DOCUMENT RESUME

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IDENTIFIERS	Department of Defense; DOD

ABSTRACT

This student workbook includes the necessary materials and some of the references needed by each student during the conduct of the Radiological Monitoring for Instructors (RMI) course. The contents include a radiation exposure record, instrument exercise materials, fallout forecasting problems, dose and dose rate problems, source handling techniques, quizzes and answer sheets, and a RMI course examination answer sheet. (LS)

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RADIOLOGICAL MONITORING FOR INSTRUCTORS

Student Workbook

(Supersedes SM–11.22–1 dated June 1964
which may not be used)

DEPARTMENT OF DEFENSE
OFFICE OF CIVIL DEFENSE

CONTENTS

Note to the Instructor

This Student Workbook includes the necessary materials and some of the references needed by each student during the conduct of the Radiological Monitoring for Instructors course. All pages are perforated for easy removal.

RADIATION EXPOSURE RECORD

NAME _____

AGE _____ DATE OF BIRTH _____

SOCIAL SECURITY NUMBER _____

DOSIMETER SERIAL NUMBER _____

DATE	INITIAL READING	FINAL READING	DOSE

DATE _____ TOTAL EXPOSURE _____

SIGNATURE _____

1

WORK SHEET FOR OPERATION PROSPECT EXERCISE

SOURCE	LOCATION OF SOURCE
0	(BASE OF FIRE HYDRANT)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

NAME _____

WORK SHEET FOR INSTRUMENT FAMILIARIZATION EXERCISE

CD V-700

DISTANCE (FEET)	RANGE	x	METER READING	=	MEASURED DOSE RATE (mr/hr)
1		x		=	
2		x		=	
3		x		=	
4		x		=	
5		x		=	
6		x		=	
8		x		=	
10		x		=	
12		x		=	
14		x		=	
16		x		=	
18		x		=	
20		x		=	
		x		=	

CD V-715 (r/hr)

1		x		=	
1.5		x		=	
2		x		=	
2.5		x		=	

NAME _____

TABLE OF DECAY CORRECTION FACTORS FOR COBALT 60

λ factor (1 month) = 0.01 half life = 5.3 years

MONTHS	0	1	2	3	4	5	6	7	8	9
0	1.00	.99	.98	.97	.96	.95	.94	.93	.92	.91
10	.90*	.89	.88	.87	.86	.85	.84	.83	.82	.81
20	.80	.79	.79	.78	.77	.76	.75	.74	.74	.73
30	.72	.71	.70	.70	.69	.68	.67	.67	.66	.65
40	.65	.64	.63	.62	.62	.61	.60	.60	.59	.58
50	.58	.57	.57	.56	.55	.55	.54	.54	.53	.52
60	.52	.51	.51	.50	.50	.49	.49	.48	.48	.47
70	.46	.46	.45	.45	.44	.44	.43	.43	.42	.42
80	.41	.41	.41	.40	.40	.39	.39	.38	.38	.38
90	.37	.37	.36	.36	.35	.35	.35	.34	.34	.34
100	.33	.33	.33	.32	.32	.31	.31	.31	.30	.30
110	.30	.29	.29	.29	.28	.28	.28	.28	.27	.27
120	.27	.26	.26	.26	.26	.25	.25	.25	.24	.24
130	.24	.24	.23	.23	.23	.23	.22	.22	.22	.22
140	.21	.21	.21	.21	.20	.20	.20	.20	.20	.19

SAMPLE PROBLEM: If the activity of a source was 8-millicuries in June 1961, what was the activity in April 1962?

ELAPSED TIME 10 Months

DECAY CORRECTION FACTOR .90*

SOURCE ACTIVITY IN APRIL 1962 8 X .90 = 7.2 mc

SAMPLE

WORK SHEET FOR INSTRUMENT RADIATION RESPONSE EXERCISE

SOURCE ACTIVITY 7.2 mc SERIAL No. 1234

FORMULA Used to determine calculated (ACTUAL) dose rates.

Dose rate in mr/hr = $\frac{(13.2)\,(\text{Number of millicuries } Co^{60})}{(\text{distance in feet})^2}$

DISTANCE	RANGE	x	METER READING	=	MEASURED DOSE RATE (mr/hr)	CALCULATED DOSE RATE (mr/hr)
1	100	x	OFF	=	SCALE	95
2	100	x	.26	=	26	24
3	100	x	.14	=	14	11
4	100	x	.07	=	7.0	6.0
5	10	x	.39	=	3.9	3.8
6	10	x	.26	=	2.6**	2.6*
8	10	x	.16	=	1.6	1.5
10	10	x	.11	=	1.1	1.0
12	10	x	.07	=	.70	0.7
14	10	x	.05	=	.50	.49
16	1	x	.33	=	.33	.37
18	1	x	.26	=	.26	.29
20	1	x	.22	=	.22	.24
22	1	x	.18	=	.18	.20
24	1	x	.15	=	.15	.17
		x		=		
		x		=		
		x		=		

* Obtain reading near mid-scale on X10 range

** Before readings are taken, adjust calibration screw so measured dose rate equals calculated (ACTUAL) dose rate at dose rate point nearest to 2.5 mr/hr

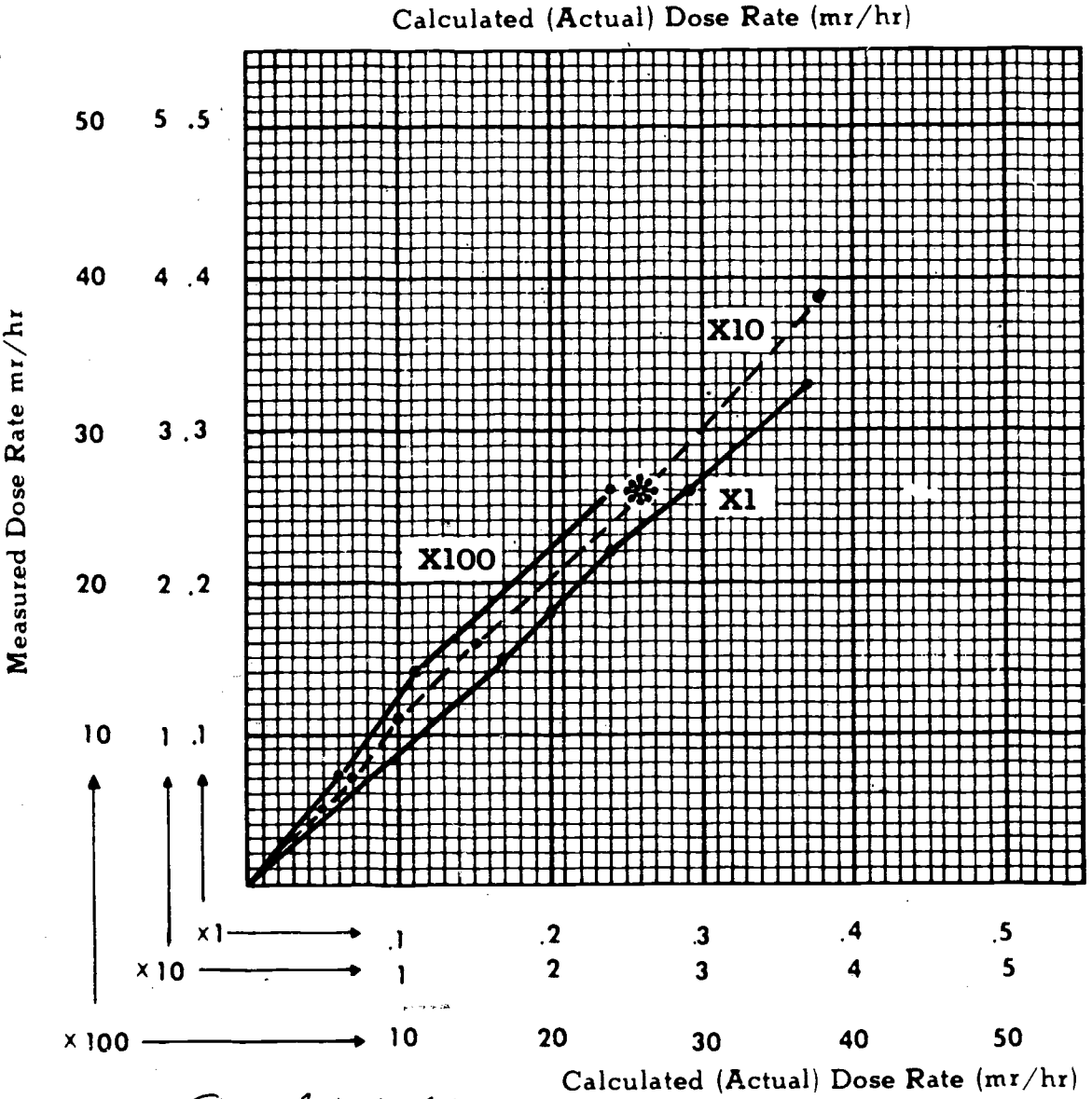
NAME John Doe

8

SAMPLE

RADIATION RESPONSE CURVES FOR THE CD V-700

SOURCE ACTIVITY 7.2 mc SERIAL No. 1234



DATE April 1, 1963

NAME John Doe

✱ Operational Check Source

9

WORK SHEET FOR
INSTRUMENT RADIATION RESPONSE EXERCISE

SOURCE ACTIVITY _____ SERIAL No. _____

FORMULA: Used to determine calculated (ACTUAL) dose rates.

