sources of radiation a total occupational dose of radiation in excess of the limits specified in the following table:

Rems per Quarter

- (a) Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads 1 $\frac{1}{4}$
- (b) Hands and forearms; feet and ankles; 18 $\frac{3}{4}$
- (c) Skin of whole body 7 $\frac{1}{2}$

(2) A licensee or registrant may permit an individual in a restricted area to receive a total occupational dose to the whole body greater than that permitted under (1)(a) of this rule, provided:

- (a) During any calendar quarter the total occupational dose to the whole body shall not exceed 3 rems;
- (b) The dose to the whole body when added to the accumulated occupational dose to the whole body shall not exceed 5(N-18) rems where "N" equals the individual's age in years at his last birthday; and
- (c) The licensee or registrant has determined the individual's accumulated occupational dose to the whole body on Division Form RHS 8-1 or on a clear and legible record containing all the information required in that form; and has otherwise complied with the requirements of 1200-2-5-.04. "Dose to the whole body" shall be deemed to include any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of the eye.

(3) The requirements of this rule or 1200-2-5-.06(1) shall not be construed to limit the kind or amount of radiation or radioactive material which may be intentionally given to a patient for the purpose of medical diagnosis or therapy.

1200-2-5-.04 DETERMINATION OF PRIOR DOSE

(1) Each licensee or registrant shall require any individual, prior to first entry of the individual into the licensee's or registrant's restricted area during each employment or work assignment unless it has been determined that the individual will not receive or is not likely to receive in any period of one calendar quarter an occupational dose in excess of 25 percent of the applicable limits in 1200-2-5-.03(1) and 1200-2-5-.06(1) to disclose in a written, signed statement, either:

- (a) That the individual had no prior occupational dose during the current calendar quarter; or
- (b) The nature and amount of any occupational dose which the individual may have received during the specifically identified current calendar quarter from sources of radiation possessed or controlled by other persons.
- (c) Each licensee or registrant shall maintain records of such statements for inspection by the Division.

(2) Before permitting any individual in a restricted area to receive an occupational radiation dose in excess of the limits specified in (1) of 1200-2-5-.03, each licensee or registrant shall:

- (a) Obtain a certificate on Division Form RHS 8-1, or on a clear and legible record containing all the information required in that form, signed by the individual showing each period of time after the individual attained the age of 18 in which the individual received an occupational radiation dose; and
- (b) Calculate on Division Form RHS 8-1 in accordance with the instructions appearing therein or on a clear and legible record containing all the information required in the form, the previously accumulated occupational dose allowed for the individual under (2) of Rule 1200-2-5-.03.

(3) (a) In the preparation of Division Form RHS 8-1 or on a clear and legible record containing all the information required in that form, the licensee or registrant shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. For each period for which the licensee or registrant obtains such reports, he shall use the occupational dose shown in the report in

preparing the form. In any case where a licensee or registrant is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

Part of body	Column 1 Assumed exposure in rems for calendar quarters prior to January 1, 1961	Column 2 Assumed exposure in rems for calendar quarters beginning on or after January 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye	3 ¾	1 ¼

(b) The licensee or registrant shall retain and preserve records used in preparing Division Form RHS 8-1 as specified in (3) of Rule 1200-2-5-.22. If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961, yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in (2) of Rule 1200-2-5-.03, the excess may be disregarded.

1200-2-5-.11 PERSONNEL MONITORING

(1) Each licensee or registrant shall provide personnel monitoring devices which shall be calibrated for the radiations and energies which may be encountered and shall require the use of such equipment by:

- (a) Each individual who enters a restricted area unless it has been determined that such persons will not receive or are not likely to receive a dose in any calendar quarter in excess of 25 percent of the applicable value specified in 1200-2-5-.03.
- (b) Each individual under 18 years of age who enters a restricted area unless it has been determined that such person will not receive or is not likely to receive a dose in any calendar quarter in excess of 5 percent of the applicable value specified in 1200-2-5-.03.
- (c) Each individual who enters a high radiation area.

(2) All individuals required to use personnel monitoring equipment shall be instructed in its proper use and purpose.

(3) Personnel monitoring will not be required for individuals undergoing diagnostic or therapeutic procedures.

(4) All personnel dosimeters (except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to hands and forearms, feet and ankles) that require processing to determine the radiation dose and that are utilized by licensees to comply with (1) of this rule, with other applicable provisions of these regulations, or with conditions specified in a licensee's license must be processed and evaluated by a dosimeter processor:

- (a) Holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Bureau of Standards; and
- (b) Approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

(5) For the purpose of (4) of this rule, "dosimeter processor" means an individual or an organization that processes and evaluates personnel monitoring equipment in order to determine the radiation dose delivered to the equipment.

