ORNL/TM-7984

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OAK RIDGE NATIONAL LABORATORY

UNION CARBIDE

Methods and Procedures for External Radiation Dosimetry at ORNL

E. D. Gupton

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Industrial Safety and Applied Health Physics Division

METHODS AND PROCEDURES FOR EXTERNAL RADIATION DOSIMETRY AT ORNL

E. D. Gupton

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OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37830
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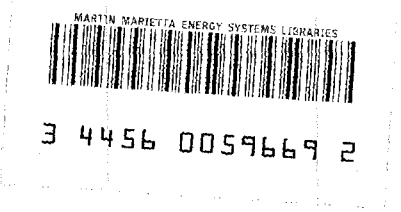


C O N T E N T S

APPENDICES

INTRODUCTION

Procedures, methods, materials, records, and reports used for accomplishing the personnel, external radiation monitoring program at Oak Ridge National Laboratory are described for the purpose of documenting what is done now for future reference.

This document provides a description of the methods and procedures for external radiation metering, monitoring, dosimetry, and records which are in effect at ORNL July 1, 1981. A major consideration has been given to future retrieval of these data. Previous procedures are in "Methods and Procedures for External Radiation Dosimetry at ORNL," January 1, 1968 (CF 68-1-73), January 1, 1969 (CF 69-1-59), January 1, 1970 (CF 70-1-53), January 1, 1971 (CF 71-1-65), October 1974 (CF 74-1-72), and August 22, 1977 (CF 77-390).

This document does not include procedures for nuclear accident dosimetry except insofar as routine techniques may apply also to nuclear accident dosimetry capability.

E. D. Gupton
Radiation Monitoring Section
Industrial Safety and
Applied Health Physics

1. PERSONNEL MONITORING INSTRUMENTS

1.1 UCC-ND Meter (Fig. 1.1)

The UCC-ND meter is a Harshaw TLD card containing two TLD-700 ribbons, an aluminum filter and a bar code identifier, all sealed within a plastic envelope for attachment to the personnel identification badge. The meter and its use are described in Y/DD-268.[1]

1.2 ORNL Supplementary Meters (Fig. 1.2)

The design, personnel monitoring features and dosimetry with the ORNL HP meter are described in ORNL/TM-6357.[2] The current variations in terms of use and dosimetry components are described in Section 3, following.

1.3 Hand Exposure Meter

The hand exposure meter is for monitoring radiation exposures to hands. Its description and the procedures for its use are in IS&AHP-IP No. 210, Hand Exposure Dosimetry with the ORNL Hand Exposure Meter (Appendix 1.1).

1.4 Pocket Meter

Pocket meters (Victoreen Pocket Ionization Chamber, Model 362) and the Victoreen Minometer, Model II, which is used for charging and reading them are described in ORNL-332.[3] The procedure for users of pocket meters is IS&AHP-IP No. 211 (Appendix 1.2).

1.5 Specialized Instruments and Techniques

For dosimetry in cases of unusual exposures for which the instruments 1.1 - 1.4, above, may be inadequate, specialized devices may be provided, and supplemental measurements may be made with non-personal radiation measuring instruments.

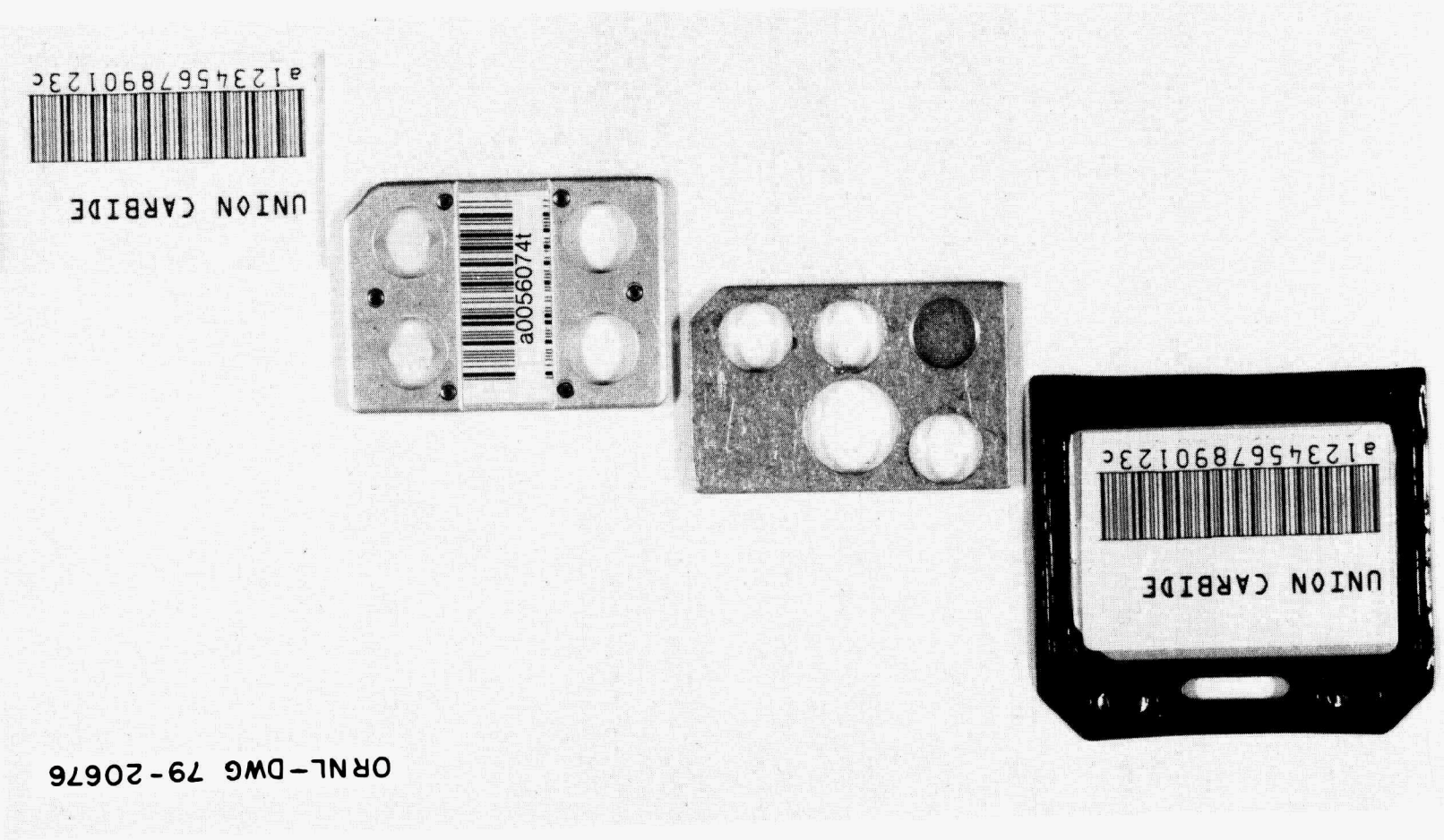

a1234567890123c
UNION CARBIDE
a0056074t
a1234567890123c
UNION CARBIDE
ORNL-DWG 79-20676

Fig. 1.1

ORNL PHOTO 3663-81

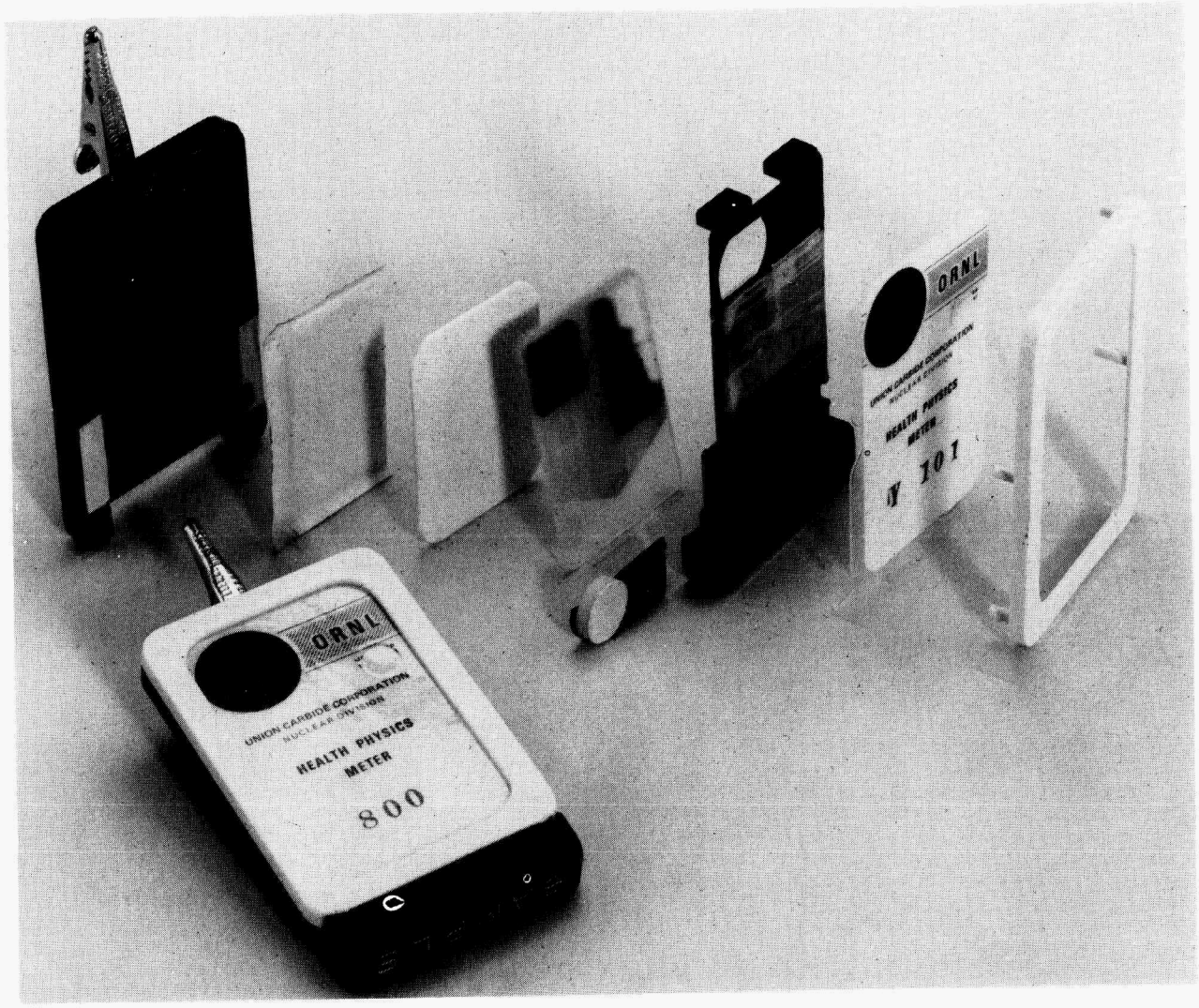


Fig. 1.2

2. PERSONNEL MONITORING RULES AND REGULATIONS

2.1 General Requirements for Monitoring and Metering

2.1.1 Persons who are authorized to perform work in Radiation Zones are assigned devices for monitoring the type and degree of radiation to which they are likely to be exposed.

2.1.2 Persons who are not authorized to work or stay in Radiation Zones or who are under constant surveillance of a responsible ORNL representative need not be assigned a metering or monitoring device.

2.2 ORNL Procedures

The ORNL policy and general procedures for personnel monitoring are included in the manual "Procedures and Practices for Radiation Protection." Among the applicable procedures are:

Procedure 3.3, Personnel Monitoring (Appendix 2.1)
Procedure 3.4, Personnel Radiation Monitoring (Appendix 2.2)
Procedure 3.1, Radiation Protection Standards for Occupational Exposure (Appendix 2.3)
Procedure 3.2, Personnel Exposure Control (Appendix 2.4)

2.3 Supplemental Procedures

Other procedures related to the assignment and use of personnel monitoring devices are:

IS&AHP-IP No. 202, Procedure for Personnel Metering of ORNL Employees (Appendix 2.5)
IS&AHP-IP No. 203, Procedure for ORNL Supplementary Meters (Appendix 2.6)
IS&AHP-IP No. 210, Hand Exposure Dosimetry (Appendix 1.1)
IS&AHP-IP No. 211, Procedure for Use of Pocket Meters (Appendix 1.2)
IS&AHP-IP No. 213, Radiation Monitoring for Photo-Badged Non-Employees (Appendix 2.7)

2.4 Metering of ORNL Employees

All employees are provided a UCC-ND meter that is routinely changed and analyzed annually. The procedure for these meters is in IS&AHP-IP No. 202 (Appendix 2.5).

2.5 Monitoring of Radiation Workers

Employees who work in Radiation Zones must use pocket meters in accordance with IS&AHP-IP No. 203 (Appendix 2.6) and those who are likely to sustain dose equivalents of 100 mrem or more per quarter are provided ORNL supplementary meters and are considered to be monitored for any calendar quarter that the supplementary meter is assigned.

2.6 Monitoring of Non-Employees

2.6.1 Photo-badge assignees are monitored in accordance with IS&AHP-IP No. 213 (Appendix 2.7).

2.6.2 Visitors other than photo-badge assignees are monitored if arrangements are made with Health Physics for monitoring devices and services.

3. TYPES, COMPONENTS AND USES OF ORNL SUPPLEMENTARY METERS

3.1 General

ORNL meters are variations of the model shown in Fig. 1.1. They are used as adjunct to or in lieu of the UCC-ND meter. A description of the dosimetric components and dose calculations are in Reference 1. The uses are described in detail in IS&AHP-IP No. 203, Appendix 2.6.

3.1.1 Beta-Gamma Meter for Radiation Workers

These meters, called "yellow dot" meters, are for use by those persons who are likely to sustain dose equivalents equal to or greater than 10 percent of the DOE quarterly standards from a mixture of X and/or beta and/or gamma radiation. The dosimetric components are an Eastman Type 2, film packet; two 15 mil, TLD-700 chips; one 35 mil, TLD-700 chip; and one 35 mil, TLD-100 chip.

3.1.2 Beta-Gamma-Neutron Meter for Radiation Workers

These meters, called "red dot" meters, are for use by those persons who are likely to sustain dose equivalents equal to or greater than 10 percent of the DOE quarterly standards and of which 100 mrem or more per quarter is likely to be from neutrons. The dosimetric components are a vapor-sealed, NTA film packet; an Eastman Type 2, film packet; two 15 mil, TLD-700 chips; two 35 mil, TLD-700 chips; and two 35 mil, TLD-600 chips.

3.1.3 Beta-Gamma Meter for Occasional Radiation Workers

These meters, called "green dot" meters are for use by those persons who are assigned to radiation work only rarely and who may sustain dose equivalents of 10 percent or more of the DOE quarterly standards from a mixture of beta and/or X and/or gamma radiation during performance of the work. The dosimetric components are the same as those for the "yellow dot" meters.

3.1.4 Meter for Casual Monitoring

These meters, called "H Meters" are for short-term use by those persons who do not have a UCC-ND meter and who are likely to sustain dose equivalents greater than 1 percent and less than 10 percent of the DOE annual standards during use of the meter.

3.2 Responsibilities

3.2.1 Radiation and Safety Surveys Section (R&SS)

R&SS determines who should have ORNL supplementary meters, with advice from the Radiation Monitoring Section (RM), delivers meters to and recovers meters from assignees, and provides RM with any information required for the monitoring record of the assignee.

3.2.2 Radiation Monitoring Section

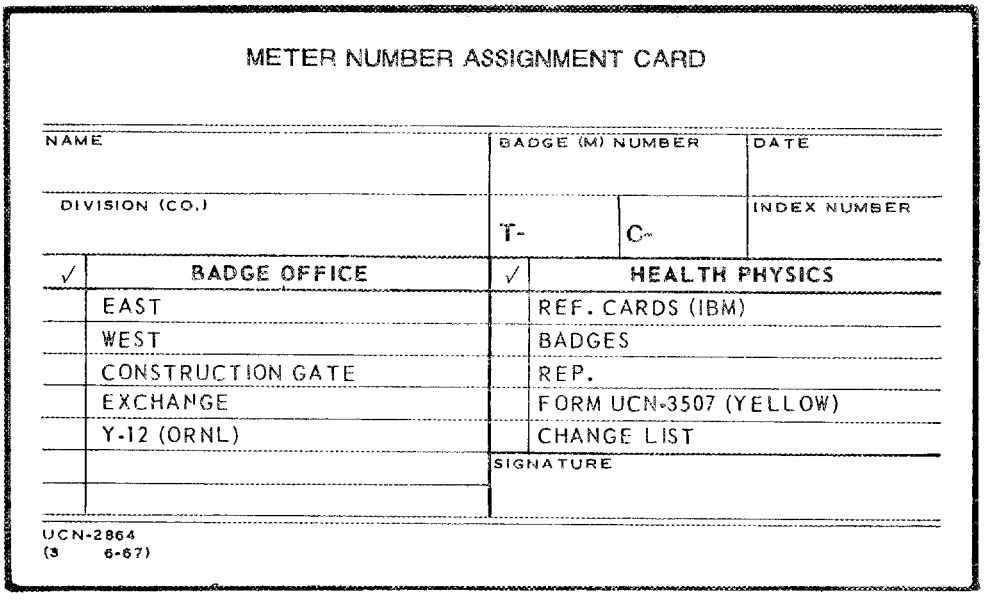
RM provides the meters and dosimetric components, advises R&SS — on the basis of current exposure records — about who may require red and yellow dot meters, analyzes the meters, and makes all necessary records and reports of dosimetry data.