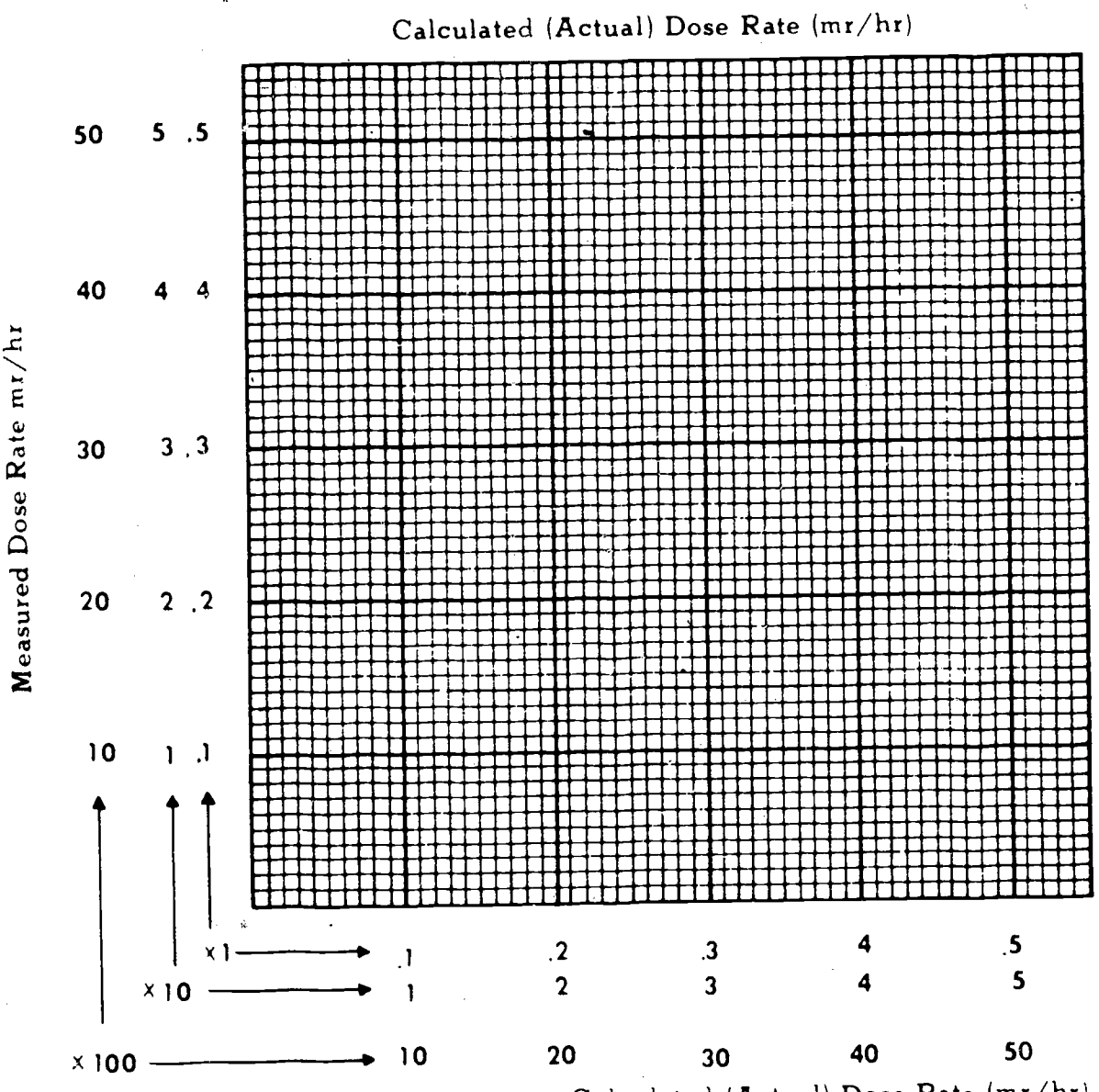
$$\text{Dose rate in mr/hr} = \frac{(13.2)\,(\text{Number of millicuries } Co^{60})}{(\text{distance in feet})^2}$$

DISTANCE	RANGE	x	METER READING	=	MEASURED DOSE RATE (mr/hr)	CALCULATED DOSE RATE (mr/hr)
1		x		=		
2		x		=		
3		x		=		
4		x		=		
5		x		=		
6		x		=		
8		x		=		
10		x		=		
12		x		=		
14		x		=		
16		x		=		
18		x		=		
20		x		=		
22		x		=		
24		x		=		
		x		=		
		x		=		
		x		=		