1200-2-5-.14 POSTING OF NOTICES TO WORKERS: INSTRUCTIONS TO WORKERS AND OTHER INDIVIDUALS

(1) Posting.

(a) Each licensee or registrant shall post current copies of the following documents, as applicable, in a number of places to permit workers to observe them on the way to or from any particular licensed or registered activity location to which the document applies, in a conspicuous position, and replacements of the documents if defaced or altered:

(1) Instruction.

(a) Each licensee or registrant is responsible that all individuals working in or frequenting any portion of a restricted area:

2. Shall be instructed:

- (i) In the hazards associated with exposure to such radiation or sources of radiation;
- (ii) In precautions or procedures to minimize radiation exposure; and
- (iii) In the purposes and functions of protective devices employed;

7. Shall be advised that workers may request radiation exposure reports pursuant to 1200-2-5-.25.

1200-2-5-.22 RECORDS OF SURVEYS, RADIATION MONITORING AND DISPOSAL

(1) Each licensee or registrant shall maintain records showing the radiation exposures of all individuals for whom personnel monitoring is required under 1200-2-5-.11, 1200-2-6-.05(2)(b)1.(vi), 1200-2-6-.08(2)(a), 1200-2-7-.04(3), 1200-2-8-.05(3)(a) and 1200-2-8-.11(9). Such records shall be kept on Division Form RHS 8-2 in accordance with instructions contained in that form or on clear and legible records containing all the information required by Division Form RHS 8-2. The dose entered on the forms or records shall be for periods of time not exceeding 1 calendar year.

(7) Records of individual radiation exposure which must be maintained pursuant to the provisions of paragraph (1) of this rule and records of bioassays, including the results of whole body counting examinations, made pursuant to 1200-2-5-.09 shall be preserved indefinitely or until the Division authorizes their disposal. Records which must be maintained pursuant to this chapter may be maintained in the form of microfilm.

1200-2-5-.133 DETERMINATION OF PRIOR OCCUPATIONAL DOSE

(1) For each individual who may enter the licensee's or registrant's restricted area and is likely to receive, in a year, an occupational dose requiring monitoring pursuant to 1200-2-5-.71, the licensee or registrant shall:

- (a) Determine the occupational radiation dose received during the current year; and
- (b) Attempt to obtain the records of lifetime cumulative occupational radiation dose.

(2) Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant shall determine:

- (a) The internal and external doses from all previous planned special exposures; and

(b) All doses in excess of the limits (including doses received during accidents and emergencies) received during the lifetime of the individual.

(3) In complying with the requirements of (1) of this rule, a licensee or registrant may:

(a) Accept, as a record of the individual's occupational dose for the current year, a written statement disclosing the nature and the amount of any occupational dose the individual may have received during the current year. Such statement shall be signed by the individual or the individual's most recent employer for work involving radiation exposure.

(b) Accept, as the record of lifetime cumulative radiation dose, an up-to-date Form RHS 8-1H, or equivalent. Such form shall be signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure. If the individual is employed by a person other than the licensee or registrant, the countersignature shall be from the current employer.

(c) From the most recent employer obtain reports of the individual's dose equivalent(s) for work involving radiation exposure. If the individual is employed by a person other than the licensee or registrant the report shall be from the individual's current employer. Reports may be obtained by telephone, telegram, electronic media or letter. The licensee or registrant shall request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

(4) The licensee or registrant shall record the exposure history together with all information required by (1) of this rule on Form RHS 8-1H 13, or other clear and legible record. The form or record shall show each period in which the individual received occupational exposure and be signed by the individual receiving the exposure. For each period for which the licensee or registrant obtains reports, the licensee or registrant shall use the dose shown in the report in preparing Form RHS 8-1H. For any period in which the licensee or registrant does not obtain a report, the licensee or registrant shall place a notation on Form RHS 8-1H indicating the periods of time for which data are not available.

(5) If the licensee or registrant is unable to obtain a complete record of an individual's current and previously accumulated occupational dose, the licensee or registrant shall:

- (a) In establishing administrative controls under 1200-2-5-.50(6) for the current year, reduce the individual's allowable dose limit by 1.25 rems (12.5 mSv) for each quarter for which records were unavailable and the individual could have received occupational exposure; and
- (b) Not allow the individual to be available for planned special exposures.