4. FORMS

The forms included in this section are those which are used for data, records, information and instructions related to the external radiation monitoring program by the Radiation Monitoring Section, Industrial Safety and Applied Health Physics Division.

4.1 Meter Number Assignment Card, UCN-2864

This form is originated by the Security Department, Badge Office, and it is transmitted to the Health Physics Personnel Meters Group along with the initially fabricated photo-badge case for each photo-badge assignee.



METER NUMBER ASSIGNMENT CARD

NAME		BADGE (M) NUMBER		DATE
DIVISION (CO.)		T-	C-	INDEX NUMBER
✓	BADGE OFFICE	✓	HEALTH PHYSICS	
	EAST		REF. CARDS (IBM)	
	WEST		BADGES	
	CONSTRUCTION GATE		REP.	
	EXCHANGE		FORM UCN-3507 (YELLOW)	
	Y-12 (ORNL)		CHANGE LIST	
		SIGNATURE		

UCN-2864
(3 6-67)

a. Purpose - Serves as notification from the Badge Office of initiation of badge assignment, the class of badge and the area or entry gate of the assignee. Health Physics uses it to check off the several actions they must perform to assign meters and initiate records of the assignment, and files the card for future reference.
b. Originated by - Security Department, Badge Office.
c. Transmitted to - Personnel Meters Group.
d. Filed - Yes, by Personnel Meters Group.
e. Retention Period - Indefinite, but no longer than three years.

4.2 Meter Number Termination Card, UCN-2864A

This form is a notification from the Security Department, Badge Office, to the Health Physics Personnel Meters Group of termination of a photo-badge assignment.

METER NUMBER ASSIGNMENT CARD
(TERMINATIONS)

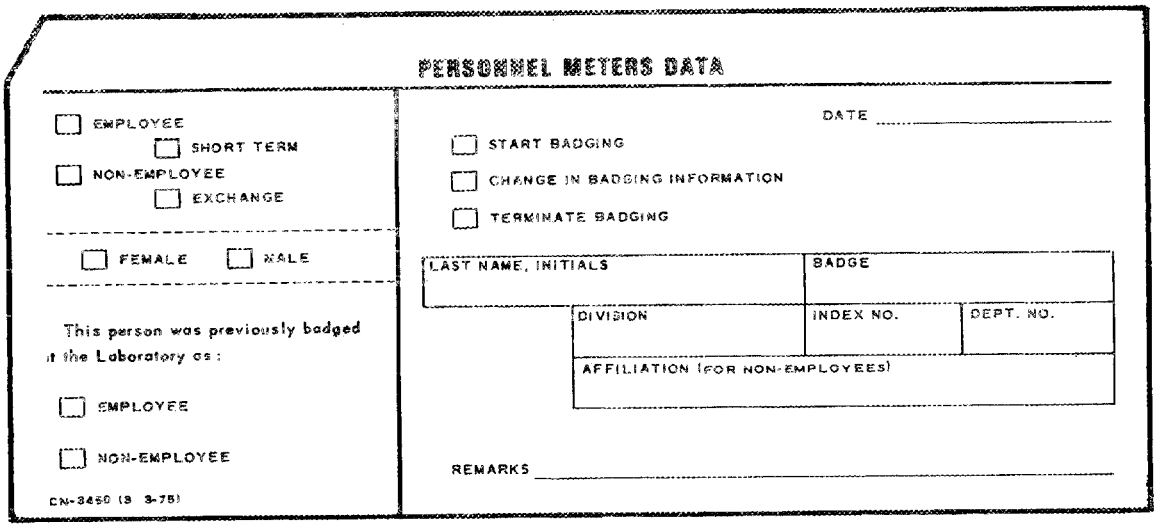
NAME	BADGE (M) NUMBER		DATE
DIVISION (CO.)	T-	C-	INDEX NUMBER

✓	BADGE OFFICE	✓	HEALTH PHYSICS
	EAST		REF. CARDS (IBM)
	WEST		BADGES
	CONSTRUCTION GATE		REP.
	EXCHANGE		FORM UCN-3507 (YELLOW)
	Y-12 (ORNL)		CHANGE LIST
		SIGNATURE	

UCN-2864A
(3 9-75)

a. Purpose - Notification to Health Physics that badging is to be discontinued for a photo-badge assignee. Health Physics uses it as a check-off for the several actions they must perform relative to terminating the badge assignment.
b. Origination - Security Department, Badge Office.
c. Transmitted to - Personnel Meters Group.
d. Filed - Yes, by Personnel Meters Group.
e. Retention Period - Indefinite, but no longer than three years.

4.3 Personnel Meters Data, UCN-3450
This form is for transmittal of information relative to a photo-badge assignee from the Personnel Meters Group to the Dose Data Group.



PERSONNEL METERS DATA

☐ EMPLOYEE
☐ SHORT TERM
☐ NON-EMPLOYEE
☐ EXCHANGE

☐ FEMALE ☐ MALE

This person was previously badged at the Laboratory as:

☐ EMPLOYEE

☐ NON-EMPLOYEE

CN-3450 (8 3-75)

DATE _____

☐ START BADGING

☐ CHANGE IN BADGING INFORMATION

☐ TERMINATE BADGING

LAST NAME, INITIALS	BADGE	
DIVISION	INDEX NO.	DEPT. NO.
AFFILIATION (FOR NON-EMPLOYEES)		

REMARKS _____

4.3.1 *Application*

a. Purpose - To provide formal notification of all transactions by the Personnel Meters Group which are related to the dosimetry records of a photo-badge assignee, other than those which are directly related to the processing of a dosimetry device.
b. Originated by - Personnel Meters Group.
c. Transmitted to - Dose Data Group.
d. Filed - Yes, if related to the status of the assignee.
e. Retention Period - May be discarded when data therefrom have been entered onto permanent record forms.

4.3.2 *Procedure*

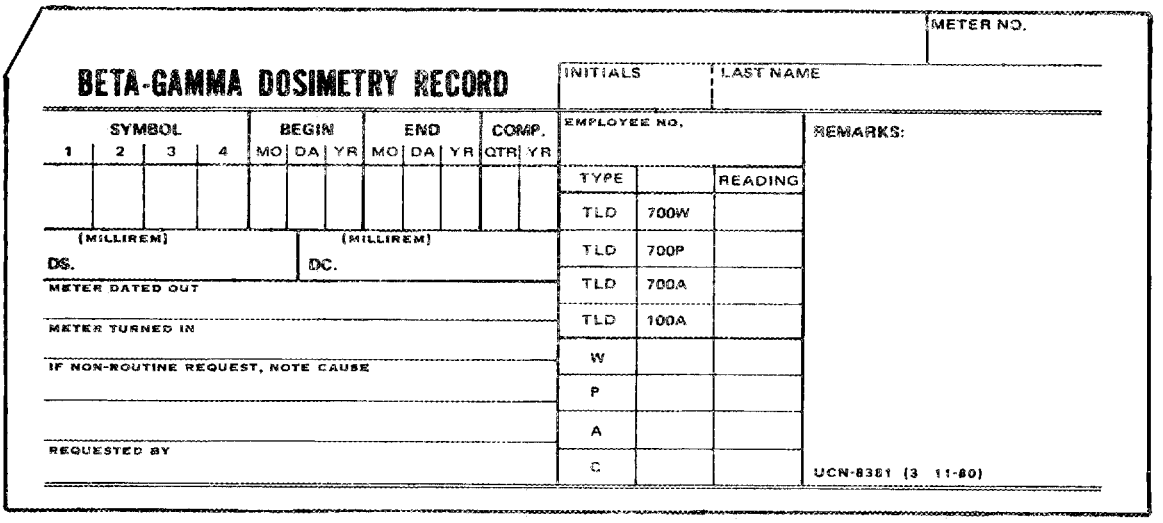
a. The Personnel Meters Group originates the form, enters the appropriate information and transmits the form to the Dose Data Group for any transaction related to the assignee or to the badge of the assignee which may relate to the dosimetry records of the assignee. Such transactions include, but are not necessarily limited to:

(1) Initiation of badge assignment (ADD).
(2) CHANGE of Name, Badge Number, Index Number, Department (Division) or Non-ORNL affiliation.
(3) Subsequent badge assignment for a previous assignee, following a termination of assignment (REHIRE).
(4) TERMINATION of badge assignment.

b. The Dose Data Group:
(1) Initiates records and maintains record keeping for ADD's and REHIRE's.
(2) Makes the changes in records for CHANGE's.
(3) Takes appropriate action for TERMINATION's.
(4) Files the form whenever applicable.

4.4 Beta-Gamma Dosimetry Record, UCN-8381

This form accompanies a dosimeter from a photo-badge which is to be processed for dosimetry data and is a record form onto which the data are recorded.



METER NO.

BETA-GAMMA DOSIMETRY RECORD

INITIALS | LAST NAME

SYMBOL 1	2	3	4	BEGIN MO	DA	YR	END MO	DA	YR	COMP. QTR	YR

EMPLOYEE NO.

REMARKS:

TYPE		READING
TLD	700W	
TLD	700P	
TLD	700A	
TLD	100A	
W		
P		
A		
C		

(MILLIREM) DS.

(MILLIREM) DC.

METER DATED OUT

METER TURNED IN

IF NON-ROUTINE REQUEST, NOTE CAUSE

REQUESTED BY

UCN-8381 (3 11-80)

4.4.1 *Application*

a. Purpose - A transmittal form for TLD's and films from photo-badges which are to be processed for dosimetry data. It contains information to identify the badge assignee, the period of time of the assignment and the reason, if any, for out-of-routine processing. It is a record form onto which the dosimetry data are entered; and is a transmittal form to the electrodata computer record and report programs. It becomes the basic, original record for routine beta-gamma dosimetry.

b. Originated by -

(1) The Dose Data Group for all routine (prescheduled) processing.

(2) The Personnel Meters Group for all non-routine processing.

c. Transmittals -
   (1) If originated (pre-punched identification) by the Dose Data Group, it is sent to the Personnel Meters Group.
   (2) The Personnel Meters Group sends a form for each dosimeter to be processed to the Dose Data Group.
   (3) After processing data, dose calculations and the appropriate computer program symbols are noted onto and key-punched into the form by the Dose Data Group, the data are sent to the Computer Center.
   (4) The Dose Data Group files the form.

d. Filed - Yes, by Dose Data Group.

e. Retention Period - As long as is required for regulatory and legal retention of permanent records.

4.4.2 *Procedure*

a. The Dose Data Group originates forms with pre-punched and interpreted personal identification for each scheduled dosimeter processing, and sends the forms to the Personnel Meters Group at the time of scheduled dosimeter transmittal.

b. The Personnel Meters Group attempts to retrieve all dosimeters from badge assignees for scheduled processing, makes any applicable data entry onto the forms, and transmits them to the Dose Data Group.

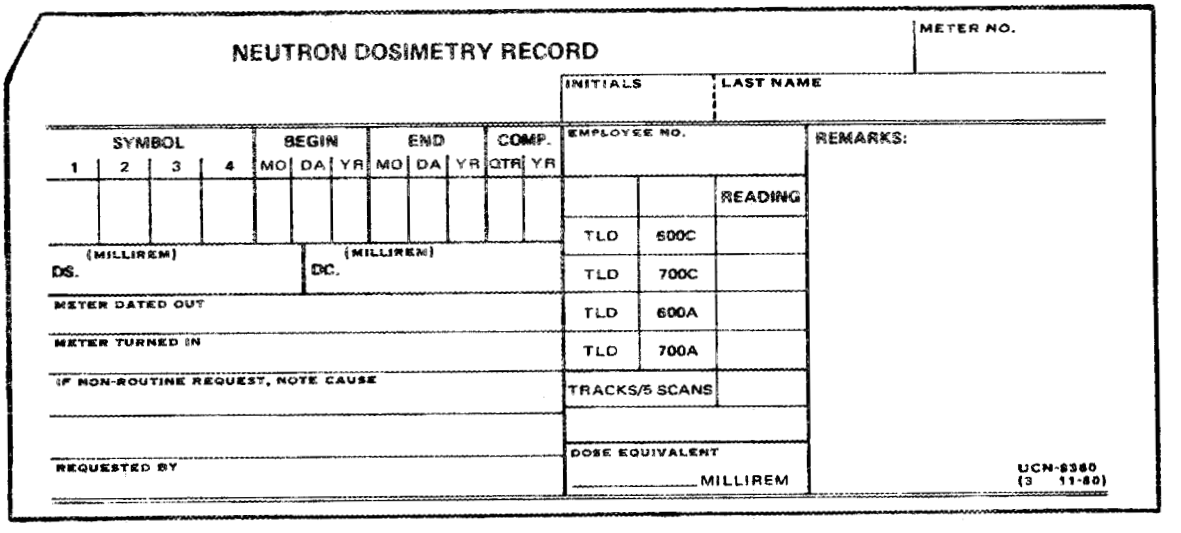
c. The Dose Data Group will at each routine exchange, identify such of the forms, at the time of transmittal to the Personnel Meters Group, which are for persons most likely to have been exposed to more than one-tenth the permissible level for the quarter. The Personnel Meters Group will collect and transmit dosimeters for these persons before collecting and transmitting those for other persons.

d. The Personnel Meters Group will originate a form, enter the appropriate information and transmit the form and dosimeter for non-routine (non-scheduled) dosimetry events.

e. The Dose Data Group will enter the data onto the form, calculate the doses, key-punch the form, transmit the data to the Computer Center, and store it in the designated, permanent files.

4.5 Neutron Dosimetry Record, UCN-8380

This form accompanies neutron dosimeters from a photo-badge which are to be processed for dosimetry data and is a record form onto which the data are recorded.



NEUTRON DOSIMETRY RECORD

METER NO.

INITIALS | LAST NAME

SYMBOL 1	2	3	4	BEGIN MO	DA	YR	END MO	DA	YR	COMP. QTR	YR

EMPLOYEE NO.

REMARKS:

		READING
TLD	600C	
TLD	700C	
TLD	600A	
TLD	700A	
TRACKS/5 SCANS		

DS. (MILLIREM) DC. (MILLIREM)

METER DATED OUT

METER TURNED IN

IF NON-ROUTINE REQUEST, NOTE CAUSE

REQUESTED BY

DOSE EQUIVALENT _____ MILLIREM

UCN-8380 (3 11-80)

4.5.1 and 4.5.2 Except that this form is for neutron dosimetry, the application and procedure for its uses are the same as for form UCN-8381 (Section 4.4).

4.6 Radiation Dosimetry Supplement, UCN-2872

This form is for recording data which relate to the external radiation exposure of a meter assignee and which are not directly derivable from meter data.

ORNL PERSONNEL RADIATION DOSIMETRY SUPPLEMENT

NAME	ID NO.	BADGE NO.	DIVISION	DEPARTMENT

ISSUED BECAUSE OF			DATE ISSUED	
INCLUSIVE DATES OF THIS RECORD:	FROM	TO	QUARTER	YEAR
SPECIAL NOTIFICATION TO:	SIGNATURE		DATE	

The recorded external radiation dose from occupational exposure for above named employee for inclusive dates shown above is

DS	DC	OTHER	CERTIFIED BY
mrem	mrem		

UCN-2872
(3 6-74)

RETURN THIS FORM TO DOSIMETRY RECORDS

The description, uses and procedures for this form are described in Section 8.6 and in IS&AHP-IP No. 209 (Appendix 4.1). Additionally, the Dose Data Group shall assure that all data from forms UCN-2872 which should be entered in the electrodata program for external doses are, in fact, entered and correctly reported in the appropriate EDP reports.

4.7 ORNL Radiation Dosimetry Supplement, UCN-2872B

This form is used to provide documentation and a record entry for persons who do not turn in their meters on schedule and whose radiation exposure is likely to be nominal and for whom a dosimetric investigation is unnecessary.

ORNL PERSONNEL RADIATION DOSIMETRY SUPPLEMENT

NAME	BADGE NO.	DIVISION	DEPARTMENT	DATE ISSUED

INCLUSIVE DATES OF THIS RECORD:	FROM	TO	QUARTER	YEAR

The recorded external radiation dose from occupational exposure for above named person for inclusive dates shown above is

DS	DC	OTHER	CERTIFIED BY
mrem	mrem		

UCN-2872B
(3 5-68)

THE BADGE OF THE PERSON HAS NOT BEEN MADE AVAILABLE TO HEALTH PHYSICS FOR PROCESSING WITHIN 30 DAYS AFTER THE END OF THE PERIOD FOR WHICH IT WAS ASSIGNED.

THE DOSE FOR THE PERIOD IS RECORDED AS THAT OF THE TOTAL OF THE PERSON'S POCKET METER READINGS FOR THE PERIOD, OR ZERO IF THERE WERE NO POCKET METER ENTRIES.