NAME _____

RADIATION RESPONSE CURVES FOR THE CD V-700

SOURCE ACTIVITY _____ SERIAL No. _____

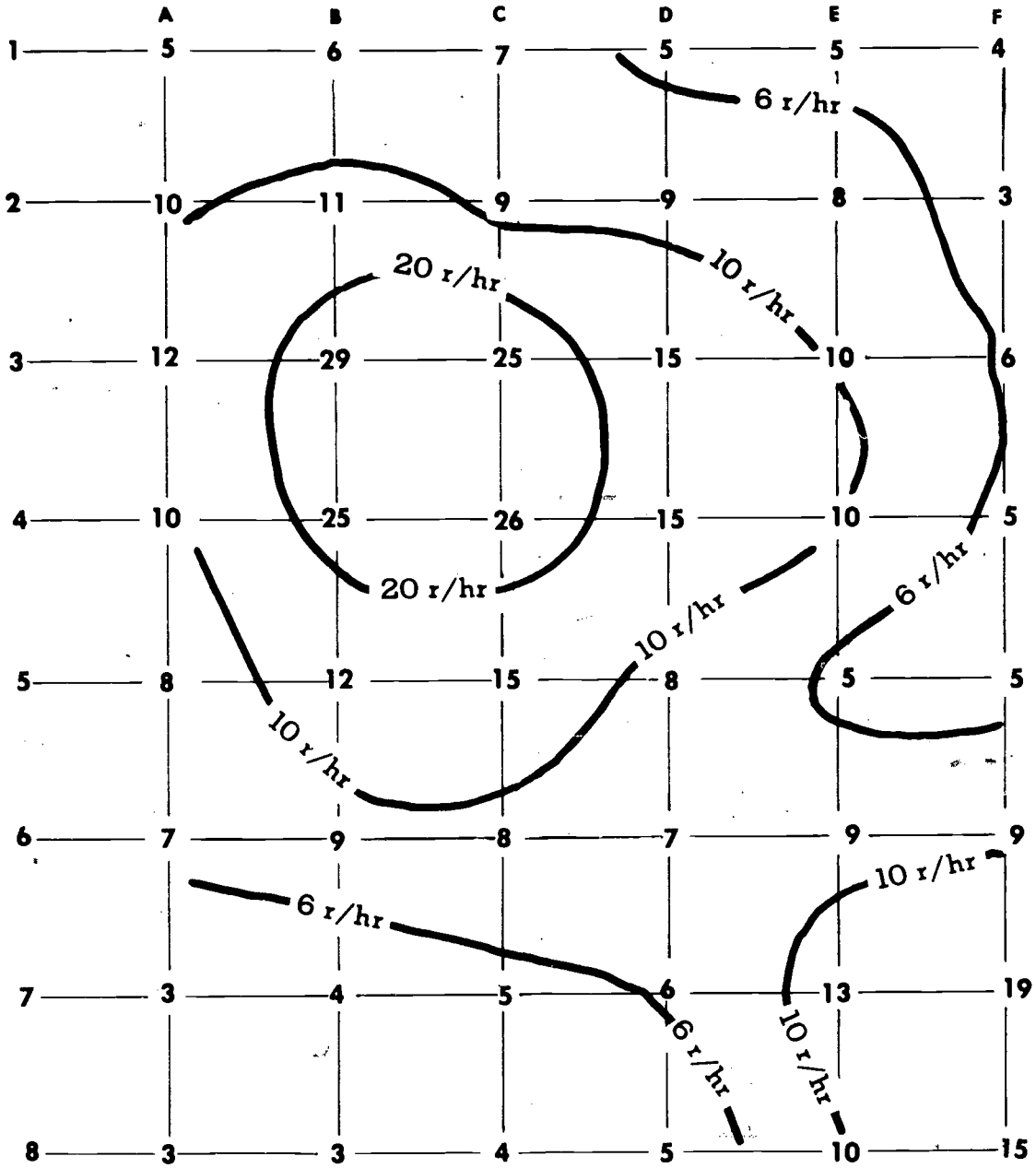


DATE _____

NAME _____

SAMPLE

WORK SHEET FOR AREA MONITORING EXERCISE

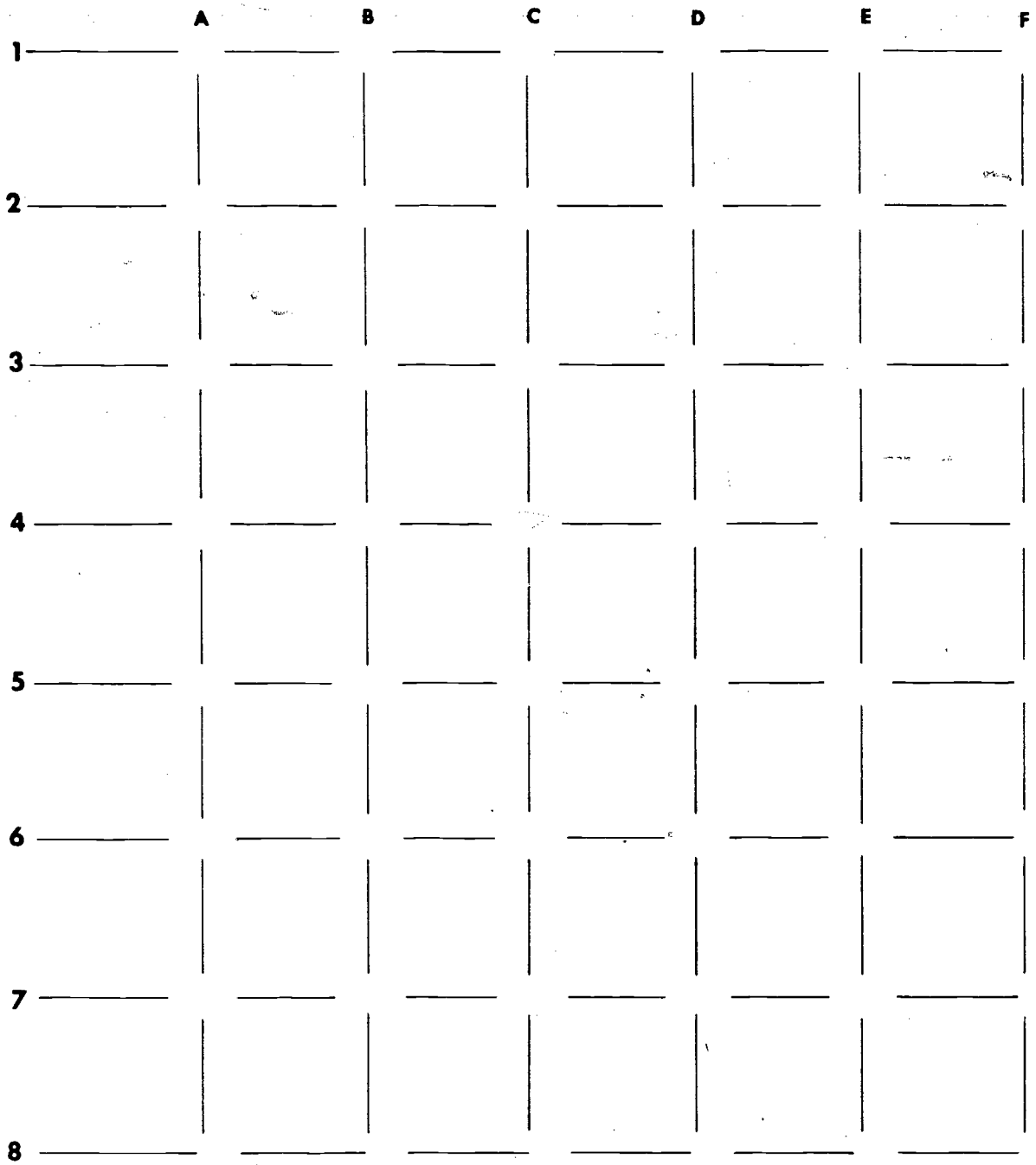


NAME John Doe

13

307-892 O - 68 - 2

WORK SHEET FOR
AREA MONITORING EXERCISE



NAME _____

WORK SHEET FOR RADIATION PROTECTION EXERCISE

DISTANCE _____

TIME	DOSIMETER READINGS											AVERAGE READING	CALCULATED READING

DISTANCE _____

TIME	DOSIMETER READINGS											AVERAGE READING	CALCULATED READING

DISTANCE _____

TIME _____

SHIELDING MATERIAL	DOSIMETER READINGS									AVERAGE READING	% REDUCTION

NAME _____

15

WORK SHEET FOR
STUDENT PROFICIENCY EXERCISE

STATION I, LEAK TESTING

The results of the leak test were _____

STATION II, PROTECTION FACTOR

A. Outside dose rate =

Inside dose rate =

Shelter protection factor = $\frac{\text{outside dose rate}}{\text{inside dose rate}}$ =

B. Using the protection factor found in A above, calculate the following dose rates:

1. Inside dose rate = 5 r/hr

   Protection factor =

   Outside dose rate =

2. Inside dose rate =

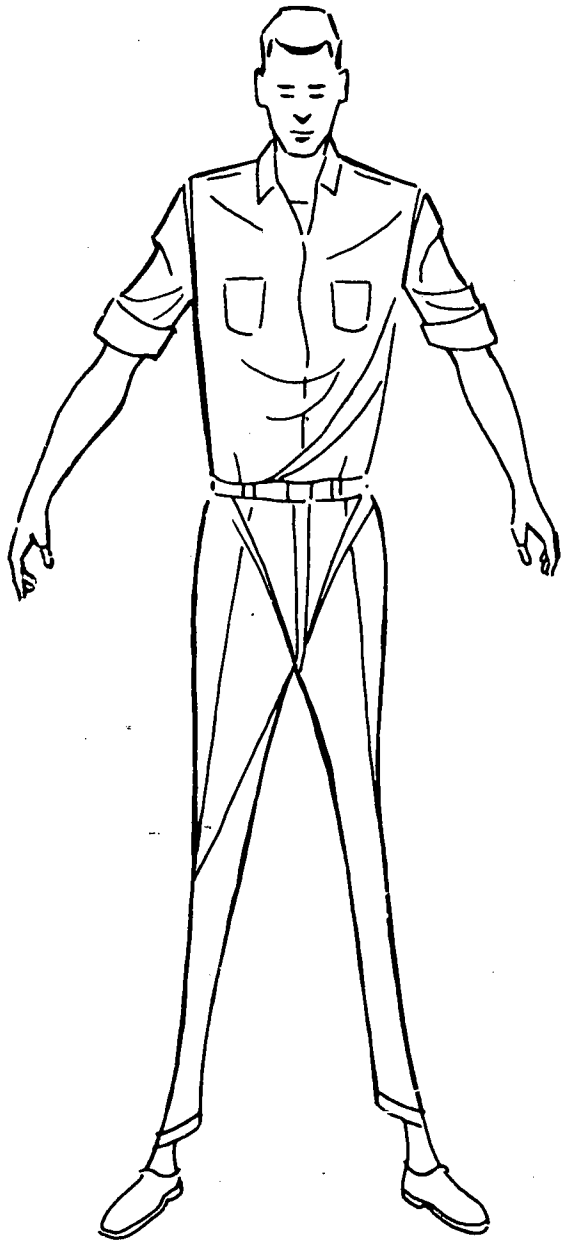
   Protection factor =

   Outside dose rate = 500 r/hr

NAME _____

STATION III, PERSONNEL MONITORING

Place an X on the diagram corresponding to exact locations contamination is found on the person being monitored.

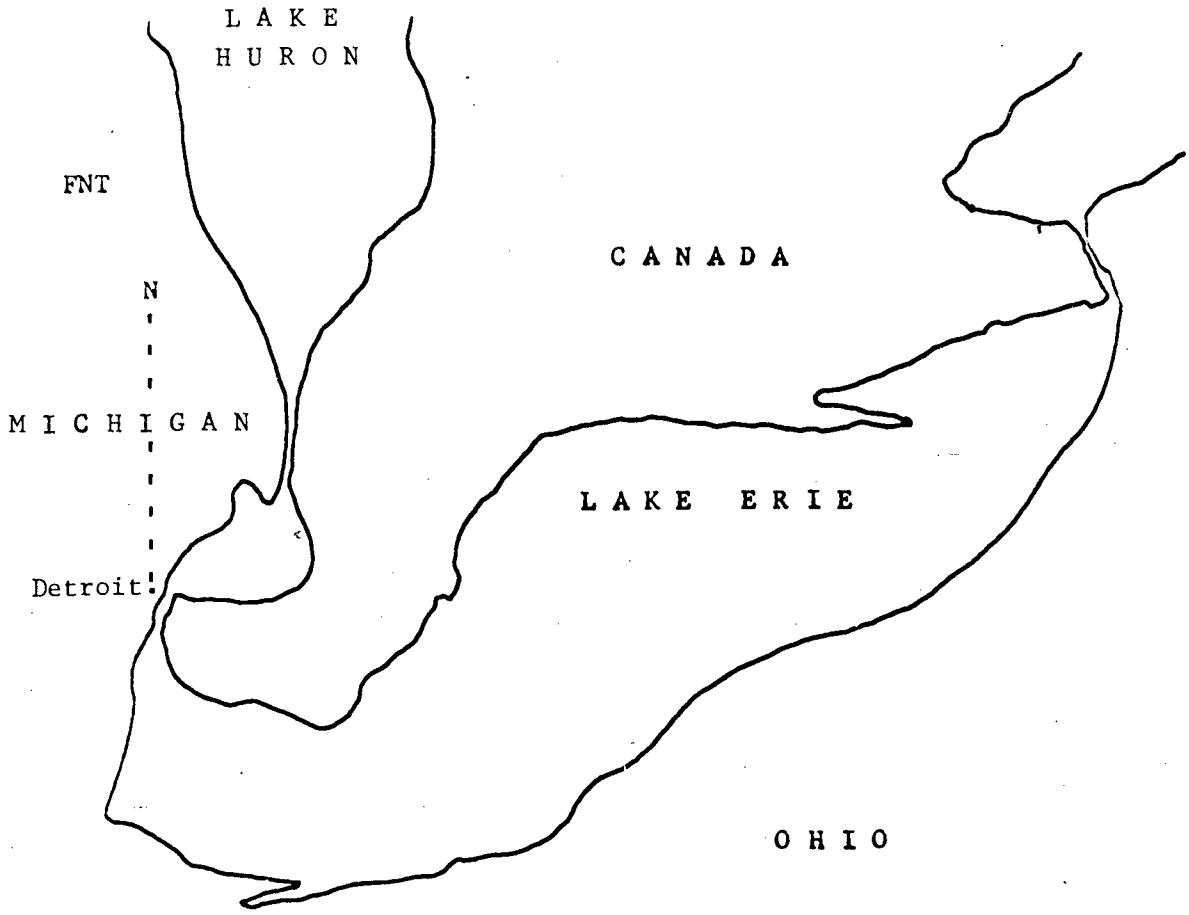


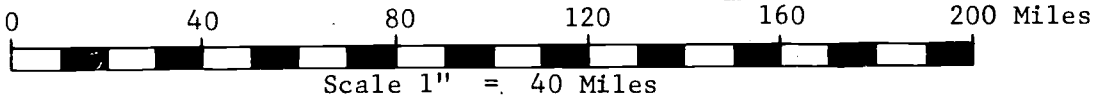
18

FALLOUT FORECASTING PROBLEMS

Problem 1

Strike: 5-megaton detonation on Detroit, Mich.
Closest Rawin Station: Flint, Mich.
Latest UF Data: 11408 21310 41112 60920 80818
Plot the probable area to be affected by fallout from this weapon during the first 3 hours after detonation.