(6) The licensee or registrant shall retain the records on Form RHS 8-1H or equivalent until the Division terminates each pertinent license or registration requiring this record. The licensee or registrant shall retain records used in preparing Form RHS 8-1H for three (3) years after the record is made.

1200-2-5-.135 RECORDS OF INDIVIDUAL MONITORING RESULTS

(1) Each licensee and registrant shall maintain records of doses received:

- (a) By all individuals for whom monitoring was required pursuant to 1200-2-5-.71 and
- (b) During the planned special exposures, accidents and emergency conditions.

(2) These records shall include 14 , when applicable:

- (a) The deep-dose equivalent to the whole body, eye-dose equivalent, shallow-dose equivalent to the skin and shallow-dose equivalent to the extremities; and
- (b) The estimated intake or body burden of radionuclides (see 1200- 2-5-.51);
- (c) The committed effective dose equivalent assigned to the intake or body burden of radionuclides;
- (d) The specific information used to calculate the committed effective dose equivalent pursuant to 1200-2-5-.53(3);
- (e) The total effective dose equivalent when required by 1200-2-5-.51; and
- (f) The total of the deep-dose equivalent and the committed dose to the organ receiving the highest total dose.

(3) The licensee or registrant shall make entries of the records specified in (1) of this rule at least annually.

(4) The licensee or registrant shall maintain the records:

- (a) On Form RHS 8-2C and in accordance with its instructions, or
- (b) In clear and legible form containing all information required by Form RHS 8-2C.

(5) The records required under this rule should be protected from public disclosure because of their personal privacy nature. These records are protected when transferred to the Division under the regulations in 1200-2-4-.10.

(6) The licensee or registrant shall maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman. The declaration of pregnancy shall also be kept on file, but may be maintained separately from the dose records.

(7) The licensee or registrant shall retain each required form or record until the Division terminates each pertinent license or registration requiring the record.



ENVIRONMENTAL ASSISTANCE CENTER
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
711 R. S. GASS BOULEVARD
NASHVILLE, TENNESSEE 37243
PHONE (615) 687-7000 STATEWIDE 1-888-891-8332 FAX (615) 687-7078

October 11, 2000

NOTICE OF NONCOMPLIANCE

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Vanderbilt University
Institutional Safety Department
1161 21st Avenue, South
U-202-MCN
Nashville, Tennessee 37232-2665

ATTN: Dr. Danny Anglin, RSO

Dear Dr. Anglin:

This letter refers to the investigation conducted by me and Mary Reynolds on September 18, 2000 of the activities authorized by your State of Tennessee Radioactive Materials License Number R-19021-E05.

The investigation revealed the following items of noncompliance with the requirements of the license and/or the Tennessee "State Regulations for Protection Against Radiation" (SRPAR),

1. SRPAR 1200-2-5-.14(2)(a)(2)iii requires, in part, that each licensee or registrant is responsible that all individuals working in or frequenting any portion of a restricted area shall be instructed in the purposes and functions of protective devices employed.

Contrary to the above, individuals working in or frequenting any portion of a restricted area were not instructed in the purposes and functions of protective devices employed.

2. SRPAR 1200-2-5-.25(2) requires, in part, that each licensee or registrant, at the request of any worker, shall advise such worker annually of the worker's exposure to radiation or radioactive material as shown in records maintained by the licensee or registrant pursuant to 1200-2-5-.22 (1) and (3).

Contrary to the above, workers were not supplied annual exposure report records upon their request.

3. SRPAR 1200-2-5-.03, 1200-2-5-.11, and 1200-2-5-.22 requires, in part, that personnel monitoring and maintenance records be maintained adequately.

Contrary to the above, the following inadequacies were observed during the investigation.

- a) Film badges were not returned to the processor in a timely manner.
- b) Monitoring reports for certain time periods were missing.
- c) Film badges were not returned to the processor within the allowable time frame established for accurate determination of exposure.

Please respond, in writing, within 15 days of your receipt of this letter, regarding these items. State specifically the actions you are taking to correct these items and to prevent their recurrence, and the date by which full compliance will be achieved.

1200-2-5-.14(1)(a)6. And 1200-2-5-.40 require that this document be posted within two (2) working days after its receipt in a sufficient number of places to permit workers involved in registered activities to observe it and it shall remain posted for a minimum of five (5) working days or until all corrective action has been completed, whichever is longer.

Sincerely,



Paula F. Richardson
Health Physicist
Division of Radiological Health