IF THE BADGE IS SUBSEQUENTLY TURNED-IN, ANY DOSE DETERMINED THEREFROM IN EXCESS OF THAT NOTED HEREON WILL BE RECORDED AT THAT TIME.

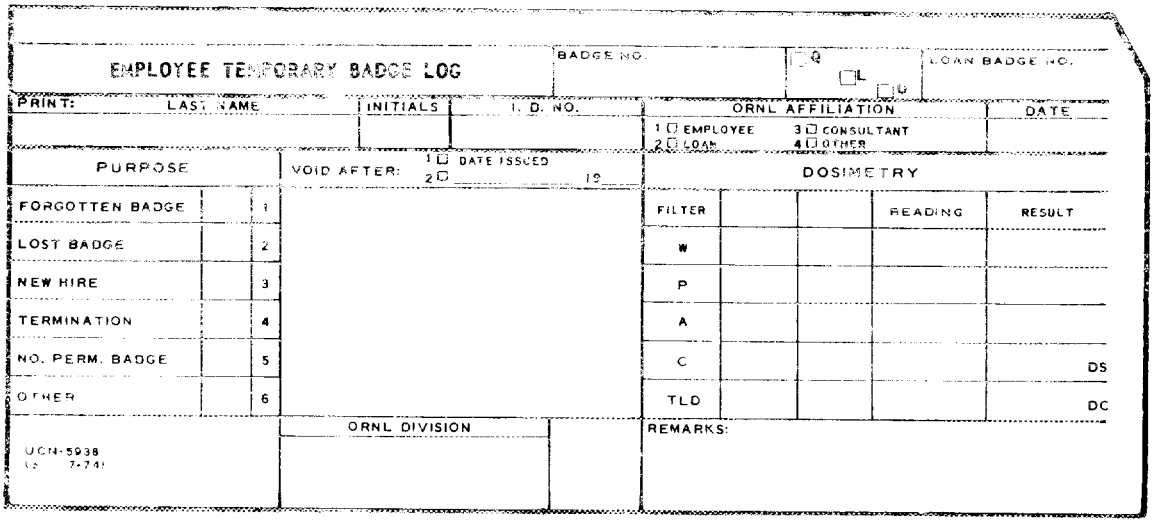
HEALTH PHYSICS DOSIMETRY RECORDS

ACKNOWLEDGEMENT OF DIVISION SUPERVISION	SIGNATURE	DATE

The description, uses and procedures for this form are described in IS&AHP-IP No. 209 (Appendix 4.1).

4.8 Employee Temporary Badge Log, UCN-5938

This form is used to log information of assignment of a temporary meter to a photo-badge assignee who does not have the photo-badge, and for recording dosimetry data if such is required for the period of assignment of the temporary meter.



EMPLOYEE TEMPORARY BADGE LOG

BADGE NO. ☐Q ☐L ☐U LOAN BADGE NO.

PRINT: LAST NAME | INITIALS | I. D. NO. | ORNL AFFILIATION (1 ☐ EMPLOYEE 2 ☐ LOAN 3 ☐ CONSULTANT 4 ☐ OTHER) | DATE

PURPOSE

FORGOTTEN BADGE		1
LOST BADGE		2
NEW HIRE		3
TERMINATION		4
NO. PERM. BADGE		5
OTHER		6

VOID AFTER: 1 ☐ DATE ISSUED 2 ☐ _____ 19__

DOSIMETRY

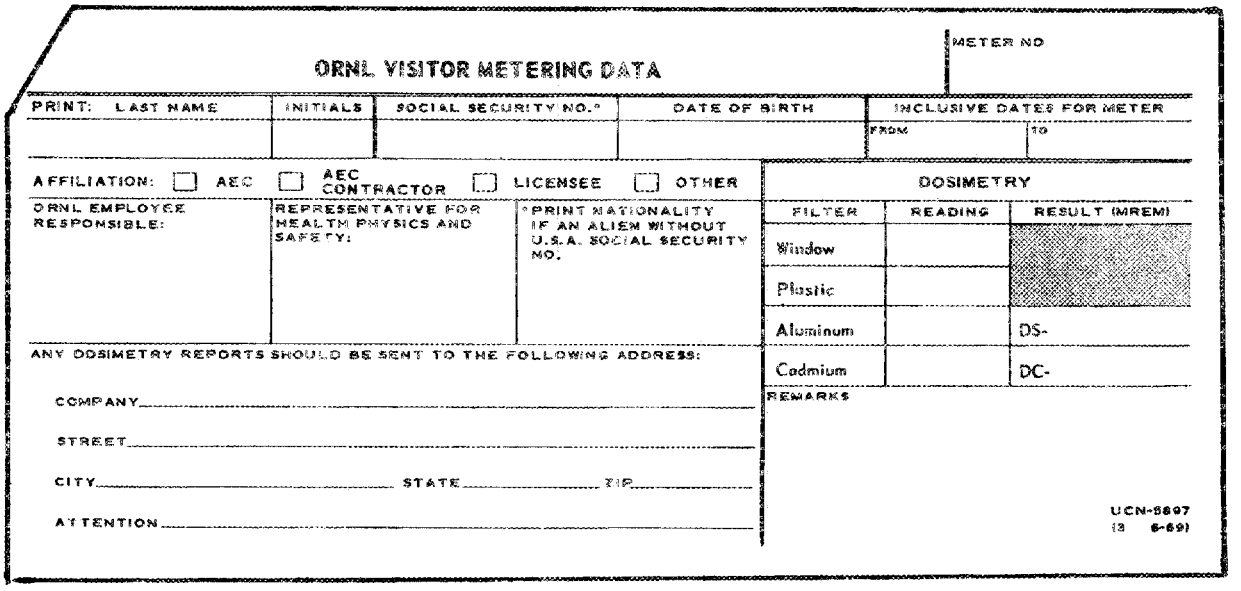
FILTER			READING	RESULT
W				
P				
A				
C				DS
TLD				DC

UCN-5938 (5 7-74)

ORNL DIVISION

REMARKS:

4.9 Visitor Metering Data, UCN-5897
This form is used to log information of assignment of a temporary meter to a non-photo-badge assignee, and for recording and reporting dosimetry data for the period of assignment of the temporary meter.



ORNL VISITOR METERING DATA

METER NO

PRINT: LAST NAME	INITIALS	SOCIAL SECURITY NO.*	DATE OF BIRTH	INCLUSIVE DATES FOR METER	
				FROM	TO

AFFILIATION: ☐ AEC ☐ AEC CONTRACTOR ☐ LICENSEE ☐ OTHER

ORNL EMPLOYEE RESPONSIBLE:	REPRESENTATIVE FOR HEALTH PHYSICS AND SAFETY:	*PRINT NATIONALITY IF AN ALIEN WITHOUT U.S.A. SOCIAL SECURITY NO.

ANY DOSIMETRY REPORTS SHOULD BE SENT TO THE FOLLOWING ADDRESS:

COMPANY

STREET

CITY STATE ZIP

ATTENTION

DOSIMETRY

FILTER	READING	RESULT (MREM)
Window		
Plastic		
Aluminum		DS-
Cadmium		DC-

REMARKS

UCN-5897
(3 6-69)

4.9.1 and 4.9.2 *Applications and Procedures*
(See IS&AHP-IP No. 203, Appendix 2.6.) Additionally, the Dose Data Group will retain and file indefinitely all completed forms UCN-5897 onto which dosimetry data are recorded.

4.10 Hand Exposure Meter Processing Request, UCN-3380
This form accompanies hand exposure meters which are to be processed for personnel dosimetry data.

HAND EXPOSURE METER PROCESSING REQUEST

NAME | BADGE NO.

	Meter No.	Inclusive Dates From	To	TLD 110	TLD 135		Dose (Rem)	Dosimetry Remarks
Right Hand								
Left Hand								
Other (Specify)								

Requester's Remarks:

☐ Please provide missing information where indicated and return to Dosimetry Records for inclusion in Personnel Monitoring Records.

Requester _____

Address _____

Date of Request _____

UCN-3380
(8 6-74)

4.10.1 and 4.10.2 *Applications and Procedures*
(See IS&AHP-IP No. 210, Appendix 1.1.) This form is returned to the Radiation and Safety Surveys requester by the Dose Data Group which does not retain or file it, but copies the dosimetry data onto form UCN-3937 (Section 4.11).

4.11 Hand Exposure Record, UCN-3937
This form is used to record, for each year, the hand exposure dosimetry data for the employee for whom it is identified. A form is initiated each year for each employee for whom hand exposure data is obtained.

HAND EXPOSURE RECORD FOR 19____

PAGE ____ OF ____

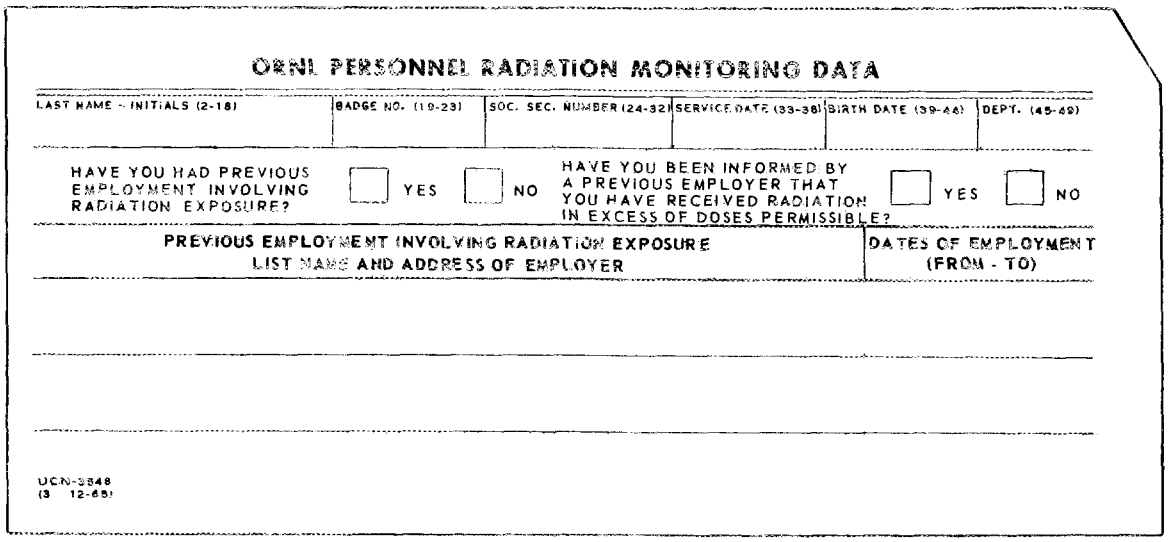
NAME | BADGE NO | DIVISION

DATE	RIGHT HAND		LEFT HAND		REMARKS
	REM	TOTAL REM	REM	TOTAL REM	

UCN-3937
(3 7-72)

4.11.1 and 4.11.2 *Applications and Procedures*
(See IS&AHP-IP No. 210, Appendix 1.1.) Additionally, the Dose Data Group sums the doses for each calendar quarter and for the year on the form, and retains the forms as permanent records in the Personal Folder of the employee.

4.12 ORNL Personnel Radiation Monitoring Data, UCN-3548
This form is for noting by an employee a summary of the employee's previous occupational work with radiation.



ORNL PERSONNEL RADIATION MONITORING DATA

LAST NAME - INITIALS (2-18)	BADGE NO. (19-23)	SOC. SEC. NUMBER (24-32)	SERVICE DATE (33-38)	BIRTH DATE (39-44)	DEPT. (45-49)

HAVE YOU HAD PREVIOUS EMPLOYMENT INVOLVING RADIATION EXPOSURE? ☐ YES ☐ NO

HAVE YOU BEEN INFORMED BY A PREVIOUS EMPLOYER THAT YOU HAVE RECEIVED RADIATION IN EXCESS OF DOSES PERMISSIBLE? ☐ YES ☐ NO

PREVIOUS EMPLOYMENT INVOLVING RADIATION EXPOSURE LIST NAME AND ADDRESS OF EMPLOYER	DATES OF EMPLOYMENT (FROM - TO)

UCN-3548
(3 12-65)

4.12.1 *Application*

a. Purpose - To determine if the employee has been exposed to radiation to the degree that it may affect the rate at which he may be exposed at ORNL, and to provide information of previous employers if a query to them is indicated.
b. Originated by - The ORNL Health Division.
c. Transmitted to - The Dose Data Group.
d. Filed - The Dose Data Group.
e. Retention Period - Duration of the period of employment.

4.12.2 *Procedure*

a. The ORNL Employee Relations Division fills in the identification data in the form UCN-3548 for each new employee. The form is given to the employee who takes it to the Health Division at the time of the employment physical examination. The data related to prior exposure is filled in by the employee, under the supervision of Health Division personnel.
b. The Health Division transmits the filled-in forms to the Dose Data Group.

c. The Dose Data Group reviews the information on the form. If the person has answered "yes" to the question related to overexposures, an immediate investigation is undertaken to establish the extent to which ORNL may be allowed to expose the person to additional radiation. If the answer to that question was "no," the person's previous exposure history may be reviewed. The previous exposure history shall be reviewed in the event that the person exceeds the permissible levels (including 5 rem per year, whole body) at ORNL.

d. The Dose Data Group files the form.

4.13 ORNL External Radiation Dose Summary, UCN-7274

This form is intended to provide a summary of the radiation exposure history for all monitoring periods (date of employment to date of termination, for example) which end after the year 1960, for all photo-badge assignees.

ORNL EXTERNAL RADIATION DOSE SUMMARY

LAST NAME - INITIALS (2-18) | ID NO. (19-23)

*DIVISION AND DEPARTMENT FOR ORNL EMPLOYEES; EMPLOYER FOR NON-EMPLOYEES.

AFFILIATION* | BIRTH DATE | SOC. SEC. NO.

OTHER DOSE DATA:
1961 KARDEX..... ☐
PERSONAL FOLDER..... ☐
NON-ORNL DOSE..... ☐
INTERNAL ..... ☐
_____ ☐

REMARKS _____

INCLUSIVE MONITORING DATES		DOSE (MILLIREM)		INCLUSIVE MONITORING DATES		DOSE (MILLIREM)	
FROM	TO	SKIN	WHOLE BODY	FROM	TO	SKIN	WHOLE BODY

UCN-7274 (3 11-67)

4.13.1 *Application*

a. Purpose - This form is intended to serve for providing a summary of all pertinent radiation dosimetry data and a reference to any non-routine records. For most persons no other record need be referred to except for legal or investigatory reasons.
b. Originated, executed and filed by the Dose Data Group.
c. Retention Period - Indefinite.

4.13.2 *Procedure*

a. The Dose Data Group originates a form UCN-7274 for each photo-badge assignee who has been assigned a photo-badge since 1960.
b. The beginning and ending dates of each period of assignment for each classification of application (employee, loaned person, consultant, etc.) are entered under "Inclusive Monitoring Dates." Periods of badge assignment may be differentiated from periods for which monitoring is required by appropriate notation on the form.
c. The recorded whole body dose in rems for the period is entered on this form.
d. Other dose data of record are indicated by checking the appropriate boxes on this form and by notation under "Remarks."

e. A file of all forms UCN-7274, in alphabetical order of the name of its photo-badge assignee, shall be maintained exclusively for these forms.

4.14 Pocket Meter Collection and Reading Sheet, UCN-2130
This form is for identifying, by recording the I.D. number of the user, pocket meters which are picked up for reading, and for recording the readings thereof.

POCKET METER COLLECTION AND READING SHEET

DATE READ | SHIFT | EDP DATE

READ BY | TOTAL PAIRS | METER STATION

☐ WEST PORTAL ☐ 2518 CHANGE HOUSE ☐ CONST.