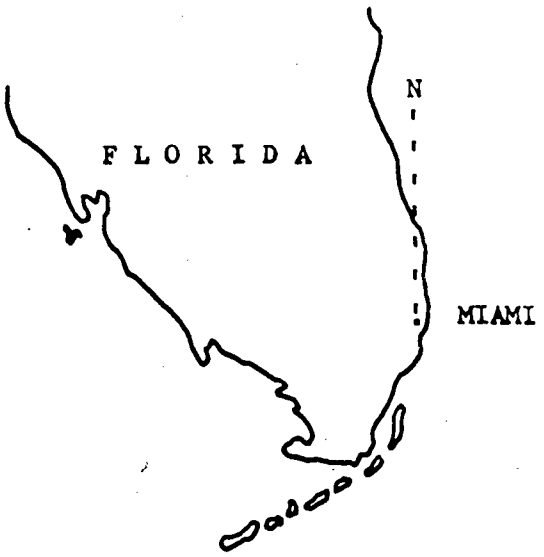


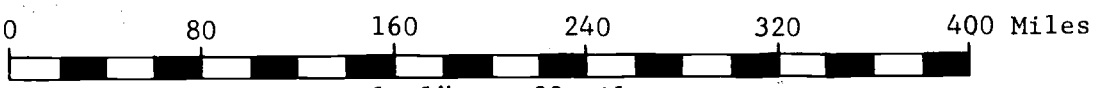
Scale 1" = 40 Miles

Stem	20 mile diameter 10,000 and 20,000 ft. vectors
Cloud	40 mile diameter 40,000 60,000, and 80,000 ft. vectors
Ground Zero	40 mile diameter

Problem 2

Strike: 8-megaton detonation on Miami, Fla.
Closest Rawin Station: Miami, Fla.
Latest UF Data: MIA 11409 21409 41912 62116 82418
Plot the probable area to be affected by fallout from this weapon during the first 6 hours after detonation. Include the hourly isochrones of fallout arrival.





Scale 1" = 80 miles

Stem	20 mile diameter 10,000 and 20,000 ft. vectors
Cloud	40 mile diameter 40,000, 60,000 and 80,000 ft. vectors
Ground Zero	40 mile diameter

DOSE AND DOSE RATE PROBLEMS

Dose Rate Problems

1. If the dose rate at 1 hour after burst is 40 r/hr, what will be the dose rate at 2, 4, 6, 8, and 10 hours?
2. If the dose rate at H+1 is 100 r/hr, what will be the dose rate at 2, 4, and 10 hours?
3. If the dose rate at H+1 is 350 r/hr, what will be the dose rate at 5, 8, and 12 hours?
4. If the dose rate at H+6 was 45 r/hr, what would be the dose rate at 1, 9, 12, and 15 hours?
5. If the dose rate at H+12 was 80 r/hr, what would be the dose rate at 1, 16, and 24 hours?
6. If the dose rate at H+20 was 10 r/hr, what will be the dose rate at 1, 20, 25, and 32 hours?
7. If the dose rate at H+30 is 10 r/hr, when would the dose rate be 7 r/hr?
8. At H+20 days the dose rate in an area is 3 r/hr. What will be the dose rate at H+25 days?
9. In a sheltered area with a protection factor of 100, the dose rate is 10 r/hr at H+10. What will be the unsheltered dose rate at H+18?
10. In a shelter with a protection factor of 1,000, the dose rate at H+24 is 15 r/hr. What will be the dose rate in the shelter at H+40?

Dose Problems

11. If the dose rate at H+1 was 200 r/hr, what would be the dose of a monitor if he entered the area at H+12 and stayed 4 hours?
12. If the dose rate at H+1 was 50 r/hr, what would be the dose of a monitor if he stayed in this area from H+5 to H+8?
13. If the dose rate at H+1 was 500 r/hr, what would be the total dose of a monitor who remained in this area for a 1.5 hour period beginning at H+12?
14. What would be a monitor's dose if he entered an area at H+6 and left at H+8? At the time of entry, the dose rate was 15 r/hr.
15. Firemen must put out a fire in an area where the dose rate was 50 r/hr at H+7. What will be their mission dose if it takes 6 hours to fight the fire and they start their mission at H+12?
16. Vital medical supplies must be moved to a shelter area. The task will require 30 minutes. If the worker enters the area at H+6 when the dose rate is 200 r/hr, what dose will he receive?
17. An individual left a shelter at H+6 on a mission to a nearby shelter but never arrived at the other shelter. At H+30 a rescue team found him unconscious in the contaminated area outside the original shelter. At that time the dose rate was 14 r/hr. What dose was received by the unconscious individual?
18. A rescue team entered a contaminated area at H+12 and accomplished a task in 4 hours. What was their dose if the dose rate at time of *exit* was 12 r/hr?
19. No water is available in a shelter. There is a safe supply nearby. It is a 45 minute walk *to the water* and the mission will begin at H+10. If the dose rate at H+7 was 30 r/hr, what dose will be received in obtaining the water for the shelter?
20. What is the dose received in a shelter from H+18 to H+24, if the unsheltered dose rate at H+16 was 120 r/hr and the shelter protection factor is 200?

Entry Time Problems

21. If the dose rate in an area was 300 r/hr at H+1, when can a monitor enter the area for a 3-hour stay and receive less than 50 r?
22. A monitor must stay in an area for 1 hour. The dose rate in this area at H+1 was 150 r/hr. He must limit his dose to 15 r. When can he enter?

23. In order to keep a monitor's dose below 20 r for a stay time of 2 hours, what is the earliest possible entry time into an area where the dose rate was 120 r/hr at H+1?

24. If the dose rate in an area is 5 r/hr at H+20 and an individual must stay there 3 hours, what is the earliest time he can enter and not exceed a dose of 10 r?

25. A mission dose is set at 35 r. The dose rate in an area was 18 r/hr at H+15. When can workers enter this area for a 3-hour period?

26. The task of removing equipment which is located in a contaminated area will require 3 hours. The mission dose is set at 50 r and the dose rate at H+9 was 50 r/hr. When can the salvage crew enter the area?

27. A monitor must make a survey of an area which will require 2 hours. The mission dose is set at 35 r and the dose rate in the area was 18 r/hr at H+1 day. When will the monitor be able to enter the area?

28. People want to move from an improvised shelter to a community shelter. At H+6 the route to be traveled had an average dose rate of 85 r/hr. The trip will take 2 hours and the mission dose is 50 r. When can they leave?

29. A supply of drugs must be delivered as soon as possible to a shelter. The drive takes 3 hours. The average dose rate along the route to be followed was 125 r/hr at H+4. The mission dose is 75 r. What is the earliest time that the drugs can arrive at the shelter?

30. A shelter with a protection factor of 500 is running low on food. The nearest supply would require 1-hour round-trip to obtain it. The average dose rate over the route to be traveled was 60 r/hr at H+7. The mission dose is set at 50 r. When can the mission be started to obtain the food?

Stay Time Problems

31. A mission dose is set at 25 r and the mission will begin at H+12. What stay time is permitted, if the dose rate at H+1 was 500 r/hr?

32. At H+1 the dose rate was 200 r/hr. If entry into the area is made at H+6 and the mission dose is set at 50 r, what is the allowable stay time?

33. A family entered a contaminated area at H+5. Their dose should not exceed 35 r. How long can they stay in this area if the dose rate at time of entry was 20 r/hr?

34. At H+12 a monitor must start an emergency mission outside his assigned shelter. At H+6 the outside dose rate was 75 r/hr. If his mission dose is not to exceed 20 r, how long can he take for the task?

35. At H+3 the dose rate in an area was 40 r/hr. A rescue squad entered the area at H+5. How long can they stay in the area if their dose is not to exceed 25 r?

36. Personnel working in a warehouse in a contaminated area received a dose of 150 r. At H+1 the dose rate was 1,300 r/hr and they entered the working area at H+8. How long were they in the area?

37. A message must be hand carried to another shelter. What is the maximum time for the mission if the average dose rate between the shelters was 90 r/hr at H+2? The mission dose is set at 35 r and the messenger is to leave shelter at H+6.

38. At H+15 a Radef Officer must move to another control center 75 miles away. The average dose rate over the area of travel was 75 r/hr at H+6. How fast will he have to travel in order not to exceed a dose of 50 r?

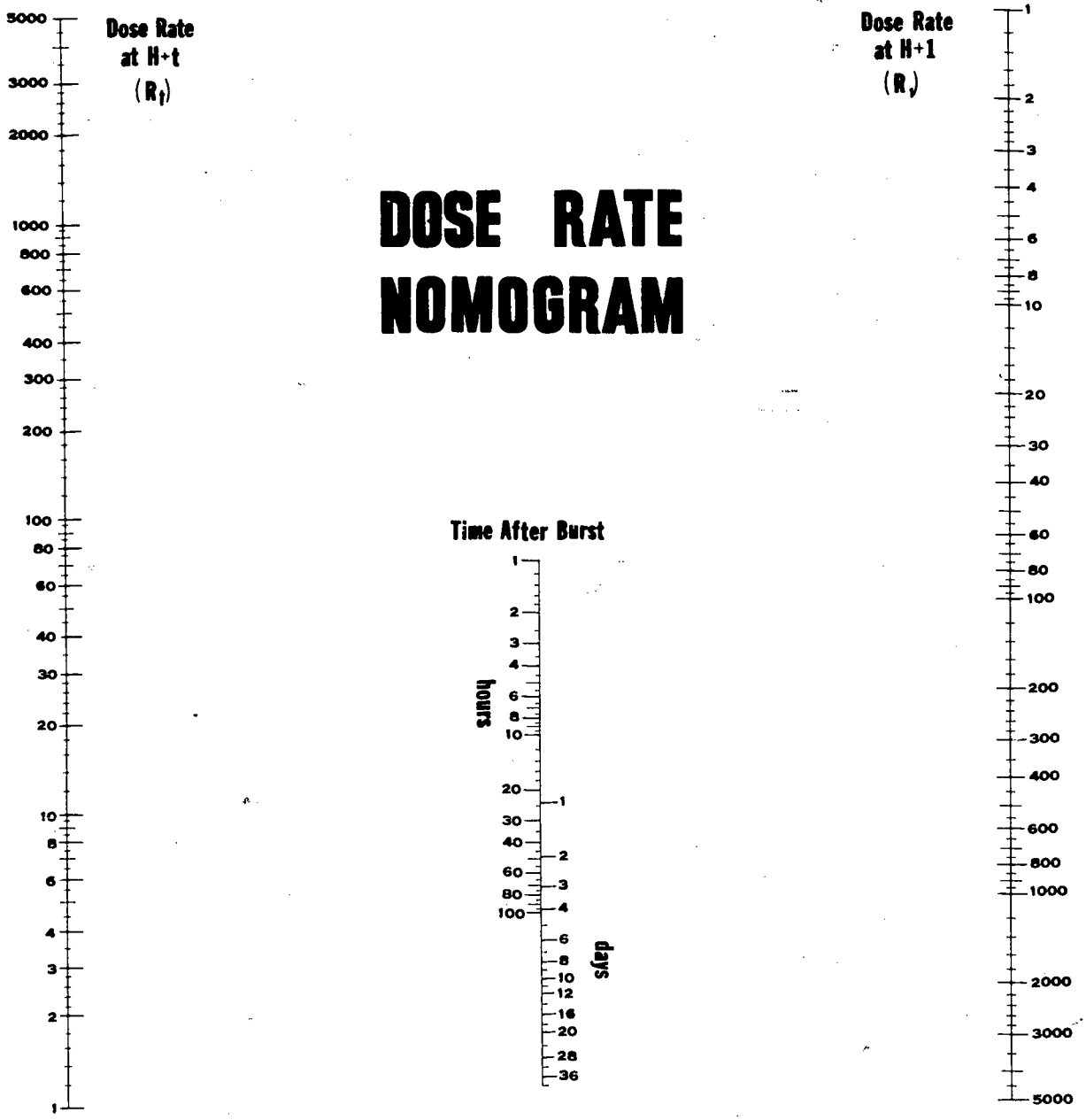
39. An individual travels at a speed of 35 m.p.h. through a contaminated area where the average dose rate was 100 r/hr at H+5. How far will he be able to travel before seeking shelter if he entered the area at H+13 and must limit his dose to 80 r?

40. Due to crowded shelter conditions some people will be moved at H+9 to another shelter. The outside dose rate was 250 r/hr at H+3. Their exposure is not to exceed 35 r. How long do they have to transfer shelters?

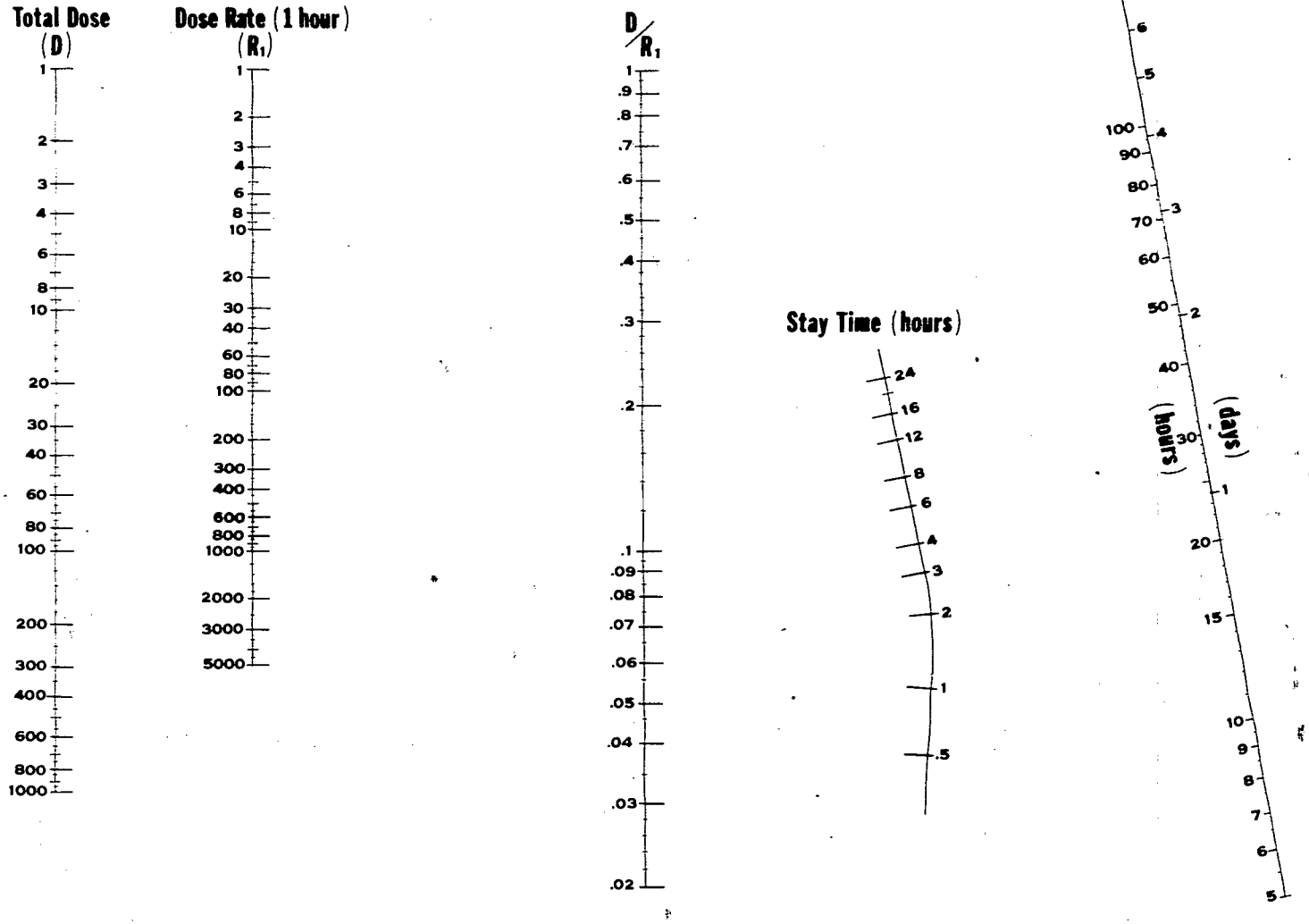
ANSWERS

1. 18, 7.6, 4.7, 3.4, 2.6 r/hr
2. 44, 19, 6.5 r/hr
3. 51, 30, 18 r/hr
4. 380, 28, 20, 15 r/hr
5. 1600, 58, 35 r/hr
6. 370,10, 8, 6 r/hr
7. H+40
8. 2.5 r/hr
9. 500 r/hr
10. 8 r/hr
11. 35 r
12. 15 r
13. 36 r
14. 25 r
15. 120 r
16. 90 r
17. 800 r
18. 60 r
19. 27 r
20. 2.7 r
21. H+11
22. H+6
23. H+7
24. H+27
25. H+21
26. H+22
27. H+23
28. H+17
29. H+18
30. H+8
31. 1 hour
32. 2.7 hrs.
33. 2.2 hrs.
34. .6 hour
35. 1.5 hrs.
36. 1.6 hrs.
37. 1.8 hrs.
38. 38 m.p.h.
39. 95 miles
40. .5 hr.

DOSE RATE NOMOGRAM



ENTRY TIME - STAY TIME TOTAL DOSE NOMOGRAM



SOURCE HANDLING TECHNIQUES
HOMEWORK ASSIGNMENT

A SHORT QUIZ WILL BE GIVEN OVER THIS MATERIAL DURING THE COURSE. SEE THE COURSE SCHEDULE FOR THE EXACT TIME.

1. Study the sample Byproduct Material License.
2. Study the following sections of 10–CFR–20, Standards for Protection Against Radiation.
   - 20.3 Definitions.
   - 20.4 Units of radiation dose.
   - 20.101 Exposure of individuals in restricted areas.
   - 20.104 Exposure of minors.
   - 20.201 Surveys.
   - 20.202 Personnel monitoring.
   - 20.203 Caution signs, labels, and signals.
   - 20.206 Instruction of personnel; posting of notices to employees.
   - 20.207 Storage of licensed material.
   - 20.401 Records of surveys, radiation monitoring, and disposal.
   - 20.402 Reports of theft or loss of licensed material.
   - 20.601 Violations.
3. Study the following sections of 10–CFR–30, Licensing of Byproduct Material.
   - 30.4 Definitions.
   - 30.31 Types of Licenses.
   - 30.32 Applications for specific licenses.
   - 30.33 General requirements for issuance of specific licenses.
   - 30.34 Terms and conditions of licenses.
   - 30.36 Expiration of licenses.
   - 30.37 Application for renewal of license.
   - 30.38 Amendment of licenses at request of licensee.
   - 30.39 Commission action on applications to renew, or amend.
   - 30.51 Records.
   - 30.52 Inspection.
   - 30.53 Tests.
   - 30.61 Modification and revocation of licenses.
   - 30.62 Right to withhold or recall Byproduct Material.
   - 30.63 Violations.
4. Study the following sections of 10–CFR–31, General Licenses.
   - 31.2 Terms and conditions.
   - 31.4 Certain quantities of Byproduct Material.
   - 31.100 Schedule A—Generally licensed quantities.

U.S. ATOMIC ENERGY COMMISSION

Compliance Offices

Region	*Address*	*Telephone*	
		Daytime	*Nights and holidays*
I	Region I, Division of Compliance USAEC 376 Hudson Street New York, N.Y. 10014	212–989–1000	212–989–1000
II	Region II, Division of Compliance USAEC 50 Seventh Street NE. Atlanta, Ga. 30323	404–526–5791	404–526–5791
III	Region III, Division of Compliance USAEC Suite 410, Oakbrook Professional Building Oak Brook, Ill. 60523	312–654–1680	312–739–7711
IV	Region IV, Division of Compliance USAEC 10395 West Colfax Avenue Denver, Colo. 80215	303–297–4211	303–237–5095
V	Region V, Division of Compliance USAEC 2111 Bancroft Way Berkeley, Calif. 94704	415–841–5620	415–841–5620

FORM AEC-374
(1-60)
10 CFR 30

U.S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE

License Number 14-12501-01
Page 1 of 2 pages
Amendment No. 01

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Parts 30, 32, 33, 34, and 35, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Iowa Civil Defense Division 2. State Office Building, Room B-33 Des Moines, Iowa 50319	In accordance with application dated January 8, 1968 3. License No. 14-12501-01 is amended in its entirety to read as follows: 4. Expiration date October 31, 1972 5. Reference No.