READ AT

☐ WEST PORTAL ☐ EAST PORTAL ☐ Y-12 ☐ _____

☐ EAST PORTAL ☐ Y-12 ☐ _____

	BADGE NO.	mr		BADGE NO.	mr		BADGE NO.	mr		BADGE NO.	mr
1			26			51			76		
2			27			52			77		
3			28			53			78		
4			29			54			79		
5			30			55			80		
6			31			56			81		
7			32			57			82		
8			33			58			83		
9			34			59			84		
10			35			60			85		
11			36			61			86		
12			37			62			87		
13			38			63			88		
14			39			64			89		
15			40			65			90		
16			41			66			91		
17			42			67			92		
18			43			68			93		
19			44			69			94		
20			45			70			95		
21			46			71			96		
22			47			72			97		
23			48			73			98		
24			49			74			99		
25			50			75			100		

UCN-2130
(3 7-74)

4.14.1 *Application*

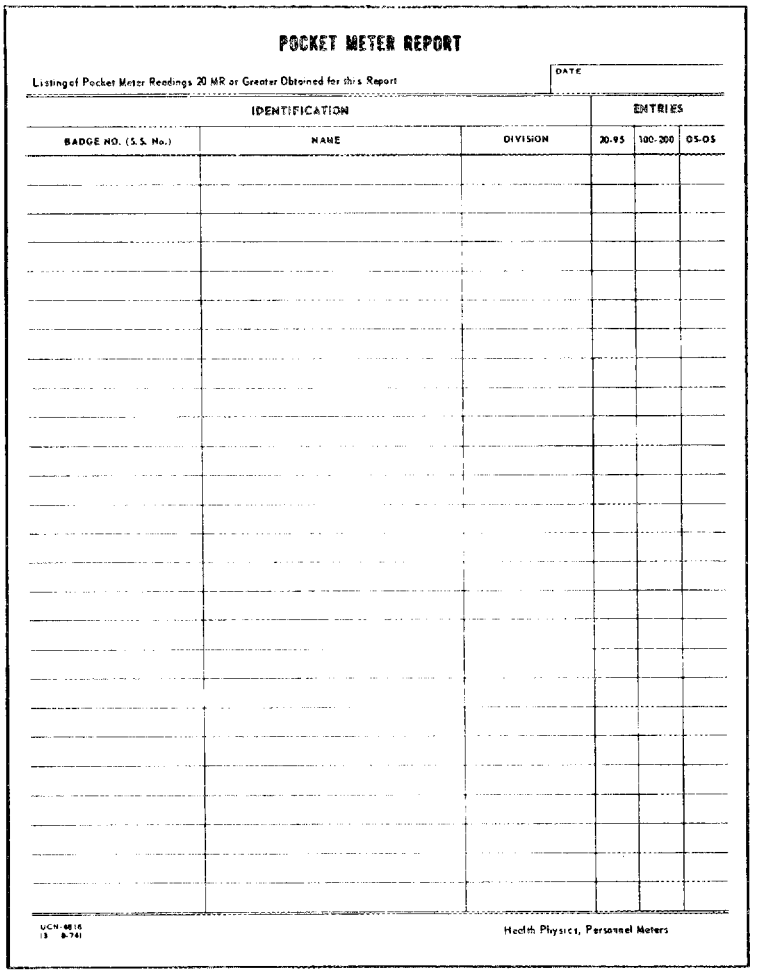
a. Purpose - Identification of pairs of pocket meters which are collected for reading, a form for recording the readings, and a form for transmittal of the data to the Computer Center for preparation of the EDP Pocket Meter Report.
b. Originated by - The Health Physics employee who picks up the pocket meters.
c. Transmitted to - The Personnel Meters Lab for entering the readings of the pocket meter, then to the Dose Data Group for transmittal to the Computer Center, which returns it to the Dose Data Group.
d. Filed by - Dose Data Group.
e. Retention Period - No longer than the end of the calendar quarter for which the data were collected.

4.14.2 *Procedure*

a. The meter station should be noted by the collector.
b. The I.D. number of the repository slot in which the pair of pocket meters are found is recorded under Badge No. As many as 100 numbers may be recorded on a sheet.
c. The sheet and associated pocket meters are taken to the appropriate reading station.
d. The lower reading is recorded for each pair under mR.
e. Information for the Daily Pocket Meter Report is transcribed from the sheet.
f. The reading date and shift on which readings were made are entered on the sheet.
g. The sheet is transmitted to the Dose Data Group.
h. The Dose Data Group audits the data for appropriateness for use by the Computer Center, enters the EDP date (the date for which the reading data apply) and transmits the sheets to the Computer Center.
i. When the sheets are returned from the Computer Center, the Dose Data Group retains them as long as they may be needed to resolve anomalies in the EDP reports for the current quarter.

4.15 Pocket Meter Report, UCN-4816

This form is used for a daily report of pocket meter readings which were 20 mR or greater during the previous 24 hours.



POCKET METER REPORT

Listing of Pocket Meter Readings 20 MR or Greater Obtained for this Report — DATE

IDENTIFICATION			ENTRIES		
BADGE NO. (S.S. No.)	NAME	DIVISION	20-95	100-200	05-05

UCN-4816 (3 8-74)

Health Physics, Personnel Meters

4.15.1 *Application*

a. Purpose - To provide Health Physics and supervision with a day-to-day report of likely significant exposures to external gamma radiation.
b. Originated by - Personnel Meters Group.
c. Transmitted to - Health Physics and Safety Supervision and Radiation and Safety Surveys Area Leaders.
d. Filed and retained as wished by the recipient.

4.15.2 *Procedure*

a. The Shift Surveys Group prepares a report for each day, listing the indicated information for all pocket meter readings of 20 mR or more for the preceding 24-hour period.
b. The Shift Surveys Group reproduces and distributes the number of copies which have been established to provide for the approved distribution list.

4.16 Data for Monitored, ORNL Non-Employee, UCN-9489
This form is used for obtaining information of a monitored non-employee as required by DOE Manual Chapters.

INTRA-LABORATORY CORRESPONDENCE
OAK RIDGE NATIONAL LABORATORY

TO: Radiation Monitoring Section
Industrial Safety and Applied Health Physics Division
Building 4500S, H-256

DATA FOR MONITORED, ORNL NON-EMPLOYEE

The information herein is provided in compliance with ORNL Health Physics Procedures and US-DOE requirements.

LAST NAME _____ INITIALS _____

SOCIAL SECURITY NUMBER _____

DATE OF BIRTH _____

ORNL EMPLOYEE WHO IS RESPONSIBLE FOR THIS PERSON AT ORNL _____

ORNL DIVISION _____

NAME OF ASSIGNEE'S NON-ORNL EMPLOYER OR AFFILIATION _____

ADDRESS OF ASSIGNEE'S NON-ORNL EMPLOYER OR AFFILIATION _____

Regulation A, H.P. Procedure 1.2 has been effected for the named non-employee

_____
DIVISIONAL RCO

UCN-9489
(3 4-80)

4.16.1 *Application* (see IS&AHP-IP No. 213, Appendix 2.7)

a. Use - To obtain information about monitored non-employees which is required by DOE regulations and which may not otherwise be available in ORNL records.
b. Originated by - ORNL division to whom the monitored person is assigned.
c. Transmitted to - Dose Data Group.
d. Filed - Yes.
e. Retention Period - At least one year after the person is last monitored.

4.16.2 *Procedure* (see IS&AHP-IP No. 213, Appendix 2.7)

4.17 Personnel Monitoring Supplementary Report, UCN-8397
This form is used to notify the Radiation and Safety Surveys Section of noteworthy external dose data. The application and procedure for it are included in Section 8.5.

PERSONNEL MONITORING SUPPLEMENTARY REPORT

BADGE NO. (SS #)			DATE ISSUED	
NAME	I.D. NUMBER	DIVISION	DEPARTMENT	
INCLUSIVE DATES OF THIS REPORT:	FROM	TO	QUARTER	YEAR
EXTERNAL RADIATION DOSE FROM OCCUPATIONAL EXPOSURE FOR ABOVE NAMED EMPLOYEE FOR INCLUSIVE DATES SHOWN ABOVE:	DS MREM	DC MREM		

REMARKS:

UCN-8397
(3 6-74)

FOR NOTIFICATION ONLY

5. DOSIMETER SERVICING AND PROCESSING

5.1 Responsibilities

5.1.1 The Personnel Meters Group is responsible for:

a. Installing and replacing of dosimetry devices for all personnel, and auditing these transactions,
b. Stocking, operational checking, and, with the Shift Survey Group, charging and reading of all pocket meters used at the X-10 site,
c. Sealing of films which are to be sealed in a vapor barrier,
d. Transmittal of dosimetry devices and dosimetry forms for processing,
e. Assigning or issuing meters to the assignee or to authorized persons who may be responsible for issuing them.

5.1.2 The Y-12 Plant Laboratory is responsible for:

a. Providing UCC-ND meters for ORNL use,
b. Maintaining and providing capability for meter analysis,
c. Reading the meters and reporting the readings to the Dose Data Group.

5.1.3 The Dose Data Group is responsible for:

a. Procuring, stocking and providing dosimetry components for ORNL supplementary meters,
b. Denoting the dosimetry devices to be used for external radiation monitoring,
c. Providing forms to be used for dosimetry data,
d. Processing and evaluating dosimetry devices from supplementary meters,
e. Evaluating data from UCC-ND meters.

5.2 UCC-ND Meters

UCC-ND meters are read at the Y-12 Plant Laboratory with equipment maintained by and in accordance with procedures established by the Y-12 Plant Laboratory.

5.3 ORNL Thermoluminescent Dosimeters

Thermoluminescent dosimeters (TLD'S) used in ORNL supplemental meters contain combinations of chips (Harshaw TLD-100, -600 and -700).

5.3.1 The chips are heated for ten minutes at 300°C and assembled into TLD's by the Dose Data Group and transmitted to the Personnel Meters Group for installation in badge-meters.

5.3.2 TLD's are identified with a printed, gummed label at the time of installation in badge-meters. The name and identification number of the person is on the label, which is not removed until dosimeter analysis is completed.

5.3.3 The Personnel Meters Group transmits TLD's to be processed to the Dose Data Group, ordered in accordance with accompanying data card forms.

5.3.4 The Dose Data Group records the readings of the chips, which are removed one at a time from the TLD and read with a calibrated reader.

5.3.5 The TLD reading cycle is a preheat at 135°C for 12 seconds followed by integration of the light output during a ramp to and hold at 285°C for 12 seconds.

5.3.6 Appropriate calibration factors are applied to the readings and the computed equivalent millirad (gamma) is recorded.

5.3.7 The data forms are transmitted within the Dose Data Group for calculation of dose equivalents.

5.4 Photographic Film

The photographic films used for monitoring are Kodak, Personnel Monitoring Film, Type 2. The characteristics of the films and their response to radiation are described in ORNL-3126.

5.4.1 The Personnel Meters Group transmits films to be processed to the Dose Data Group. The films are ordered in accordance with the order of the accompanying data card forms.

5.4.2 Dose Data Group personnel x-ray mark the films with a process batch code. This batch code is also x-rayed onto the standard calibrated films which will be processed with the batch of films.

5.4.3 The processing procedure is:

a. With freshly prepared (less than one week) developer in the development tank, completely immerse the film rack and agitate the rack for three minutes.
b. Rinse the rack (and films) in clean water, then immerse in the stop bath for one minute, rinse again.
c. Immerse in fixing solution for 10 minutes.
d. Immerse in clean, flowing water for 30 minutes.
e. Place in film dryer until thoroughly dry.

5.4.4 The films are analyzed by visual observation and by use of a transmitted light metering device.

5.4.5 In the visual observation, any anomaly, such as missing or misaligned filter patterns, x-ray identification errors, fogging of the emulsion, extraneous objects x-rayed onto the film, damaged films, etc., is observed and noted and the film and data form are referred to Dose Data supervision.

5.4.6 The data forms are transmitted within the Dose Data Group for dosimetry calculations and analysis.

5.4.7 The film are retained temporarily.

5.5 Nuclear Track Films (NTA)

5.5.1 NTA film packets for monitoring use are desiccated by the Dose Data Group and transmitted to the Personnel Meters Group which seals them in a moisture-proof package.

5.5.2 The packet is stamped with the date on which it is to be issued for use, and the I.D. number of the assignee or badge number is marked on the packet.

5.5.3 Each film to be processed for monitoring data is transmitted with a card record (ref. Section 6) to the Dose Data Group.

5.5.4 At least once each calendar quarter a set of standard calibrated films are processed and analyzed for calibration data.

5.5.5 The processing procedure is:

a. With freshly prepared developer (less than 72 hours) in which few, if any, photographic films may have been developed, completely immerse the film rack and agitate it for 4 minutes.
b. Rinse in clear water, immerse in the stop bath for one minute, then rinse again.
c. Immerse in fixing solution for 15 minutes.
d. Rinse for at least 30 minutes.
e. Place in film dryer until thoroughly dry.

5.5.6 The films are analyzed by visual observation and by use of a microscope with 900X magnification and dark field illumination, to ascertain the number of proton recoil tracks per unit volume of the emulsion. The track density is determined and recorded in terms of tracks per scan, where a scan is a volume equivalent to the depth of the emulsion, the width of the field of vision and 2 mm in length. As many as five scans per film may be observed, dependent upon the track density.

5.5.7 The track density in terms of the total number of tracks and the number of scans is recorded on the data card. Any observed anomaly, such as faded tracks, photon fogging, unusually short or long tracks, star tracks, etc., is noted on the card.

5.5.8 The data forms and calibration film data are transmitted for dosimetry calculations and analysis.

5.5.9 The films are retained temporarily.

5.6 Pocket Meters

Pocket meters are for use by persons whose exposure to external X- or gamma-radiation may exceed 20 mR per day. They are made available by Health Physics to be used on a daily basis. They are to be picked up, used, and returned as a pair. The daily readings, in mR, are recorded, reported, and cumulated on weekly and quarterly time bases.

5.6.1 The Personnel Meters Group procures new or repaired pocket meters by requisition to the Calibrations Unit, which will supply the meters as they become available.

5.6.2 The Calibrations Unit will perform a leak and radiation calibration check of each new or repaired pocket meter prior to delivering it to the Personnel Meters Group. An acceptable meter must leak less than an equivalent 10 mR per day and must yield a reading between 90 and 110 mR when exposed to 100 mR from a standardized radium source.

5.6.3 The Personnel Meters and Shift Surveys Groups at X-10 and the ORNL Radiation Survey Group at Y-12 will freshly charge each day the supply of pocket meters for use during the following day.

5.6.4 Freshly charged pocket meters will be distributed and made available daily at the several established pick-up points. Except at the East, West and Auxiliary East Portal at X-10, the pick-up points are selected and serviced by the Radiation Survey Section.

5.6.5 Once each day, the Health Physics group responsible will collect the used meters and left-over, unused meters at each station. The used meters will be kept in sequence related to the I.D. number of the user, which the collector records on a Pocket Meter Reading Sheet (Section 4.14).

5.6.6 The used pocket meters are read and recharged on a standardized Minometer by the Personnel Meters Group at X-10, and the ORNL Radiation Survey Group at Y-12. The lower reading of the pair of meters is recorded on the reading sheet. Readings are made on the 0 - 200 mR range of the Minometer, except if a reading exceeds full-scale on that range, the range selector switch is turned to the 0 - 300 range. If the reading is less than full-scale on that range, an arbitrary value of 250 is recorded. If off-scale, the symbol O.S. is recorded.

5.6.7 All meters which yield an off-scale (>300) reading are submitted to a voltage leak test and vibration test before reuse.

5.6.8 All meters are electronically checked and calibrated once each quarter, by use of the ORNL Pocket Meter checking device, Model Q-2561.

5.6.9 Pocket meters which fail to pass the tests of 5.6.7 and 5.6.8 are referred to the Calibrations Unit for repair.

5.7 Hand Exposure Meter

The hand exposure meter is for monitoring beta and photon exposures to the hands (IS&AHP-IP No. 210, Appendix 1.1).

5.7.1 The Dose Data Group equips and provides hand meters to the Radiation and Safety Surveys Groups, on request of Survey personnel, who return the meters for analysis, data recording and reporting.

5.7.2 Each meter has an inscribed serial number.

5.7.3 The meters are equipped with TLD's.

5.7.4 Used meters are sent with form UCN-3380 for analysis.

5.7.5 The Dose Data Group analyzes the TLD's, records the data and the calculated doses on form UCN-3380 and form UCN-3937.

5.7.6 Form UCN-3380 is returned to the Radiation and Safety Surveys staff.

6. DOSE EVALUATION

Dose evaluation is determining as accurately as may be feasible the radiation doses sustained by monitored persons. It may involve:

- calculations with data obtained directly from analysis of personal dosimeters,
- knowledge of the sources of radiation and circumstances of exposure,
- measurements made with radiation monitoring instruments,
- investigatory action,
- cohort dosimetry,
- mock-up reconstructions of the source and conditions of exposure, etc.

6.1 Responsibilities

6.1.1 The Radiation Monitoring Section is responsible for obtaining a recorded dose or estimate of dose for all monitored persons for all periods for which monitoring is required.

6.1.2 The Radiation and Safety Surveys Section is responsible for assisting the Radiation Monitoring Section and for providing estimates of personnel doses for cases in which the data from a personal dosimeter may be insufficient.

6.2 Doses Recorded

6.2.1 *Whole Body Dose*. All dosimetry record entries for dose data from dosimetric devices used in a badge-meter include a value for the whole body dose. The symbol used in all routine records for the whole body dose is DC, construed from "dose at a depth of one centimeter," at the point where the badge is located. The unit is rem.

6.2.2 *Skin or Superficial Dose*. All dosimetry record entries for dose data from dosimetric devices used in a badge-meter include a value for the superficial dose. The symbol used in all routine records for this dose is DS, and it represents the dose in tissue at a depth of 7 mg/cm^2 at the point where the badge is located. The unit is rem.

6.2.3 *Extremity Dose*. Dosimetry record entries from hand monitoring devices may be expressed as dose to extremities. The symbol used is DE, and it represents the dose in tissue at a depth of about 10 mg/cm^2 at the point where the dosimeter is located. The unit is rem.

6.2.4 Doses to other body organs or tissues are not routinely monitored, but, if monitored, are recorded with a description of the circumstances in the personal folder of the monitored person.

6.3 Supplementary Dosimetry

6.3.1 The procedure of IS&AHP-IP No. 209 (Appendix 4.1) may be initiated for any questionable or insufficient dosimetry data.

6.3.2 Specialized instrumentation and techniques as may be available will be provided by the Radiation Monitoring Section to evaluate doses of personnel.