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Cobalt 60	A. Office of Civil Defense Model CD V-786 or CD V-784 Sealed Source Sets	A. 40 sets 1200 millicuries total

9. Authorized use

A. For use in training instrument operators and for instrument calibration.

SAMPLE

CONDITIONS

10. Byproduct material may be used anywhere in the State of Iowa.

11. The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards for Protection Against Radiation."

12. Byproduct material shall be used by, or under the supervision and in the physical presence of, individuals issued user certificates by the Iowa Civil Defense Division in accordance with criteria specified in Iowa Civil Defense Division Radiological Defense OCD Training Source Set Procedures Manual.

13. Sealed sources containing byproduct material shall not be opened.

14. Each sealed source of licensed material used outside of a shielded exposure device shall have a durable, legible, and visible tag permanently attached by a durable ring. The tag shall be at least one (1) inch square, shall bear a conventional radiation symbol

307-892 O - 68 - 3

Continued from Page 1

prescribed in Section 20.203(a) of Part 20, and a minimum of the following instructions: DANGER - RADIOACTIVE MATERIAL - DO NOT HANDLE - NOTIFY CIVIL AUTHORITIES IF FOUND.

Replacement of tags and rings shall be carried out by the licensee in accordance with instructions contained in Iowa Civil Defense Division Radiological Defense OCD Training Source Set Procedures Manual.

15. A. Sealed sources containing byproduct material with a half-life greater than thirty (30) days and in any form other than gas shall be tested for external leakage and/or contamination upon receipt from another person, except when the licensee receives certification from the person that the sources had been tested within six (6) months prior to transfer and found free of surface contamination. Thereafter, sources shall be tested for leakage and/or contamination at intervals not to exceed six (6) months. Records of leak test results shall be maintained by the licensee.

B. The test for leakage and/or contamination shall be capable of detecting the presence of 0.05 microcurie of radioactive material on the test sample.

C. If the test reveals any radioactive material, the licensee shall take immediate action to prevent spread of contamination and within thirty (30) days after completion of the test shall notify the Isotopes Branch, Division of Materials Licensing, U. S. Atomic Energy Commission, Washington, D. C., 20545. A copy of the report shall be sent to the Director, Region III, Division of Compliance, USAEC, 799 Roosevelt Road, Glen Ellyn, Illinois, 60137.

D. Leak test of sealed sources in OCD Sealed Source Sets shall be performed by the licensee in accordance with instructions contained in Iowa Civil Defense Division Radiological Defense OCD Training Source Set Procedures Manual.

16. Byproduct material shall be stored at locations specified in Iowa Civil Defense Division Radiological Defense OCD Training Source Set Procedures Manual, except for temporary storage at locations where training courses are conducted.

17. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7, and 8 of this license in accordance with statements, representations, and procedures contained in application dated January 9, 1968.

For the U. S. Atomic Energy Commission

Nathan Bassin

by Isotopes Branch
Division of Materials Licensing
Washington, D. C. 20545

Date FEB 7 1968

30

STATE OF WYOMING

Civil Defense Agency

BYPRODUCT MATERIAL USER'S CERTIFICATE

*Number*_____

*Name*_____ *Address*_____

This Certificate is issued under AEC License Number 49-8631-1 by authority of the Director, Wyoming Civil Defense Agency. The holder is authorized by this certificate to receive, possess and transfer byproduct material as follows:

Byproduct Material (Element and Mass No.): Cobalt 60

Physical Form: OCD CD V-786 or CD V-784 Sealed Source Set.

Maximum Amount of Radioactivity User May Possess: 50 Millicuries.

The above byproduct material will be obtained from the Wyoming Civil Defense Agency, for use in training of radiological monitors (instrument operators) only.

This Certificate is subject to the conditions for use and control of byproduct material as indicated in the State of Wyoming Radiological Defense Source Handling and Training Manual. This Certificate may be revoked without notice if the above conditions are violated.

*This Certificate will remain valid until*_____*unless revoked.*

_____
George O. Pearson
Maj. Gen., AGC, Wyo ARNG
The Adjutant General and
Director of Civil Defense for Wyoming

_____
Radiological Defense Officer

_____
Date

STORAGE

Byproduct material in amounts not to exceed two (2) source sets (60 millicuries total) shall be stored in locked storerooms and/or vaults, except for temporary storage at locations where training courses and/or instrument calibration exercises are conducted.

City	*Location*
Cheyenne	a. Maintenance and Calibration Facility
	b. Maintenance and Calibration Facility
Evanston	Basement, Uinta County Memorial Hospital
Rock Springs	935 Adams (concrete vault)
Cody	Basement, Cody Auditorium
Casper	Casper College (Physics Lab. Vault)
Lovell	School (Shoshoni Ave.) (safe)
Afton	% County Agent Veterans Building, Afton, Wyo.
Cheyenne	Vault No. 2, State Office Building (Department of Health)

PART 20

STANDARDS FOR PROTECTION AGAINST RADIATION

GENERAL PROVISIONS

§ 20.1 Purpose.

(a) The regulations in this part establish standards for protection against radiation hazards arising out of activities under licenses issued by the Atomic Energy Commission and are issued pursuant to the Atomic Energy Act of 1954 (68 Stat. 919).

(b) The use of radioactive material or other sources of radiation not licensed by the Commission is not subject to the regulations in this part. However, it is the purpose of the regulations in this part to control the possession, use, and transfer of licensed material by any licensee in such a manner that exposure to such material and to radiation from such material, when added to exposures to unlicensed radioactive material and to other unlicensed sources of radiation in the possession of the licensee, and to radiation therefrom, does not exceed the standards of radiation protection prescribed in the regulations in this part.

25 FR 10914

§ 20.2 Scope.

The regulations in this part apply to all persons who receive, possess, use or transfer byproduct material, source material, or special nuclear material under a general or specific license issued by the Commission pursuant to the regulations in Part 30, 40, or 70 of this chapter.

§ 20.3 Definitions.

(a) As used in this part:

(1) "Act" means the Atomic Energy Act of 1954 (68 Stat. 919) including any amendments thereto;

(2) "Airborne radioactive material" means any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors, or gases;

(3) "Byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material;

(4) "Calendar quarter" means any period determined according to either of the following subdivisions:

*Added 25 FR 13952

25 FR 13952

(i) The first period of any year may begin on any date in January; provided that the second, third and fourth periods accordingly begin on the same date in April, July, and October, respectively, and that the fourth period extend into January of the succeeding year, if necessary to complete a three-month quarter. During the first year of use of this method of determination by a licensee, the first period for that year shall also include any additional days in January preceding the starting date for the first period.

(ii) The first period in a calendar year of 13 complete, consecutive calendar weeks; the second period in a calendar year of 13 complete, consecutive calendar weeks; the third period in a calendar year of 13 complete, consecutive calendar weeks; the fourth period in a calendar year of 13 complete, consecutive calendar weeks.

*Alternatively, the four periods may consist of the first 14 complete, consecutive calendar weeks; the next 12 complete, consecutive calendar weeks; the next 14 complete, consecutive calendar weeks; and the last 12 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included (for purposes of this part) within the last complete calendar week of that year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included (for purposes of this part) within the last complete calendar week of the previous year.

25 FR 10914

No licensee shall change the method observed by him of determining calendar quarters for purposes of this part except at the beginning of a calendar year.

(5) "Commission" means the Atomic Energy Commission or its duly authorized representatives;

(6) "Government agency" means any executive department, commission, independent establishment, corporation, wholly or partly owned by the United States of America which is an instrumentality of the United States, or any board, bureau, division, service, office, officer, authority, administration, or other establishment in the executive branch of the Government;

(7) "Individual" means any human being;

(8) "Licensed material" means source material, special nuclear material, or by-product material received, possessed, used, or transferred under a general or specific license issued by the Commission pursuant to the regulations in this chapter;

(9) "License" means a license issued under the regulations in Part 30, 40, or 70 of this chapter. "Licensee" means the holder of such license;

(10) "Occupational dose" includes exposure of an individual to radiation (i) in a restricted area; or (ii) in the course of employment in which the individual's duties involve exposure to radiation; provided, that "occupational dose" shall not be deemed to include any exposure of an individual to radiation for the purpose of medical diagnosis or medical therapy of such individual.

25 FR 10914

(11) "Person" means (i) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the Commission, any State, any foreign government or nation or any political subdivision of any such government or nations, or other entity; and (ii) any legal successor, representative, agent, or agency of the foregoing;

(12) "Radiation" means any or all of the following: alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but not sound or radio waves, or visible, infrared, or ultraviolet light;

(13) "Radioactive material" includes any such material whether or not subject to licensing control by the Commission;

25 FR 13952

(14) "Restricted area" means any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials. "Restricted area" shall not include any areas used as residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area;

27 FR 5905

(15) "Source material" means (i) uranium or thorium, or any combination thereof, in any physical or chemical form; or (ii) ores which contain by weight one-twentieth of one percent (0.05%) or more of *a.* uranium, *b.* thorium or *c.* any combination thereof. Source material does not include special nuclear material.

25 FR 10914

(16) "Special nuclear material" means (i) plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51 of the act, determines to be special nuclear material, but does not include source material; or (ii) any material artificially enriched by any of the foregoing but does not include source material;

25 FR 13952

(17) "Unrestricted area" means any area access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.

(b) **Definitions of certain other words and phrases as used in this part are set forth in other sections, including:**

(1) "Airborne radioactivity area" defined in § 20.203;

(2) "Radiation area" and "high radiation area" defined in § 20.202;

(3) "Personnel monitoring equipment" defined in § 20.202;

(4) "Survey" defined in § 20.201;

(5) Units of measurement of dose (rad, rem) defined in § 20.4;

(6) Units of measurement of radioactivity defined in § 20.5.

25 FR 10914

§ 20.4 Units of radiation dose.

(a) "Dose," as used in this part, is the quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body. When the regulations in this part specify a dose during a period of time, the dose means the total quantity of radiation absorbed, per unit of mass, by the body or by any portion of the body during such period of time. Several different units of dose are in current use. Definitions of units as used in this part are set forth in paragraphs (b) and (c) of this section.

(b) The rad, as used in this part, is a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue. (One millirad (mrad) = 0.001 rad.)