6.3.3 All doses determined from routine monitoring data are subject to authorized review and documented revision by the Radiation and Safety Surveys Section.

7. RECORDS

7.1 Beta-Gamma Dosimetry, Form UCN-8381
See Section 4.4.

7.2 Visitor Metering Data, Form UCN-5897
See Section 4.9.

7.3 Employee Temporary Badge Log, Form UCN-5938
See Section 4.8.

7.4 Hand Exposure Record, Form UCN-3937
See Section 4.11 and Appendix 1.1.

7.5 Photographic Film
See Section 5.4.

7.6 Neutron Dosimetry Record, Form UCN-8380
See Section 4.5.

7.7 NTA Film
See Section 5.5.

7.8 Radiation Dosimetry Supplement, Forms UCN-2872 and 2872B
See Section 4.6, 4.7, 8.6, and Appendix 4.1.

7.9 Personnel Radiation Monitoring Data, Form UCN-3548
See Section 4.12.

7.10 External Radiation Dose Summary, Form UCN-7274
See Section 4.13.

7.11 Personal Folder
The Personal Folder is a manila folder which is identified for the person to whom it pertains.

7.11.1 *Application*

a. Use - The folder is used for filing all forms, memos, reports, etc., which are related to the radiation exposure record of the person and which are not accumulated in other record files. Routine data, other than Hand Exposure Records, are not filed in the Personal Folder. Persons with only routine data may not have a Personal Folder.
b. Originated and filed by - The Dose Data Group.
c. Retention - Personal Folders which contain data which apply to the period after December 31, 1960 are retained permanently in a set of standard, letter-size, office files—older folders are retained by ORNL Central Files.

7.11.2 *Procedure*

a. On the first occasion that there is a record item to be filed in a Personal Folder, the Dose Data Group initiates a folder for the person.
b. Folders are filed in alphabetical order by name of the person.
c. Whenever a folder is initiated, the appropriate symbols for reference to its existence are entered into the electrodata program and onto form UCN-7244 for the person.
d. The Dose Data Group files all applicable items in the Personal Folder.

7.12 Computer Tape

Computer quality tape which is stored at the Computer Center is the primary record source for all data related to personal identification, dose data related to the skin and whole body of the person, and the monitoring status of the person.

7.12.1 *Application*

a. Use - To store data which are used in recording, computing, and reporting information related to external (skin and whole body) radiation dosimetry of monitored persons.
b. Originated by - All data entries for the computer program are originated and transmitted by the Dose Data Group.
c. Filed - Yes, duplicate sets of tapes, by the Computing Center.
d. Retention Period - Permanent for information included in annual and individual EDP reports.

7.12.2 *Procedure*

a. The Dose Data supervisor arranges for and coordinates the electrodata programming for external dose data, establishes, and has included in the program, provisions for data storage, report preparation, and checks and audits of data accuracy.
b. The information transmitted to the computer for the monitored person includes:
   (1) Start data -
      (a) Last name, first two initials,
      (b) Social Security Number,
      (c) Date of birth,
      (d) ORNL department,
      (e) Sex,
      (f) Activation date of monitoring.
   (2) Changes of -
      (a) Name,
      (b) ORNL department or division.
   (3) Dose data, prior and current for ORNL.
   (4) Date of termination of monitoring.

c. The programmed checks and audits are:
   (1) A quarterly data entry for the ending date of the quarter with the appropriate dosimeter (F, E, X, or M) symbol,
   (2) Name must be the same as for start data, or a name change entry must have been made,
   (3) Social Security Number must be unique for a given name,
   (4) Any non-appropriate entry in punch card such as a numeric symbol in an alphabetical field, and vice versa, or an entry in what should be a blank field, etc.,
   (5) Other checks related to computer-identifiable error in dose values.
d. The data stored and their retention periods are:
   (1) The data for the printout of the Annual Report are retained on tape indefinitely.
   (2) The data for quarterly summations as shown in the quarterly reports are retained until the first report of the following year.

7.13 Electrodata Reports of External Dose

The reports are for both reporting and reference of external dose (skin and whole body) data.

7.13.1 *Application*

a. Use - For record purposes the quarterly reports provide a record of the dosimetry events within each calendar quarter and a summation of the doses for the year, a summation of the whole body dose for the period since monitoring was last initiated, and the average dose per year of current monitoring. The Annual Report includes all such data for the year.
b. The Annual Report is filed and retained indefinitely by the Dose Data Group.

7.13.2 *Procedure*

a. Two copies of the annual EDP reports (see Section 8.9) in the alphabetical (non-departmental) format are retained, identified, and filed by the Dose Data Group, one copy at each of two separate file points.
b. All entries of dose data in the report which are indirectly derived (see Section 6.3) and all for which the DS is greater than 1000 mrem and the DC is greater than 300 mrem are audited for accuracy and any errors are corrected in the report and in the data stored in the computer tape.

7.14 Quarterly Summary of Pocket Meter Data

This is the final weekly report of the Pocket Meter Weekly Report for a quarter.

7.14.1 *Application*

a. Use - To provide supplementary exposure data in the event that film and/or TLD dosimetry data for the quarter are insufficient.
b. Filed and retained by the Dose Data Group and may be discarded one year after the end of the quarter to which the report applied.

7.15 Methods and Procedures for External Radiation Dosimetry

This is a compilation into a report, which is updated as required, of the methods and procedures used by the Industrial Safety and Applied Health Physics Division for radiation monitoring information by the Radiation Monitoring Section.

7.15.1 *Application*

a. Use - To describe the methods and procedures used for external radiation dosimetry for personnel at Oak Ridge National Laboratory.
b. Originated by - The Radiation Monitoring Section of the Industrial Safety and Applied Health Physics Division.
c. Filed by - The Dose Data Group.
d. Retention Period - Permanent.

7.15.2 *Procedure*

a. At or near the beginning of each calendar year, the Radiation Monitoring Section supervisor will review current procedures and prepare and have published, if needed, an updated "Methods and Procedures for External Radiation Dosimetry at ORNL."
b. The Dose Data Group will maintain a file of these documents.
c. Copies of these documents will be distributed to the ORNL groups involved in the procedures therein.

8. REPORTS

8.1 Pocket Meter Daily Report, Form UCN-4816

See Section 4.15.

8.2 Pocket Meter Weekly Report

This report includes, for each week, the pocket meter readings in mR for each person for each day during the week, the total of the readings for the current calendar quarter, the whole body dose from all badge-meter dosimetry devices processed during the quarter, the total number of days in which pocket meters have been used during the quarter, and a code, if applicable, to indicate off-scale (greater than 300 mR readings) during the week, a daily reading greater than 20 mR, a weekly total reading greater than 100 mR, or a cumulative reading for the quarter greater than 300 mR.

The report is prepared in two forms: one by ORNL departments for the monitored persons, and one which lists all persons monitored, alphabetically, without reference to department. An excerpt and description of the report are in Appendix 8.1.

8.2.1 *Application*

a. Use - To provide divisional supervision, Health Physics Radiation and Safety Surveys Section, and the Health Physics Radiation Monitoring Section with information of pocket meter users for the week, the readings of all pocket meters for each day of the week, the total of the readings for the week, the cumulative total of the readings for the quarter, and such other information as may be used to audit and control exposures during the quarter.

b. Originated by - The Dose Data Group from data submitted by the Personnel Meters Group on form UCN-2130 (Section 4.14).

c. Preparation - Forms UCN-2130 are transmitted daily to the Computer Center which converts the data and prepares the report which is sent to the Dose Data Group.

d. Schedule for distribution - The reports should be dispatched from the Dose Data Group during the afternoon of the second regularly scheduled workday following the Sunday on which the data week ended.

e. Distribution -

(1) Two copies of each departmental report are sent to the Health Physics Representative for that department, and he in turn distributes the information to departmental supervision.

(2) One copy of each departmental report is given to the Radiation and Safety Surveys Section Head.

(3) One copy of the alphabetical listing is given to the Radiation Monitoring Section Head.

(4) One copy of the alphabetical listing is retained by the Dose Data Group.

8.2.2 *Procedure*

a. The Dose Data supervision arranges for and coordinates the programming and preparation of the report.
b. The Dose Data Group transmits to the Computer Center the basic personal data of all potentially monitored personnel. Such information includes name, initials, I.D. number, department, name changes, and employment status changes.
c. The Dose Data Group audits, then transmits to the Computer Center, all forms UCN-2130 each day on receipt from the Personnel Meters Group.
d. The Dose Data Group arranges for editing, corrections, and inclusion of dose data in the report.
e. The Dose Data Group distributes the report.
f. The Radiation and Safety Surveys Section takes followup action as may be required to control exposure, including arranging for dosimeter processing for persons for whom it may be desirable during the quarter.

8.3 Pocket Meter Quarterly Data Summary

This report is the final weekly report (ref. Section 8.2 above and Section 7.14) of a quarter.

8.3.1 and 8.3.2 The application and procedure for this report is the same as that for the weekly report (Section 8.2).

8.4 Telephoned Reports

Dosimetry data which may be of immediate concern for control of radiation exposure to personnel are transmitted as soon as they become known by the Dose Data Group, by the most expeditious means, which is usually by telephone. The information is usually transmitted to the Radiation and Safety Surveys Section Head, and, if a recommended permissible level of dose may have been exceeded, to the Radiation Monitoring Section Head.

8.5 Personnel Monitoring Supplementary Report, Form UCN-8397

This form is for transmitting information of each noteworthy data item related to external radiation exposure for which the degree of exposure is greater than about 10% of the allowable quarterly level and less than about 20% of the allowable average annual level.

8.5.1 *Application*

a. Use - To provide formalized, individual reporting of external radiation exposures which may be noteworthy but well within permissible levels.
b. Originated by - The Dose Data Group.
c. Schedule for distribution - Shortly after data are known.
d. Distribution - One copy only, to Radiation and Safety Surveys Section personnel.

8.5.2 *Procedure*

a. The Dose Data Group reviews all data derived from dosimetric devices.
b. Any dose data which exceed one of the following and which are not reported on form UCN-2872 (Section 8.6) shall be reported on form UCN-8397.
   (1) A single dosimetry item for which the estimated dose is 500 mrem to the skin, 300 mrem to the whole body, or 2000 mrem to the extremities.
   (2) A cumulative dose for a calendar quarter of 1000 mrem to the skin, 500 mrem to the whole body, or 5000 mrem to the extremities.
c. This form should be used to report data for all badges which are processed out-of-routine for exposure control purposes.
d. This form may be used to report any unusual or questionable data derived from dosimeter analysis, such as inadequate radiation work procedures, inadequate monitoring, unsuspected or unusual radiation, etc.

8.6 Radiation Dosimetry Supplement, Form UCN-2872

This form has three uses (ref. IS&AHP-IP No. 209, Appendix 4.1), one of which is for receipt notification to divisional supervision of doses which approach permissible levels or which may be avoidable.

8.6.1 *Application*

a. Use - To notify and obtain the signature of divisional supervision of a monitored person whose dose approaches permissible levels or which seems from monitoring data to be easily avoidable.
b. Originated by - The Dose Data Group.
c. Schedule for distribution - Within a few days after data are available to the Dose Data Group.
d. Distribution - Radiation and Safety Surveys Leader for the area in which the monitored person works, a divisional supervisor for the person, and the Radiation Control Officer of the person's division, each of whom signs the form. The form is returned to the Dose Data Group for their records.

8.6.2 *Procedure*

a. The Dose Data Group reviews all doses derived from all sources for the dose record of a monitored person.
b. The Dose Data Group initiates a form UCN-2872 as a receipted report for any case in which:
   (1) There is a significant exposure to "soft" radiation,
   (2) The dose within any calendar quarter exceeds 1 rem, whole body; 3 rem, skin of the body; or 10 rem to the hands.
c. The Dose Data Group transmits the form to Radiation and Safety Surveys supervision, accounts for its return with appropriate signatures, then files the form in the permanent records.

8.7 Quarterly Preliminary Report of External Dose Data

This report is a listing of all data derived from personnel monitoring techniques for persons who were deemed likely to have sustained or were known to have sustained doses in excess of 10% of the permissible levels for external radiation.

8.7.1 *Application*

a. Use - To inform Radiation and Safety Surveys Leaders and divisional supervision of the personnel doses sustained during the previous quarter by persons who were deemed likely to have sustained doses in excess of 10% of the permissible levels for external radiation. This report is expeditiously prepared and distributed, and may precede by several weeks the distribution of the Electrodata Program Report (Section 8.9). The report is divisionally organized.

b. Prepared and distributed by the Dose Data Group.

c. Time schedule - The first edition, which includes all data which are available at that time, is prepared and distributed within two weeks after the initial day of a quarterly film exchange. A subsequent, updated report may be prepared and distributed whenever all significant data may be included.

d. Distribution - One copy of the data for their divisions to each divisional RCO and each divisional HPR. Two copies for internal use by the Dose Data Group.

8.7.2 *Procedure*

a. The Dose Data Group determines from the Weekly Pocket Meter Report those persons whose total pocket meter reading for the quarter may be 100 mR or greater. By definition, by the Radiation Monitoring Section, such persons are likely to have required personnel monitoring services.

b. The Dose Data Group identifies these persons to the Personnel Meters Group at the time of routine quarterly film exchange.

c. The Personnel Meters Group expeditiously collects and transmits the dosimeters of these persons to the Dose Data Group.

d. The Dose Data Group expeditiously processes and determines doses from the dosimeter data, key punches the dosimetry record cards, has the key-punched data listed, and distributes the listings.

e. Pertinent data which may be collected subsequently during the quarter are added, and updated listings are prepared and distributed.

8.8 Quarterly EDP Report of External Dose Data

This is the most inclusive and informative of the reports of external radiation dose data. All transactions and events related to personnel dosimetry and records for skin dose and whole body dose of monitored ORNL employees and affiliates are referenced in this report. An excerpt from such a report and the definitions of symbols used are in Appendix 8.2.

8.8.1 *Definitions*

a. ORNL Employee - A person who is on the payroll of ORNL, and who regularly performs work in ORNL facilities at the X-10 or Y-12 sites.
b. ORNL Affiliate - A person who is not employed at ORNL, but who is assigned through the ORNL Personnel Division to perform work under the auspices of an ORNL division at the X-10 or Y-12 site.

8.8.2 *Limitations*

a. Only dose data for the skin of the body and the whole body are included in this report.
b. Only data for ORNL employees and affiliates are included in this report.
c. Only data for the person's period of employment or current affiliation with ORNL are included in this report.

8.8.3 *Application*

a. Use - This report is used both for a temporary record (Section 7.13) and for a report. The report is for providing the radiation dosimetry status of all monitored ORNL personnel.
b. Originated by - The Dose Data Group.
c. Time Schedule - Within 90 days following the close of the quarter to which it pertains.
d. Distribution - Two forms of the report are prepared, one is a listing, in alphabetical order of name, of all persons monitored; the other is a listing by department of the monitored persons of each department.
   (1) The alphabetical listings are for internal use in the Radiation Monitoring Section.
   (2) The departmentally organized listings are available for those who need the information.

8.8.4 *Procedure*

a. The Dose Data Group provides all data to the Computer Center which is required for preparing the report and informs the Computer Center when the data for preparing the report are complete.
b. The Dose Data Group distributes the report.

c. The Computer Center processes the data in an "edit pass" and reports any requirements for correction, additional data, etc., to the Dose Data Group.
d. The Dose Data Group provides additional and corrected data as may be required and the Computer Center prepares and transmits the report to the Dose Data Group.
e. The Dose Data Group distributes the copies to be distributed and files the copies to be filed.

8.9 Annual EDP Report of External Dose Data

The Annual EDP Report contains all the dosimetry information which is included in the four quarterly reports for the year (Section 8.8).

8.9.1 This report is the responsibility of and for use as a permanent record by the Dose Data Group.

8.9.2 The Dose Data Group shall obtain, identify and file separately two copies of this report.

8.10 Hand Exposure Meter Processing Request, Form UCN-3380

This form is submitted with hand exposure meters which are to be processed. The dosimetry data are recorded thereon and copied onto form UCN-3937, and the form UCN-3380 is returned to the Radiation and Safety Surveys representative who submitted it (ref. IS&AHP-IP No. 210, Appendix 1.1).

8.11 Individual Report of Overexposure

This is an individualized report which is made in compliance with DOE Manual requirements. The procedure is IS&AHP-IP No. 207 (Appendix 8.3).

8.12 Reports of ORNL Dose Data Requested by Previous Employees

The Radiation Monitoring Section prepares and transmits, at the written, signed request of a previous employee, a statement relative to that employee's radiation monitoring data for the period of employment at ORNL. The data for a non-employee may be directed to the employer by whom he was employed while at ORNL (the person may have been self-employed) or to DOE.

Three forms for reporting are currently in use:

a. If the total cumulative doses for a period of employment were less than 20% of the permissible level for one year, and if in a calendar quarter no dose greater than 10% of that allowable for a quarter was sustained, the form of Appendix 8.4 may be used for reporting.
b. If there was no significant (greater than 50% of a body burden) internal exposure and if no permissible level was exceeded for external radiation, but the doses were greater than for a., above, the form shown in Appendix 8.5 is used.
c. A specially prepared report, designating doses by calendar quarters, the periods of monitoring, and any other pertinent information would be transmitted for any person who was exposed in excess of levels which require special reporting to DOE in compliance with Manual Chapter 0525.