(c) The rem, as used in this part, is a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of one roentgen (r) of X-rays. (One millirem (mrem) = 0.001 rem.) The relation of the rem to other dose units depends upon the biological effect under consideration and upon the conditions of irradiation. For the purpose of the regulations in this part, any of the following is considered to be equivalent to a dose of one rem:

(1) A dose of 1 r due to X— or gamma radiation;

(2) A dose of 1 rad due to X—, gamma, or beta radiation;

(3) A dose of 0.1 rad due to neutrons or high energy protons;

(4) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye;

If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, as provided in subparagraph (3) of this paragraph, one rem of neutron radiation may, for purposes of the regulations in this part, be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there exists sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to one rem may be estimated from the following table:

NEUTRON FLUX DOSE EQUIVALENTS

Neutron energy (Mev)	Number of neutrons per square centimeter equivalent to a dose of 1 rem (neutrons/cm²)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm² per sec.)
Thermal	970×10⁶	670
0.0001	720×10⁶	500
0.005	820×10⁶	570
0.02	400×10⁶	280
0.1	120×10⁶	80
0.5	43×10⁶	30
1.0	26×10⁶	18
2.5	29×10⁶	20
5.0	26×10⁶	18
7.5	24×10⁶	17
10	24×10⁶	17
10 to 30	14×10⁶	10

(d) For determining exposures to X or gamma rays up to 3 Mev, the dose limits specified in §§ 20.101 to 20.104, inclusive, may be assumed to be equivalent to the "air dose". For the purpose of this part "air dose" means that the dose is measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of highest dosage rate.

§ 20.5 Units of radioactivity.

(a) Radioactivity is commonly, and for purposes of the regulations in this part shall be, measured in terms of disintegrations per unit time or in curies. One curie (c) = 3.7×10^{10} disintegrations per second (dps) = 2.2×10^{12} disintegrations per minute (dpm). A commonly used submultiple of the curie is the microcurie (μc). One $\mu c = 0.000001$ c = 3.7×10^{4} dps = 2.2×10^{6} dpm.

(b) For purposes of the regulations in this part, it may be assumed that the daughter activity concentrations in the following table are equivalent to an air concentration of 10^{-7} microcuries of Radon 222 per milliliter of air in equilibrium with the daughters RaA, RaB, RaC, and RaC':

Maximum time between collection and measurement (hours)[1]	Alpha-emitting daughter activity collected per milliliter of air	
	Microcuries/cc	Total alpha disintegrations per minute per cc.
0.5	7.2×10^{-8}	0.16
1	4.5×10^{-8}	0.10
2	1.3×10^{-8}	0.028
3	0.3×10^{-8}	0.0072

[1] The duration of sample collection and the duration of measurement should be sufficiently short compared to the time between collection and measurement, as not to have a statistically significant effect upon the results.

(c) *Natural uranium and natural thorium.* (1) For purposes of the regulations in this part, one curie of natural uranium (U-natural in Appendix B or C) means the sum of 3.7×10^{10} disintegrations per second from U-238 plus 3.7×10^{10} dis/sec from U-234 plus 9×10^{8} dis/sec from U-235. Also, a curie of natural thorium (thorium-natural in Appendix B or C) means the sum of 3.7×10^{10} dis/sec from Th^{232} plus 3.7×10^{10} dis/sec from Th^{228}.

(2) For the purpose of the regulations in this part, one curie of natural uranium (U-natural in Appendix B or C) is equivalent to 3,000 kilograms, or 6,615 pounds of natural uranium; and one curie of natural thorium (thorium-natural in Appendix B or C) is equivalent to 9,000 kilograms or 19,850 pounds of natural thorium.

25 FR 10914

§ 20.6 Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part by any officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding upon the Commission.

§ 20.7 Communications.

31 FR 4668

Except where otherwise specified in this part, all communications and reports concerning the regulations in this part, and applications filed under them, should be addressed to the Director of Regulation, U.S Atomic Energy Commission, Washington, D.C., 20545. Communications, reports and applications may be delivered in person at the Commission's offices at 1717 H Street NW., Washington, D.C.; at 4915 St. Elmo Avenue, Bethesda, Md.; or at Germantown, Md.;

§ 20.101 Exposure of individuals to radiation in restricted areas.

25 FR 10914

(a) Except as provided in paragraph (b) of this section, no licensee shall possess, use, or transfer licensed material in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from radioactive material and other sources of radiation in the licensee's possession a dose in excess of the limits specified in the following table:

Rems per calendar quarter

1. Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads	1¼
2. Hands and forearms; feet and ankles	18¾
3. Skin of whole body	7½

(b) A licensee may permit an individual in a restricted area to receive a dose to the whole body greater than that permitted under paragraph (a) of this section, provided:

(1) During any calendar quarter the dose to the whole body from radioactive material and other sources of radiation in the licensee's possession shall not exceed 3 rems; and

(2) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5 (N-18) rems where "N" equals the individual's age in years at his last birthday: and

(3) The licensee has determined the individual's accumulated occupational dose to the whole body on Form AEC-4, or on a clear and legible record containing all the information required in that form; and has otherwise complied with the requirements of § 20.102. As used in paragraph (b), "Dose to the whole body" shall be deemed to include any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye.

§ 20.102 Determination of accumulated dose.

(a) This section contains requirements which must be satisfied by licensees who propose, pursuant to paragraph (b) of § 20.101, to permit individuals in a restricted area to receive exposure to radiation in excess of the limits specified in paragraph (a) of § 20.101.

(b) Before permitting any individual in a restricted area to receive exposure to radiation in excess of the limits specified in paragraph (a) of § 20.101, each licensee shall:

(1) Obtain a certificate on Form AEC-4, or on a clear and legible record containing all the information required in that form, signed by the individual showing each period of time after the individual attained the age of 18 in which the individual received an occupational dose of radiation; and

(2) Calculate on Form AEC-4 in accordance with the instructions appearing therein, or on a clear and legible record containing all the information required in that form, the previously accumulated occupational dose received by the individual and the additional dose allowed for that individual under § 20.101(b).

(c)(1) In the preparation of Form AEC-4, or a clear and legible record containing all the information required in that form, the licensee shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. For each period for which the licensee obtains such reports, the licensee shall use the dose shown in the report in preparing the form. In any case where a licensee is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

Part of body	Column 1 Assumed exposure in rems for calendar quarters prior to Jan. 1, 1961	Column 2 Assumed exposure in rems for calendar quarters beginning on or after Jan. 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye.	3¾	1¼

(2) The licensee shall retain and preserve records used in preparing Form AEC-4.

If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961 yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in paragraph (b) of § 20.101, the excess may be disregarded.

§ 20.103 Exposure of individuals to concentrations of radioactive material in restricted areas.

(a) No licensee shall possess, use or transfer licensed material in such a manner as to cause any individual in a restricted area to be exposed to airborne radioactive material possessed by the licensee in an average concentration in excess of the limits specified in Appendix B, Table I, of this part. "Expose" as used in this section means that the individual is present in an airborne concentration. No allowance shall be made for the use of protective clothing or equipment, or particle size, except as authorized by the Commission pursuant to paragraph (c) of this section.

(b) The limits given in Appendix B, Table I, of this part are based upon exposure to the concentrations specified for forty hours in any period of seven consecutive days. In any such period where the number of hours of exposure is less than forty, the limits specified in the table may be increased proportionately. In any such period where the number of hours of exposure is greater than forty, the limits specified in the table shall be decreased proportionately.

(c)(1) Except as authorized by the Commission pursuant to this paragraph, no allowance shall be made for particle size or the use of protective clothing or equipment in determining whether an individual is exposed to an airborne concentration in excess of the limits specified in Appendix B, Table I.

(2) The Commission may authorize a licensee to expose an individual in a restricted area to airborne concentrations in excess of the limits specified in Appendix B, Table I, upon receipt of an application demonstrating that the concentration is composed in whole or in part of particles of such size that such particles are not respirable; and that the individual will not inhale the concentrations in excess of the limits established in Appendix B, Table I. Each application under this subparagraph shall include an analysis of particle sizes in the concentrations; and a description of the methods used in determining the particle sizes.

(3) The Commission may authorize a licensee to expose an individual in a restricted area to airborne concentrations in excess of the limits specified in Appendix B, Table I, upon receipt of an application demonstrating that the individual will wear appropriate protective equipment and that the individual will not inhale, ingest or absorb quanti-

ties of radioactive material in excess of those which might otherwise be permitted under this part for employees in restricted areas during a 40-hour week. Each application under this subparagraph shall contain the following information:

(i) A description of the protective equipment to be employed, including the efficiency of the equipment for the material involved;

(ii) Procedures for the fitting, maintenance and cleaning of the protective equipment; and

(iii) Procedures governing the use of the protective equipment, including supervisory procedures and length of time the equipment will be used by the individuals in each work week. The proposed periods for use of the equipment by any individual should not be of such duration as would discourage observance by the individual of the proposed procedures; and

(iv) The average concentrations present in the areas occupied by employees.

§ 20.104 Exposure of minors.

(a) No licensee shall possess, use or transfer licensed material in such a manner as to cause any individual within a restricted area who is under 18 years of age, to receive in any period of one calendar quarter from radioactive material and other sources of radiation in the licensee's possession a dose in excess of 10 percent of the limits specified in the table in paragraph (a) of § 20.101.

25 FR 10914

(b) No licensee shall possess, use or transfer licensed material in such a manner as to cause any individual within a restricted area, who is under 18 years of age to be exposed to airborne radioactive material possessed by the licensee in an average concentration in excess of the limits specified in Appendix B, Table II of this part. For purposes of this paragraph, concentrations may be averaged over periods not greater than a week.

(c) The provisions of paragraph (c) of § 20.103, shall apply to exposures subject to paragraph (b) of this section.

§ 20.105 Permissible levels of radiation in unrestricted areas.