8.13 Annual Report of the ORNL Applied Health Physics and Safety Sections

The Radiation Monitoring Section provides summary data of external exposures for this report.

8.14 Reports of Dose Data to DOE

The Radiation Monitoring Section provides data for reports of external radiation exposures to DOE as required by or requested by them.

8.15 Reports to Employers of Visitors

The Dose Data Group reports dose information to employers of visitors to ORNL in accordance with DOE Manual requirements.

8.16 Termination Report

Radiological exposure data for a terminated employee are transmitted by the Dose Data Group to the DOE repository.

9. STANDARDIZATION AND CALIBRATION

The initial dosimetry standardization of a personnel monitoring device is done with research quality, standardized sources of X rays, neutrons, beta radiation, etc., to determine the energy dependence, response to various admixtures of radiation, angular dependence, dose rate dependence, etc., of the device. Routine calibrations are performed subsequently to assure the continued quality and reliability of the device, and to obviate what might otherwise be small errors in fabrication or processing of the device, or of the system for analyzing the device.

9.1 Gamma Radiation Sources

Routine gamma calibrations are performed with sources of ^{226}Ra in equilibrium with daughter products. The sources are originally certified by the U.S. Bureau of Standards and are subsequently intercompared for exposure rates with a Victoreen R-Meter each year. A source which varies more than ± 3% from the standard value is not used unless restandardized.

When used for dosimeter calibration, the sources are mounted and contained to assure equilibrium of the electron component with air or air equivalent material at the point of incidence of the radiation and the dosimeter.

9.2 Neutron Sources

Routine neutron calibrations are performed with a ^{238}Pu-Be or ^{252}Cf source. The sources are originally standardized for neutron emission and subsequently intercompared each year.

9.3 Beta Sources

Beta sources are obtained, standardized and used for dosimetry response analyses of a new-type instrument, for which the gamma response is determined at the same time. Subsequently, routine calibrations are made with only gamma radiation.

Beta sources may be used routinely to audit the absorber thickness of the dosimeter.

9.4 Quality Control Checks

All dosimeter systems are subject to audit by the introduction of test dosimeters among those to be analyzed. The test devices would not be identified differently from other devices for the purpose of the analysts.

Calibrated dosimeters are used for standardizing reading systems each time that dosimeters are to be read.

REFERENCES

1. External Radiation Monitoring of Union Carbide Corporation Nuclear Division Personnel, Y/DD-268 (1980).

2. E. D. Gupton, Dosimetry with the ORNL Badge, 1978, ORNL/TM-6357 (1968).

3. E. D. Gupton, Health Physics Instrument Manual, 5th Revision, ORNL-332, August 1978.

APPENDIX 1.1

IS&AHP IP-No. 210
Page 1 of 4 Pages
Issued 2/15/79
Supersedes Issue Dated 1/1/73

HAND EXPOSURE DOSIMETRY WITH THE ORNL HAND EXPOSURE METER

The radiation exposure to the hands of ORNL personnel should be monitored whenever it is likely that the dose equivalent to the hands may exceed 2.5 rem in a calendar quarter.

DEFINITION

Monitoring consists of measuring and recording the radiation dose equivalent.

RESPONSIBILITIES

Dose Data Group

1. Provides hand dosimeters for use by the Radiation and Safety Surveys Staff.
2. When requested by the Radiation and Safety Surveys Staff, advises them relative to the use and application of hand dosimeters.
3. Processes hand dosimeters and reports dosimetry data to the Radiation and Safety Surveys Staff.
4. Advises and assists the Radiation and Safety Surveys Staff in assessing the hand dose.
5. Keeps records and makes reports relative to hand exposure doses.

Radiation Survey Section

1. Determines when hand exposure monitoring is required.
2. Issues hand dosimeters and explains to wearer the proper method of wearing the device.
3. Retrieves hand dosimeters, fills in the required information on form UCN-3380 (Figure 1), and transmits the forms and the dosimeters to the Dose Data Group for processing.
4. Audits the metering data supplied by the Dose Data Group from the hand dosimeter and recommends any changes which may be advisable.
5. Requests the advice and assistance of the Dose Data Group when it is anticipated that the standard Hand Exposure Meter is not adequate for a monitoring application.

REGULATIONS

1. Hand exposure monitoring is usually accomplished with the ORNL Hand Exposure Meter. The meter, with standard TLD-100, has certain limitations among which are:

   a. Low-energy radiation must be incident on the face of the meter to be measured.
   b. The meter is not moisture-proof and liquids may interfere with dosimetry results.
   c. Because the meter is in many cases further from a handled source than the tips of the fingers, the dose to the fingertips may be greater than that to the meter.

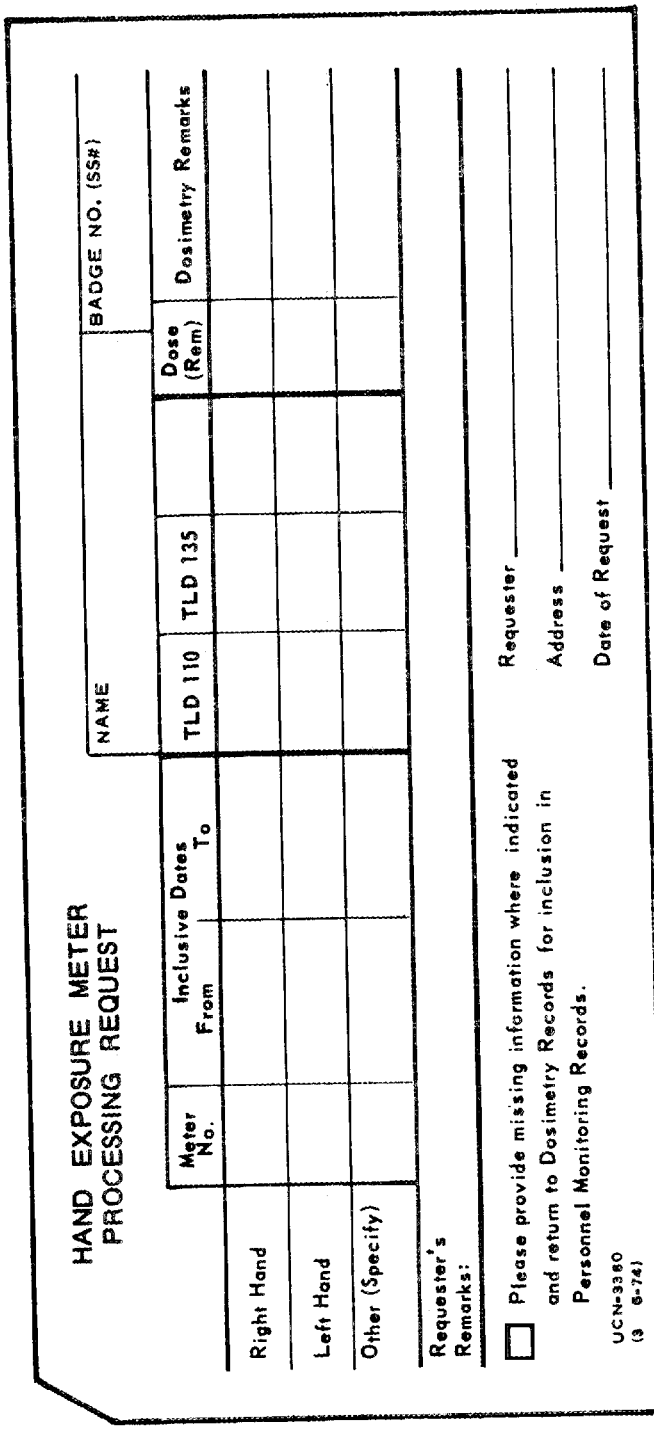
2. Rubber gloves must be worn between the skin and the meter for proper dose evaluation.

3. Special factors must be derived experimentally for exposure to neutrons.

4. Dosimetry calculations by the Dose Data Group may be modified by the Radiation and Safety Surveys Staff on receipt of written notification.

5. Contaminated meters should not be sent for processing except by arrangement with the Dose Data Group.

6. Routine hand exposure dose records are kept on form UCN-3937 (Figure 2). Personnel hand exposure data other than routine will be documented and filed in the Personal Folder of the employee.



HAND EXPOSURE METER
PROCESSING REQUEST

NAME

BADGE NO. (SS#)

	Meter No.	Inclusive Dates From	Inclusive Dates To	TLD 110	TLD 135		Dose (Rem)	Dosimetry Remarks
Right Hand								
Left Hand								
Other (Specify)								

Requester's Remarks:

☐ Please provide missing information where indicated and return to Dosimetry Records for inclusion in Personnel Monitoring Records.

Requester _____

Address _____

Date of Request _____

UCN-3380
(3 6-74)

Figure 1

HAND EXPOSURE RECORD FOR 19____

NAME ______________________ BADGE NO. ________ PAGE ____ OF ____ DIVISION ________

DATE	RIGHT HAND		LEFT HAND		REMARKS
	REM	TOTAL REM	REM	TOTAL REM	

UCN-3837
(3 7-72)

Figure 2

APPENDIX 1.2

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Issued 6/12/81

PROCEDURE FOR USE OF POCKET METERS

1. General

Pocket meters (condenser ionization chambers) are provided by Industrial Safety and Applied Health Physics for the purpose of auditing the approximate radiation exposure of radiation workers within periods of time between badge meter processing.

2. Availability

Pocket meters are made available for employee use at or near the main pedestrian entry portals and in many work areas at ORNL. These meters are located in dispensing racks which have slots for holding the meters. Any two meters should be taken from the dispensing rack for use.

3. By Whom Used

Pocket meters should be used (worn) by ORNL personnel when they are performing work or visiting for extended times in a Radiation Zone, or a combination of Radiation Zones, where it is likely that they may accumulate a dose of 20 equivalent mR in one day. Pocket meters should not be used by non-ORNL personnel (employees of other UCC-ND facilities, visitors, etc.) except as described in Item 7 below.

4. How Used

During use, the pocket meters should be securely clipped to the user's clothing and located near the user's badge. The meters should be protected from severe shock (such as dropping them) and exposure to liquids, corrosive substances, grease, dirt, etc.

5. How Long Used

The pair of pocket meters should be used for only one work shift (plus overtime). At the end of the shift they should be deposited in the user's pocket meter collection slot, which he has identified with his I.D. number. For casual use, the Radiation Surveyor should provide the user with a pocket meter envelope, supplied to Survey Offices by the Portals.

6. Disposal of Meters Not Used

Pocket meters are expensive and any which are unused or which have been found should be returned. Any "old" or unused meters should not be placed in a collection slot, but should be placed on or near the rack at the collection point, or in one of the boxes provided for this purpose at some of the change houses.

7. Use for Non-ORNL Personnel

Pocket meters should be used for non-ORNL personnel only when the person is metered with an ORNL-supplied personnel dosimeter. The pocket meters should be provided by a Radiation Surveyor, who should deliver them to the Portal after use for reading--otherwise, the Portals Group would be unable to identify the user and report the results.

8. Limitation

This procedure is for users and use of pocket meters. Procedures for pocket meter servicing and processing, and for reports of pocket meter data are in "Methods and Procedures for External Radiation Dosimetry at ORNL," ORNL/CF-77/390, August 1977, et seq.

APPENDIX 2.1

Number 3.3
Page 1 of 3 Pages
Issued 4/19/72
Supersedes Issue Dated 7/1/65

PERSONNEL MONITORING

POLICY

It is the policy of the Oak Ridge National Laboratory that each person who has access to a radiation control zone be monitored for exposure to ionizing radiation while occupying the Laboratory premises.

LIMITATIONS

Regulations in this procedure may be suspended in accordance with Laboratory Emergency Procedures.

RESPONSIBILITIES

1. Health Physics and Safety
   (a) Prescribes personnel monitoring methods used in monitoring exposure to ionizing radiation, provides for the issuance and processing of personnel monitoring equipment, monitors personnel for radioactive contamination, and estimates the individual doses received.
   (b) Maintains a continuous audit program to determine and evaluate the accumulated radiation exposure of Laboratory personnel.
   (c) Informs supervision promptly when the radiation exposure of an individual exceeds maximum operating limits or when the running exposure rate is such as to suggest additional administrative controls.
2. Supervision
   (a) Ensures that personnel comply with the personnel monitoring procedures.
   (b) Advises Health Physics and Safety of exposure conditions in operating procedures that may require a re-evaluation of existing personnel monitoring requirements.
   (c) Promptly informs the Area Health Physics Representative of each occurrence where personnel exposure to external radiation or contamination is known or suspected to have exceeded an authorized planned exposure.

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Supersedes Issue Dated 7/1/65

REGULATIONS

1. The radiation and contamination hazards in each work area shall be evaluated on a schedule considered adequate for keeping those in the work areas aware of their presence and appropriate personnel monitoring techniques shall be employed.

2. An immediate evaluation by Health Physics of the radiation exposure received by personnel should be made following any accident or occurrence in which abnormal or excessive exposure to radioactive materials is suspected.

3. The personnel monitoring techniques used for each radiation exposure condition shall:

   (a) be compatible with the work in progress permitting the control of planned necessary exposure on a single-job or daily accumulation basis,

   (b) give suitable warning when an exposure rate is such as to necessitate corrective measures or whenever there is a reasonable expectation that corrective measures may be needed,

   (c) provide sufficient information regarding the type and degree of personnel exposure sustained over a given period of time in order to permit the evaluation of accumulated exposure with respect to permissible dose limits, and

   (d) provide a record of personnel exposure, or lack of exposure, so as to authenticate the individual's Laboratory record of accumulated exposure.

4. Laboratory personnel shall be monitored for exposure to external radiation in accordance with Procedure No. 3.4 - Personnel Meters.

5. Laboratory personnel subjected to unconfined radioactive materials shall be monitored for exposure to internal and external contamination in accordance with Procedure No. 3.5 - Personnel Contamination Monitoring.

6. Personnel exposure data generated by Health Physics personnel monitoring units shall be recorded and reported in accordance with standard operating procedures.

7. The personnel monitoring exposure data shall be used to control and regulate planned exposures in accordance with methods and practices set forth in:

   (a) Procedure No. 3.1 - Personnel Radiation Exposure Limits.

   (b) Procedure No. 3.2 - Personnel Exposure Control.

8. Personnel monitoring data shall be made available to the Health Division for the evaluation of any personnel exposure that is known or suspected to be in excess

of a recommended limit so as to establish appropriate restrictions on future radiation work, aid in the evaluation of existing monitoring practices and requirements, and determine the course of any medical treatment or care in the case of severe overexposure.

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Page 1 of 2 Pages
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Supersedes Issue Dated 7/1/65

PERSONNEL RADIATION MONITORING

POLICY

It is the policy of the Oak Ridge National Laboratory to provide each person who may have access to a Radiation Zone with a radiation accident dosimeter and to perform radiation monitoring in accordance with AEC regulations.

DEFINITIONS

1. Radiation Zone - An area where control measures are established to prevent or minimize external radiation exposure to personnel (Ref. Procedure No. 2.7).

2. Radiation Dosimeters -

   a. Radiation Accident Dosimeter - A device containing dosimetric components to provide information for evaluating personal doses sustained in radiation accidents.

   b. Radiation Monitoring Dosimeter - A device containing dosimetric components to provide information for evaluating personal exposures sustained in Radiation Zones.

3. Supplementary Meters -

   a. Pocket Ionization Chamber (Pocket Meter) - A supplementary dosimeter for gamma radiation.

   b. Hand Meter - A device for evaluating radiation exposures to hands.

LIMITATIONS

Regulations in this procedure may be suspended in accordance with Laboratory Emergency Procedures.

RESPONSIBILITIES

1. Health Physics Division -

   a. Specifies and provides radiation dosimeters to be used.

   b. Processes radiation dosimeters, determines the dose therefrom, and maintains records and makes reports of dosimetry data.

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Issued 4/20/72
Supersedes Issue Dated 7/1/65

2. Supervision -
   a. Ensures that radiation dosimeters are used in accordance with regulations.
   b. Provides Health Physics with information required for compliance with AEC regulations.

REGULATIONS

1. All persons entering a Radiation Zone at ORNL must wear a radiation dosimeter.

2. Persons who perform work in Radiation Zones and visitors who may sustain doses of more than 20 mrem during a visit of less than one week or more than an average of 10 mrem per week during visits of more than one week shall have a radiation monitoring dosimeter assigned to them.

3. Health Physics will routinely exchange and/or service radiation dosimeters which are made available by the assignees.

4. Supervision should assure that the person to whom a dosimeter is assigned returns it, when due, to Health Physics.

5. Instructions for monitoring requirements are:
   a. Related to all employees during orientation lectures.
   b. Given a printed form to each non-employee who is assigned a permanent badge-meter.
   c. Printed on all temporarily assigned meters.

6. Persons who perform work in Radiation Zones should use pocket meters provided by Health Physics.

7. Persons who perform work such that their hands may be in proximity to items from which radiation is emitted should obtain advice from Health Physics relative to hand meters.

8. Supervision and Health Physics Representatives will be informed each week of the pocket meter data for the preceding week, and will be informed immediately of data of significance in personnel exposure control.

9. Tampering with, or unauthorized modification of, a radiation dosimeter or supplementary meter is prohibited, and their exposure to heat, sunlight, water, radioactive contamination, or non-occupational radiation should be avoided.

APPENDIX 2.3

Number 3.1
Page 1 of 5 Pages
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Supersedes Issue Dated 7/15/71

RADIATION PROTECTION STANDARDS FOR OCCUPATIONAL EXPOSURE

POLICY

It is the policy of the Oak Ridge National Laboratory to plan and conduct operations involving exposure of personnel to ionizing radiation in accordance with DOE standards for radiation protection and to require that departmental programming will be such as to result in planned exposures that will be below those standards as much as is practicable.

DEFINITIONS

1. External Exposure - Dose equivalent to body tissues from sources of ionizing radiation located outside the body.

2. Internal Exposure - Dose equivalent to tissues of the body from radioactive materials located within the body.

3. Rem (Roentgen equivalent man) - The unit of dose equivalent (H). Dose equivalent (in rem) = absorbed dose (in rads) x modifying factors. One sievert = 100 rem.

4. Rad - The unit of absorbed dose. One rad = 100 erg/g. For purposes of this Manual the rad is measured in tissue. One gray = 100 rad.

5. Modifying Factors - Dimensionless modifying factors related to linear energy transfer (Q), specific deposition of energy in an organ (N), etc., used to determine the dose equivalent.

6. CG - Concentration guide. An accepted upper limit for the concentration of a specified radionuclide in a material taken into the body below which continuous exposure to the material is not considered biologically harmful.

7. $(CG)_a$ - Concentration guide for air.

8. $(CG)_w$ - Concentration guide for water.

9. Critical Organ - That organ (or tissue) in which the dose equivalent would be most significant due to a combination of the organ radiosensitivity and selectivity and/or a particular dose pattern throughout the body.

10. Occupational Exposure - Occupational exposure of an organ or tissue consists of the total H delivered to that organ or tissue from external sources during working hours, and from internal sources whose presence in the body is a consequence of Laboratory employment. It shall not include any medical exposure or exposure to naturally occurring background radiation.

11. Maximum Permissible Dose Equivalent (MPH) - Limits on dose equivalent specified in DOE orders (based on recommendations of the NCRP and/or ICRP).

12. Dose Commitment - The dose equivalent received by specified organs during a period of one calendar year which was the result of uptake of a radionuclide by a person occupationally exposed.

13. Maximum Permissible Intake (MPI) - Limits on intake specified by DOE orders (based on information contained in NBS Handbook 69).

14. Recommended Operating Levels - Exposure levels calculated to result in long-term accumulations that will not exceed those specified as permissible in Table 1.

LIMITATIONS

This procedure applies only to planned occupational exposures.

REGULATIONS

1. The Maximum Permissible Dose Equivalent (MPH) and the Maximum Permissible Intake (MPI) limits specified in this procedure are limits for planned occupational exposures. Exposures at ORNL shall be maintained as far below these values as is reasonably achievable.

   (a) The MPH's for the various tissues and organs of the body are specified in Table 1.

TABLE 1. Dose-Limiting Recommendations for Occupational Exposure[1]

Type of Exposure	Condition	MPH (Dose equivalent or Dose commitment) (rem)
Whole body (gonads, head & trunk, lens of the eye, red bone marrow, and active blood forming organs also included)	Prospective (Planned) Annual Limit	5[2]
	Calendar Quarter	3
Skin (except hands & forearms), other organs, tissues[3,4] and organ systems (except bone).	Annual Limit	15
	Calendar Quarter	5
Hands or feet	Annual Limit	75
	Calendar Quarter	25
Forearms, bone	Annual Limit	30
	Calendar Quarter	10

[1] DOE Manual, Chapter 0524.

[2] In special cases with DOE approval, a worker may exceed 5 rem/yr provided his/her average exposure per year since age 18 will not exceed 5 rem.

[3] Exposure to women of reproductive capacity should be limited to 1.3 rem/qtr. Exposure of the fetus during any pregnancy should not exceed 0.5 rem.

[4] The presence of a chronic skeletal burden of a radionuclide of long effective half-life requires reduction of exposure to external sources of penetrating radiation as follows:

(i) if the estimated body burden is less than one-half of the maximum permissible, no consequential restriction of external radiation exposure need be applied;

(ii) if the estimated body burden is greater than one-half but less than the maximum permissible, the total body exposure to penetrating external radiation shall be limited to not more than 1.5 rem in any year; and if A years is the age of the individual when the body burden was first found to exceed one-half the maximum permissible, then the total accumulated dose from such future exposure beyond age A shall not exceed 1.5 (N-A) rem where N is the current age of the individual; if, however, at age B the body burden is found to have dropped to less than one-half the maximum permissible value, the accumulated dose from future external total body exposure beyond age B shall not exceed 5 (N-B) rem.

(iii) if the estimated body burden equals or exceeds the maximum permissible, no occupational exposure to penetrating external radiation is permissible.

(b) The MPI is based on the MPH values shown in Table 1 and is administered as follows:

(i) If there is no occupational external radiation exposure, the MPI for an individual during any calendar quarter shall be limited to the amount that would be taken into the body of standard man in 520 hours of exposure at the CG for a 40-hr week. This amounts to $6.5 \times 10^8 \times (CG)_a$ μCi/quarter by inhalation alone, and $7.2 \times 10^4 \times (CG)_w$ μCi/quarter by ingestion alone. The CG in each case is that for a 40-hr week.

(ii) If an individual is receiving occupational external radiation exposure, the above rule continues to apply with the limitation that (in calculating the MPI) the CG for a 40-hr week value referred to must be lowered as follows: if the dose that is permissible to the critical body organ during a specific calendar quarter is H rem and if external radiation is expected to deliver a dose of E rem to the organ during that quarter, then the CG based on the particular organ must be reduced by the factor $\frac{H-E}{H}$.

2. Recommended Operating Levels for Quarterly Exposures - In general, it is recommended that the planning of operations be such that the accumulated quarterly MPH or MPI will not exceed approximately 1/3 of the recommended quarterly limits. It is emphasized that, in planning, the Laboratory's policy of holding all personnel exposure as low as reasonably achievable be kept in mind.

3. Recommended Operating Levels for Weekly Exposure - The following recommendations shall be used as a guide in planning and conducting operations involving personnel radiation exposure. (Planned exposures in excess of these recommended levels shall be sanctioned only after careful consideration and in accordance with Procedure No. 3.2).

(a) External Exposure - The external exposure to an individual in any single week should not exceed:

(i) 100 mrem to the total body, head and trunk, lens of eyes, gonads, or blood-forming organs.

(ii) 300 mrem to the skin of the whole body.

(iii) 600 mrem to the forearms.

(iv) 1500 mrem to the hands.

(b) Internal Exposure - The intake of radioactive materials by an individual in any single week should not exceed 1/13 of the MPI per calendar quarter. (Note: This recommendation is intended to be used more for general planning purposes than as a practical

method for regulating internal exposures on a weekly basis. In contrast to external radiation exposures, it is very difficult to regulate or to determine the amount of intake of radioactive materials by an individual and the subsequent radiation dose to his body tissues. It is usually more practical to avoid internal exposures of significance by exercising prescribed contamination controls, employing appropriate material-handling techniques, and using adequate respiratory protection devices).

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Issued 2/1/72
Supersedes Issue Dated 7/1/65

PERSONNEL EXPOSURE CONTROL

POLICY

It is the policy of the Oak Ridge National Laboratory to keep personnel exposures at the lowest practical level and to ensure that no individual exceeds the recommended maximum dose limits.

DEFINITIONS

1. Personnel Exposure Control - Measures taken for the purpose of preventing or minimizing radiation exposure. Such measures include the control of access to radiation hazards, controlled dose rates, working time limits, and accumulated dose per time interval. Dose rates are controlled by shielding or containment, the use of maximum feasible working distance (assisted by remote handling equipment when appropriate), the minimization of surface and air contamination, and the use of personnel protection equipment.

2. Administrative Controls - Methods used for authorizing external exposure through supervisory line organization. Approvals are based on (a) exposure rates involved; (b) the individual's physical condition and accumulated dose status; and (c) specific operational conditions.

3. Health Physics Surveillance - The continuous or intermittent attendance of a Health Physics Representative at the site of a given work operation involving ionizing radiation. (The term "surveillance" is not to be confused with "radiation survey", which is defined in Procedure No. 2.1, this Manual.)

LIMITATIONS

1. Regulations in this procedure may be suspended in accordance with Laboratory Emergency Procedures.

2. Radiation exposures resulting from medical applications are exempt from the provisions of this procedure except as otherwise qualified by the Health Division.

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RESPONSIBILITIES

1. Health Physics

   (a) Assists supervision in the development and application of effective methods for preventing radiation exposure, or in controlling necessary exposure at the Laboratory within specified recommended limits.

   (b) Keeps supervision currently informed regarding the radiation exposure status of personnel under their direction by means of daily, weekly, quarterly, or special reports.

2. Supervision

   (a) Informs all individuals who occupy areas under the supervisor's control of the nature of the ionizing radiation hazards present, or apt to be present, and effects the protective measures required.

   (b) Limits the exposure of personnel to the lowest practical level at or below the recommended limits.

3. Health Division

   Determines the physical eligibility of personnel for work with ionizing radiation at ORNL and recommends medical disqualification for such work when indicated.

4. Each Individual

   (a) Cooperates in preventing avoidable radiation exposure and minimizing those exposures that are necessary for completion of work assignments.

   (b) Uses personnel monitoring equipment as required for determination of exposures.

   (c) Reports to appropriate supervision knowledge of any incident or work condition in which he knows or suspects that a significant radiation exposure occurred, or may occur.

   (d) Informs his supervisor and the Director of the Health Division of prior or concurrent work with ionizing radiation and radioactive materials at installations other than the Laboratory.

   (e) Informs his supervisor and/or the Director of the Health Division of any known or suspected personal physical condition or any significant nonoccupational internal or external radiation exposure which might alter his current ORNL eligibility for further occupational exposure.

   (f) Cooperates in supplying samples of excreta, as required for dose determinations.

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REGULATIONS

1. Only individuals qualified for radiation work shall be permitted to engage in ORNL activities involving radiation exposure above normal background. Grounds for disqualification for work involving radiation exposure include:

   (a) A known history of accumulated occupational radiation exposure or body burden of radionuclides in excess of recommended maximum limits.

   (b) A known history of accumulated non-occupational radiation exposure or body burden of radionuclides (e.g., diagnostic, therapeutic, or accidental) significantly in excess of the recommended maximum for occupational exposure.

   (c) Certain physical limitations specified by the ORNL Health Division.

   (d) Failure to comply with responsibilities, 4, above.

2. Existing and potential exposure areas shall be zoned in accordance with the Laboratory zoning procedure (see Procedure No. 2.7) and equipped with instruments and devices necessary to provide ample warning of any significant increase in radiation exposure potential.

3. In addition to the regularly issued film badge meter (see Procedure No. 3.4), all persons entering an area where there is a likelihood of a significant radiation exposure or contamination, shall be provided with special monitoring instruments, special clothing, protective equipment, instructions, and Health Physics surveillance appropriate for the existing exposure potential.

4. The radiation dose that may be sustained by an individual entering a zoned area shall be estimated, and each planned exposure of an individual exceeding 20 mrem/day shall be approved in advance by the immediate supervisor of that individual. The immediate supervisor is charged with knowing the current radiation exposure status of each individual whom he directly supervises.

5. Reference dose rates used in administering radiation exposures and exposure controls shall be determined on a current basis by appropriate radiation survey and operational inspection in accordance with radiation survey procedures (see Procedure No. 2.1).

6. Maximum working exposure-time limits shall be chosen on the basis of the type and magnitude of radiation hazard.

7. Planned exposures that are significantly above the recommended operating levels for weekly exposure require special consideration and justification.

(a) Any planned exposure of an individual in excess of the prorated weekly exposure limits (0.3 rem total body, 1.0 rem skin, 2.5 rem extremities) requires authorization of the employee's Division Director.

(b) Any planned operation which will subject an individual to an exposure greater than 1/3 of a recommended maximum quarterly limit in any one week requires the prior approval of the Laboratory Deputy Director.

8. A properly executed Radiation Work Permit shall be issued in advance of each work assignment for the day that involves a planned exposure greater than the average daily exposure permitted by the age proration formulas given in Table 1 of Procedure 3.1. These are 20 mrem whole body; 60 mrem skin; or 300 mrem extremities. Posted regulations properly approved may be used in lieu of a Radiation Work Permit for operating personnel when routine or repetitive operations are involved (see Procedure 3.6).

9. All planned exposures of personnel shall be undertaken only under conditions of accurate exposure determination, rigid exposure control, and detailed direction by supervision. Table 1 shall be used as a guide in planning and authorizing work that may involve external exposure to specified dose rates. Table 2 may be used as a guide in planning and authorizing work that may involve exposure to airborne radionuclides.

10. An employee whose radiation dose exceeds a recommended maximum limit shall be removed from further radiation exposure (emergencies excepted) until such time as his exposure status is within the recommended maximum limits.

Table 1. Guide for Planning and Authorizing External Exposure to Specified Dose Rates

I	II	III	IV	V	VI
Exposure Level Dose Rate to Whole Body* (rem/hr)	Direct Reading and/or Alarm-Type Monitoring Instruments Required	Health Physics Surveillance Required	Special Approvals Required		
			Area Division Director	Health Physics Division Director	Laboratory Deputy Director
0.003-5	X	X			
5-20	X	X	X		
20-50	X	X	X	X	
Over 50	X	X	X	X	X

*For individual organs, the equivalent multiple of the yearly dose rate indicated by the age proration formulas is to be used. See Procedure 3.1, Table 1.

Note: The above required approvals are to be noted on the Radiation Work Permit issued for the particular job assignment should doses >20 mrem in any one day be expected. In the dose-rate range of from 0.003 to 5 rem/hr, and where an individual's exposure time ensures that he will receive less than 100 mrem accumulated dose in one week (or the equivalent for individual organs), the requirements indicated in Columns II and III may be replaced by other safeguards in written procedures approved by the appropriate authorities indicated in Columns IV to VI.

Table 2. Guide for Planning and Authorizing Exposure to Unidentified* Airborne Contaminants

Concentration Range		Immediate Action
Alpha (10^{-11} µCi/cc)	Beta-Gamma (10^{-9} µCi/cc)	
< 2	< 3	Masks not required unless airborne contamination is determined to be above $(MPC)_a$ for 40-hr week.
2 to 200	3 to 300	Full face mask required; otherwise, evacuate personnel from area.
> 200	> 300	Positive air supply required; otherwise, evacuate personnel from area. (Consider external exposure potential.)

*Where airborne contaminants are identified (see NBS Handbook 69 for MPC values), masks should be issued if the $(MPC)_a$ for a 40-hr exposure will be exceeded. A positive air supply should be provided if the concentration is more than 100 times the $(MPC)_a$ for a 40-hr week.

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Issued 5/1/78
Revised 3/16/81

PROCEDURE FOR PERSONNEL METERING OF ORNL EMPLOYEES

It is the policy of Oak Ridge National Laboratory to provide each employee with a thermoluminescent dosimeter (TLD) to be worn as an attachment to the security identification device (ID).

LIMITATION

This procedure does not apply to photobadged non-employees, vendors, visitors, etc. (Ref. IS&AHP IP No. 213), or to supplementary metering of radiation workers (Ref. IS&AHP IP No. 203).

DEFINITIONS

Health Physics - The Health Physics Department of the Industrial Safety and Applied Health Physics Division.

Y-12 Lab - The Plant Laboratory of the Product Certification Division at the Y-12 Plant.

Radiation Worker - An employee who is likely to be exposed to radiation of the amount and type that requires quarterly monitoring in accordance with DOE Manual, Chapter 0524.

RESPONSIBILITIES

Health Physics - Provides meters for employees and arranges for meter analysis, data recording, and reporting.

Y-12 Lab - Supplies meters to Health Physics, analyzes the meters and reports the results to Health Physics.

ORNL Divisions - Effect routine meter exchanges with meters provided by Health Physics.

ORNL Employees - Keep meters attached to security devices, protect meters from damage and exposure to non-occupational radiation, and report damage and non-occupational exposure to Health Physics.

PROCEDURE

1. Each employee is provided with a TLD by Health Physics when initially badged by ORNL Security.

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2. TLD's of all employees are changed out during the month of July.

3. TLD's of radiation workers are changed out each calendar quarter, or more frequently, if required.

4. Health Physics requisitions TLD's from the Y-12 Lab on or about May 15 each year for all employees who are on the payroll at that time for the annual changeout to be done each July.

5. Health Physics requisitions TLD's from the Y-12 Lab for quarterly changeouts, incidental replacements and initial assignments.

6. Health Physics distributes the TLD's and checklists for annual changeout to the divisions, who effect the changeout and return the used TLD's to Health Physics.

7. Health Physics audits all changeouts and sends the used TLD's to the Y-12 Lab.

8. The Y-12 Lab analyzes the TLD's and transmits the data to Health Physics by way of the Computer Sciences Division facilities to the PDP-10 at X-10.

9. Health Physics converts the data from the Y-12 Lab to dose equivalents which are recorded in the external dosimetry data system.

APPENDIX 2.6

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Page 1 of 1 pages
Revised 6/15/81

PROCEDURE FOR ORNL SUPPLEMENTARY METERS

ORNL supplementary meters for radiation monitoring may be assigned for use in lieu of or as adjunct to the UCC-ND TLD meter. There are two classes of supplementary meters.

One class, called "HP meters," is for use for radiation for which the UCC-ND meter is inadequate. There are two types: one has a yellow dot on the front and is for X-, gamma and beta radiation; the other has a red dot on the front and is for the same radiations as the yellow dot meter plus neutrons. These meters are assigned to personnel for the duration or balance of a calendar quarter on the basis of their potential for exposure to significant amounts of the radiations for which the meters are intended. Assignment of the red dot meters is done by the Radiation and Safety Surveys Section Head. Yellow dot meters are assigned on the basis of recent (current and previous quarter) knowledge of the assignee's radiation dose. "HP meters" have white frames and blue backs and they are equipped with nuclear accident devices.

The other class is called "H meters," because the serial numbers are preceded by the letter H. They are intended for short-term (no more than a few days) use for persons who need to be monitored and have no meter and for those who may need short-term monitoring for beta radiation. There are two types: one has beta-gamma film for the dosimeter; the other has TLD's and beta-gamma film. Meters of the first type are allocated to HP offices for routine use and each Complex should maintain a few on hand. Those not used within 30 days must be recycled to the Portals for audit and film replacement. Meters of the second type are limited in quantity--there should be no more than ten of them in use at any time. They are intended for use for persons who may sustain a dose greater than 50 mrem where a significant fraction of the dose is due to beta radiation. These meters are kept at the Portals and are consigned to Complex Leaders when requested. NOTE: meters for the second type must not be requested from the Portals until needed for use and must be returned immediately after use, because of the short supply.

Whenever an H meter is assigned for use by a person with a UCC-ND meter, the UCC-ND meter should not be worn during use of the H meter. The UCC-ND meter should be left in a low background area, then returned to use by the person after the H meter use is completed.

H meters used by ORNL and photobadged, monitored non-employees must be returned with a completed form UCN-8381, Beta-Gamma Dosimetry Record. Those used by non-employees, including non-monitored, photobadged non-employees, must be returned with a completed form UCN-5897, ORNL Visitor Metering Data.

APPENDIX 2.7

IS&AHP IP No. 213
Page 1 of 4 pages
Issued 5-1-78
Supersedes Issue Dated 1-1-73

RADIATION MONITORING FOR PHOTO-BADGED NON-EMPLOYEES

Policy

It is the policy of Industrial Safety and Applied Health Physics to provide radiation monitoring for photo-badged non-employees for whom monitoring is required under DOEM Chapter 0524.

Responsibilities

1. The ORNL division with which the badge assignee is affiliated

   a. Determines if and when radiation monitoring is required,

   b. Instructs the assignee in accordance with ORNL Procedures and Practies for Radiation Protection and assures compliance therewith,

   c. Provides IS&AHP with information regarding the assignee.

2. The Badge Assignee - the badge assignee complies with Health Physics Procedures.

3. Industrial Safety and Applied Health Physics

   a. Provides required dosimetry services,

   b. Maintains records related to monitoring,

   c. Provides reports related to monitoring data.

Procedures

1. The Dose Data Group forwards Forms UCN-9489, Fig. 1, and UCN-8409, Fig. 2, to the Radiation Control Officer of the ORNL division, who delivers Form UCN-8409 to the assignee.

2. The ORNL division fills in Form UCN-9489 and returns it to the Radiation Monitoring Section.

3. If advised by Form-9489 that the assignee will work in Radiation Zones, the Radiation Monitoring Section will institute monitoring procedures and records for him.

4. If the assignee works in Radiation Zones, he makes use of the Applied Health Physics pocket meter program and has his badge serviced at the scheduled time each quarter.

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Issued 8-3-81
Supersedes Issue Dated 5-1-78

INTRA-LABORATORY CORRESPONDENCE
OAK RIDGE NATIONAL LABORATORY

TO: Radiation Monitoring Section
Industrial Safety and Applied Health Physics Division
Building 4500S, H-256

DATA FOR MONITORED, ORNL NON-EMPLOYEE

The information herein is provided in compliance with ORNL Health Physics Procedures and US-DOE requirements.

LAST NAME INITIALS

SOCIAL SECURITY NUMBER

DATE OF BIRTH

ORNL EMPLOYEE WHO IS RESPONSIBLE FOR THIS PERSON AT ORNL

ORNL DIVISION

NAME OF ASSIGNEE'S NON-ORNL EMPLOYER OR AFFILIATION

ADDRESS OF ASSIGNEE'S NON-ORNL EMPLOYER OR AFFILIATION

Regulation A, H.P. Procedure 1.2 has been effected for the named non-employee

DIVISIONAL RCO

UCN-8469
(3 4-80)

Figure 1

APPENDIX 4.1

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Issued 8-3-81

PERSONNEL RADIATION DOSIMETRY SUPPLEMENT, UCN-2872

Form UCN-2872 (Fig. 209.1) is used for one or more of the following: (1) for completion of dose data in the event of lost, damaged or missing dosimeters; (2) for review, substantiation or modification of an apparent dose; and (3) to obtain supervisory acknowledgment of the receipt of information regarding a significant radiation dose.

Limitation

This form is not used for notifying Management and the employee in the event that a standard is exceeded. (See IS&AHP IP No. 207, "Compliance with DOE Manual Chapter 0525").

Definition

A significant radiation dose is one which exceeds 20 percent of the average annual Radiation Protection Standard (DOE-0524), accumulated within a calendar quarter.

Responsibilities and Regulations

1. The Dose Data Group determines when use of the form is required, initiates the form by filling in the known, basic information and forwards the form to the supervisor of the Radiation and Safety Survey Section.

2. Radiation and Safety Survey supervision obtains any necessary investigatory information, dose estimates and signatures, and returns the form to the Dose Data Group.

3. The Dose Data Group translates the dose data into the standard record keeping and reporting programs, and files and retains the form in the permanent records.

4. The obverse (front) of the form is only for use by the Dose Data Group. Data entries and signatures thereon should not be made by field investigators.

5. Form UCN-2872B (Fig. 209.2) may be used instead of Form UCN-2872 in such cases as it may be applicable.

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ORNL PERSONNEL RADIATION DOSIMETRY SUPPLEMENT

NAME	ID NO.	BADGE NO.	DIVISION	DEPARTMENT

ISSUED BECAUSE OF	DATE ISSUED

INCLUSIVE DATES OF THIS RECORD:	FROM	TO	QUARTER	YEAR

SPECIAL NOTIFICATION TO:	SIGNATURE	DATE

The recorded external radiation dose from occupational exposure for above named employee for inclusive dates shown above is

DS	DC	OTHER	CERTIFIED BY
mrem	mrem		

UCN-2872
(3 5-74)

RETURN THIS FORM TO DOSIMETRY RECORDS

INSTRUCTIONS BY DOSE DATA GROUP	

INVESTIGATOR'S REPORT	

	SIGNATURE	DATE

ACKNOWLEDGEMENT BY SUPERVISION			
NAME (PRINT)	TITLE	SIGNATURE	DATE

Fig. 209.1

ORNL PERSONNEL RADIATION DOSIMETRY SUPPLEMENT

NAME	BADGE NO.	DIVISION	DEPARTMENT	DATE ISSUED

	FROM	TO	QUARTER	YEAR
INCLUSIVE DATES OF THIS RECORD:				

The recorded external radiation dose from occupational exposure for above named person for inclusive dates shown above is

DS	DC	OTHER	CERTIFIED BY
mrem	mrem		

UCN-28728
(3 5-66)

THE BADGE OF THE PERSON HAS NOT BEEN MADE AVAILABLE TO HEALTH PHYSICS FOR PROCESSING WITHIN 30 DAYS AFTER THE END OF THE PERIOD FOR WHICH IT WAS ASSIGNED.

THE DOSE FOR THE PERIOD IS RECORDED AS THAT OF THE TOTAL OF THE PERSON'S POCKET METER READINGS FOR THE PERIOD, OR ZERO IF THERE WERE NO POCKET METER ENTRIES.

IF THE BADGE IS SUBSEQUENTLY TURNED-IN, ANY DOSE DETERMINED THEREFROM IN EXCESS OF THAT NOTED HEREON WILL BE RECORDED AT THAT TIME.

HEALTH PHYSICS DOSIMETRY RECORDS

ACKNOWLEDGEMENT OF DIVISION SUPERVISION	SIGNATURE	DATE

Fig. 209.2

APPENDIX 8.1

Pocket Meter Weekly Report

An example of a portion of the Departmentally organized Pocket Meter Weekly Report is shown in Fig. 1.

The information included in the report is:

1. The ORNL department number and division code.

2. The "Health Physics week number" for the week during which the data apply.

3. The names, in alphabetical order, and the identification number of the persons affiliated with the department and who use pocket meters during the week.

4. The cumulative, recorded whole body dose (DC) to date in the quarter as may have been derived from badge meter data.

5. The pocket meter reading for each day is listed under the day of the week for which it was recorded.

6. The sum of the daily readings for the week (WK).

7. The sum of the readings for the quarter (QTR).

8. The number of days during the quarter for which pocket meter readings were recorded (F).

9. A symbol (SMB) as may be applicable and for which:

   D is one or more daily readings $\geq$ 20,
   W is a total reading for the week $\geq$ 100,
   Q is a total reading for the quarter $\geq$ 300, and
   + is a daily reading which exceeds 250.

10. A ratio (DC/PMD) of the DC (see 4, above) to the total pocket meter readings over the period for which the DC applies.

11. A value (BAL) of the pocket meter readings accumulated since the last DC was derived.

12. There is a summation of the noteworthy items at the bottom of the report, where Entries are the total of the daily reading events and Count is the number of persons involved.

ORNL-DWG 70-908

DEPT XXXX HP WK 52

NAME	PR NO	DC	S	M	T	W	T	F	S	WK	QTR	F	SMB	DC /PMD	BAL
----------	-----			0	5	10	0			15	270	62			
----------	-----	660		10	25		120			155	1140	57	DWQ	660/700	440
----------	-----										35	11			
----------	-----										10	1			
----------	-----			10	10	0	10			30	220	41			
----------	-----			10						10	115	62			
----------	-----										5	20			
----------	-----		0	10	10		20			40	560	54	D Q		
----------	-----										195	22			
----------	-----											1			
----------	-----		125	0		0				125	260	60	DW		
----------	-----			30	0	5	0			35	415	61	D		

ENTRIES	+	D	W	Q	COUNT
23		5	2	2	12

Typical Pocket Meter Weekly Report

INDUSTRIAL SAFETY & APPLIED HEALTH PHYSICS DIVISION
DEPARTMENT 3193
RADIATION SURVEY

Name	ID Number	Symbol	Date	REM DS	REM DC	REM This Qtr DS	REM This Qtr DC	REM This Yr DS	REM This Yr DC	Total REM DS	Total REM DC	A	DC/A
----	-----	PF	7-02-72	0.860	0.630	0.860	0.630	1.68	1.32	86.43	35.59	18	2.02
		PN	7-02-72	0.000	0.000								
----	-----	PF	7-02-72	0.340	0.240	0.340	0.240	0.34	0.24	1.89	0.24	1	0.80
----	-----	PF	7-02-72	0.020	0.020	0.020	0.020	0.02	0.20	7.45	5.22	14	0.38
----	-----	PF	7-02-72	0.070	0.040	0.070	0.040	0.30	0.19	43.62	18.38	16	1.19
----	-----	PF	7-02-72	0.390	0.310	0.390	0.310	1.40	1.14	3.13	2.74	20	0.14
----	-----	PEL	4-27-72	0.020	0.020	0.160	0.130	0.28	0.25	8.23	5.55	6	1.09
		PF	7-02-72	0.140	0.110								
		PN	7-02-72	0.000	0.000								
----	-----	PF	7-10-72	0.400	0.200	0.400	0.200	0.73	0.45	10.43	7.43	12	0.64
----	-----	PF	7-17-72	0.180	0.150	0.180	0.150	0.60	0.49	17.19	8.43	7	1.34

APPENDIX 8.2

EXPLANATION OF FORMAT FOR QUARTERLY REPORT ENTITLED
"ORNL Radiation Exposure Record for 1976"

A. This report is of photo-badged ORNL employees and affiliates, and has 10 major column headings as follows:

1. Name - Last name and initials of photo-badged person.
2. ID Number - Badge identification number.
3. Symbol - Dosimetry symbol for electronic data processing - (see B below).
4. Date - Month-day-year of the end of the monitoring period or the effective date for the record entry as noted.
5. Rem - Total rem for dosimeter and date (see above) indicated for DS (dose to the skin of the whole body) and DC (whole body dose).
6. Rem this Qtr. - Summation of all the entries in column 5 for the quarter indicated.
7. Rem this Yr. - Summation of all the entries in column 5 for the year indicated.
8. Total Rem - Cumulative dose in ORNL dosimetry records for current interval as a monitored person.
9. A - Number of years monitored by ORNL for current interval as a monitored person.
10. DC/A - Average dose per year of ORNL current monitoring.

B. Explanation of four alphabetical columns headed SYMBOL.

1. M - Non-Carbide ORNL-metered personnel,
   P - ORNL employee.

2. The symbols used in the second column are:

   E - Dose by investigation or device other than TLD, film, experiment, or by agency other than ORNL (supporting documentation in on file),
   F - TLD and/or film,
   N - NTA film and/or TLD,
   T - Dose from temporary meter in lieu of assigned meter,
   X - Dosimeter processing not required for the period.

3. The symbols used in the third column are:

   C - Change of name,
   D - Dosimeter damaged, not interpretable,
   I - Internal dose (added to external dose),
   L - Assigned meter lost,
   M - Routine monitoring not required (DOE-0524),
   N - Assignee did not return meter within 30 days after date of expiration of monitoring period,
   P - Meter for preceding monitoring period turned in,
   R - Reinstated ORNL monitoring for ID number and date indicated,
   S - Start ORNL monitoring for ID number and date indicated,
   T - Terminated ORNL monitoring for ID number and date indicated,
   W - Meter for monitoring period was not used,
   Z - Processing data loss.

4. The symbols used in the fourth column are:

D - Damaged plastic strap on meter,
F - Found lost meter,
M - Monitoring data,
N - Nuclear Division transfer,
O - ORNL meter,
T - Telephone Company employee, monitored,
X - Non-occupational exposure,
Y - Y-12 lab meter.

APPENDIX 8.3

IS&AHP IP No. 207
Page 1 of 1 pages
Issued
Supersedes Issue Dated 5-10-76

COMPLIANCE WITH DOE MANUAL CHAPTER 0525

DOE Manual Chapter 0525, Occupational Radiation Exposure Information, has certain provisions whereby non-routine reporting is required. This procedure deals with the one requiring the Contractor to notify an employee immediately of any radiation exposure that exceeds the radiation protection standards which are specified in DOEM Chapter 0524.

Purpose

The purpose of this procedure is to assure that the individual employee is notified when his exposure has exceeded the standards, and that documentation of such notification is included in his radiation monitoring record.

Responsibilities

It is the responsibility of the Industrial Safety and Applied Health Physics Division to determine when such notification is required; to prepare a written statement in which is included the name of the employee, the standards which have been exceeded and the degree to which they have been exceeded; and to provide the employee with one copy of the statement and to obtain his signature acknowledging notification on a second copy, which will be included with his radiation monitoring record.

Procedure

The Radiation Monitoring Section shall, when it has knowledge of such an overexposure, prepare the written statement and any copies which may be needed, and arrange for its delivery to the employee and the return of the signed copy to the Dose Data Group.

APPENDIX 8.4

OAK RIDGE NATIONAL LABORATORY

OPERATED BY

UNION CARBIDE CORPORATION

NUCLEAR DIVISION

POST OFFICE BOX X

OAK RIDGE, TENNESSEE 37830

Dear Sirs:

Reference: Radiation Monitoring Records for

You are hereby informed that our records indicate that because of affiliation with and work performed at Oak Ridge National Laboratory, the referenced person was not exposed to radiation or radioactive materials to the extent that monitoring is required.

Yours truly,

Edwin D. Gupton
Industrial Safety and
Applied Health Physics

cc: Dose Evaluation Records

APPENDIX 8.5

OAK RIDGE NATIONAL LABORATORY

OPERATED BY

UNION CARBIDE CORPORATION

NUCLEAR DIVISION

POST OFFICE BOX X

OAK RIDGE, TENNESSEE 37830

Dear Sir:

Reference: Radiation Monitoring Records for

The Personnel Monitoring records indicate that between and the above named individual had accumulated a whole body dose of mSv from radiation exposure at the Oak Ridge National Laboratory.

The record indicates that there was no evidence of internal dose, and that no Radiation Protection Standard (DOE Manual, Chapter 0524) was exceeded.

Yours truly,

Edwin D. Gupton
Industrial Safety and
Applied Health Physics

cc: Dose Evaluation Records

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