(a) There may be included in any application for a license or for amendment of a license proposed limits upon levels of radiation in unrestricted areas resulting from the applicant's possession or use of radioactive material and other sources of radiation. Such applications should include information as to anticipated average radiation levels and anticipated occupancy times for each unrestricted area involved. The Commission will approve the proposed limits if the applicant demonstrates that the proposed limits are not likely to cause any individual to receive a dose to the whole body in any period of one calendar year in excess of 0.5 rem.

(b) Except as authorized by the Commission pursuant to paragraph (a) of this section, no licensee shall possess, use or transfer licensed material in such a manner as to create in any unrestricted area from radioactive material and other sources of radiation in his possession:

(1) Radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of two millirems in any one hour, or

(2) Radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 100 millirems in any seven consecutive days.

§ 20.106 Concentrations in effluents to unrestricted areas.

(a) A licensee shall not possess, use, or transfer licensed material so as to release to an unrestricted area radioactive material in concentrations which exceed the limits specified in Appendix "B", Table II of this part, except as authorized pursuant to § 20.302 or paragraph (b) of this section. For purposes of this section concentrations may be averaged over a period not greater than one year.

(b) An application for a license or amendment may include proposed limits higher than those specified in paragraph (a) of this section. The Commission will approve the proposed limits if the applicant demonstrates:

(1) That the applicant has made a reasonable effort to minimize the radioactivity contained in effluents to unrestricted areas; and

(2) That it is not likely that radioactive material discharged in the effluent would result in the exposure of an individual to concentrations of radioactive material in air or water exceeding the limits specified in Appendix "B", Table II of this part.

29 FR 1434

(c) An application for higher limits pursuant to paragraph (b) of this section shall include information demonstrating that the applicant has made a reasonable effort to minimize the radioactivity discharged in effluents to unrestricted areas, and shall include, as pertinent:

(1) Information as to flow rates, total volume of effluent, peak concentration of each radionuclide in the effluent, and concentration of each radionuclide in the effluent averaged over a period of one year at the point where the effluent leaves a stack, tube, pipe, or similar conduit;

(2) A description of the properties of the effluents, including:

(i) chemical composition;

(ii) physical characteristics, including suspended solids content in liquid effluents, and nature of gas or aerosol for air effluents;

(iii) the hydrogen ion concentrations (p^H) of liquid effluents; and

(iv) the size range of particulates in effluents released into air.

(3) A description of the anticipated human occupancy in the unrestricted area where the highest concentration of radioactive material from the effluent is expected, and, in the case of a river or stream, a description of water uses downstream from the point of release of the effluent.

(4) Information as to the highest concentration of each radionuclide in an unrestricted area, including anticipated concentrations averaged over a period of one year:

(i) In air at any point of human occupancy; or

(ii) In water at points of use downstream from the point of release of the effluent.

(5) The background concentration of radionuclides in the receiving river or stream prior to the release of liquid effluent.

(6) A description of the environmental monitoring equipment, including sensitivity of the system, and procedures and calculations to determine concentrations of radionuclides in the unrestricted area and possible reconcentrations of radionuclides.

(7) A description of the waste treatment facilities and procedures used to reduce the concentration of radionuclides in effluents prior to their release.

(d) For the purposes of this section the concentration limits in Appendix "B", Table II of this part shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit. If the conduit discharges within the restricted area, the concentration at the boundary may be determined by applying appropriate factors for dilution, dispersion, or decay between the point of discharge and the boundary.

(e) In addition to limiting concentrations in effluent streams, the Commission may limit quantities of radioactive materials released in air or water during a specified period of time if it appears that the daily intake of radioactive material from air, water, or food by a suitable sample of an exposed population group, averaged over a period not exceeding one year, would otherwise exceed the daily intake resulting from continuous exposure to air or water containing one-third the concentration of radioactive materials specified in Appendix "B", Table II of this part.

(f) The provisions of this section do not apply to disposal of radioactive material into sanitary sewerage systems, which is governed by § 20.303

25 FR 10914

§ 20.107 Medical diagnosis and therapy.

Nothing in the regulations in this part shall be interpreted as limiting the intentional exposure of patients to radiation for the purpose of medical diagnosis or medical therapy.

§ 20.108 Orders requiring furnishing of bio-assay services.

Where necessary or desirable in order to aid in determining the extent of an individual's exposure to concentrations of radioactive material, the Commission may incorporate appropriate provisions in any license, directing the licensee to make available to the individual appropriate bio-assay services and to furnish a copy of the reports of such services to the Commission.

PRECAUTIONARY PROCEDURES

§ 20.201 Surveys.

(a) As used in the regulations in this part, "survey" means an evaluation of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions. When appropriate, such evaluation includes a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present.

(b) Each licensee shall make or cause to be made such surveys as may be necessary for him to comply with the regulations in this part.

§ 20.202 Personnel monitoring.

(a) Each licensee shall supply appropriate personnel monitoring equipment to, and shall require the use of such equipment by:

(1) Each individual who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in paragraph (a) of § 20.101.

(2) Each individual under 18 years of age who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 5 percent of the applicable value specified in paragraph (a) of § 20.101.

(3) Each individual who enters a high radiation area.

(b) As used in this part,

(1) "Personnel monitoring equipment" means devices designed to be worn or carried by an individual for the purpose of measuring the dose received (e. g., film badges, pocket chambers, pocket dosimeters, film rings, etc.);

(2) "Radiation area" means any area, accessible to personnel, in which there exists radiation, originating in whole or in part within licensed material, at such levels that a major portion of the body could receive in any one hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirems;

(3) "High radiation area" means any area, accessible to personnel, in which there exists radiation originating in whole or in part within licensed material at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

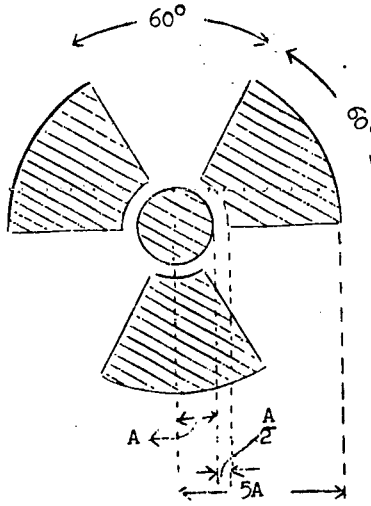
25 FR 10914

§ 20.203 Caution signs, labels, and signals.

(a) *General.* (1) Except as otherwise authorized by the Commission, symbols prescribed by this section shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this section is the conventional three-bladed design:

RADIATION SYMBOL

1. Cross-hatched area is to be magenta or purple.
2. Background is to be yellow.



(2) In addition to the contents of signs and labels prescribed in this section, licensees may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation or to radioactive material.

(b) *Radiation areas.* Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION[1]
RADIATION AREA

(c) *High radiation areas.* (1) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION[1]
HIGH RADIATION AREA

(2) Each high radiation area shall be equipped with a control device which shall either cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirem in one hour upon entry into the area or shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering and the licensee or a supervisor of the activity are made aware of the entry. In the case of a high radiation area established for a period of 30 days or less, such control device is not required.

(d) *Airborne radioactivity areas.* (1) As used in the regulations in this part, "airborne radioactivity area" means (i) any room, enclosure, or operating area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations in excess of the amounts specified in Appendix B, Table I, Column 1 of this part; or (ii) any room, enclosure, or operating area in which airborne radioactive material composed wholly or partly of licensed material exists in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed 25 percent of the amounts specified in Appendix B, Table I, Column 1 of this part.

(2) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION[1]
AIRBORNE RADIOACTIVITY AREA

(e) *Additional requirements.* (1) Each area or room in which licensed material is used or stored and which contains any radioactive material (other than natural uranium or thorium) in an amount exceeding 10 times the quantity of such material specified in Appendix C of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION[1]
RADIOACTIVE MATERIAL(S)

(2) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding one-hundred times the quantity specified in Appendix C of this part shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION
RADIOACTIVE MATERIAL(S)

(f) *Containers.* (1) Except as provided in subparagraph (3) of this paragraph, each container of licensed material shall bear a durable, clearly visible label identifying the radioactive contents.

(2) A label required pursuant to subparagraph (1) of this paragraph shall bear the radiation caution symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL". It shall also provide sufficient information[1] to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures.

31 FR 10514

(3) Notwithstanding the provisions of subparagraph (1) of this paragraph, labeling is not required:

(i) For containers that do not contain licensed materials in quantities greater than the applicable quantities listed in Appendix C of this part.

(ii) For containers containing only natural uranium or thorium in quantities no greater than 10 times the applicable quantities listed in Appendix C of this part.

(iii) For containers that do not contain licensed materials in concentrations

[1] As appropriate, the information will include radiation levels, kinds of material, estimate of activity, date for which activity is estimated, mass enrichment, etc.

Or "Danger"

greater than the applicable concentrations listed in Column 2, Table I, Appendix B of this part.

(iv) For containers when they are attended by an individual who takes the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established by the regulations in this part.

(v) For containers when they are in transport and packaged and labeled in accordance with regulations of the Interstate Commerce Commission, Federal Aviation Agency, or Coast Guard.

(vi) For containers which are accessible[1] only to individuals authorized to handle or use them, or to work in the vicinity thereof, provided that the contents are identified to such individuals by a readily available written record.

(vii) For manufacturing or process equipment, such as nuclear reactors, reactor components, piping, and tanks.

31 FR 10514

§ 20.204 Exceptions from posting requirements.

Notwithstanding the provisions of § 20.203,

(a) A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level twelve inches from the surface of the source container or housing does not exceed five millirem per hour.

(b) Rooms or other areas in hospitals are not required to be posted with caution signs because of the presence of patients containing byproduct material provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the regulations in this part.

25 FR 10914

(c) Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than eight hours provided that (1) the materials are constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive materials in excess of the limits established in the regulations in this part and; (2) such area or room is subject to the licensee's control.

31 FR 10514

(d) A room or other area is not required to be posted with a caution sign because of the presence of radioactive materials packaged and labeled in accordance with regulations of the Interstate Commerce Commission, Federal Aviation Agency, or Coast Guard.

§ 20.206 Instruction of personnel; posting of notices to employees.

25 FR 10914

(a) All individuals working in or frequenting any portion of a restricted area shall be informed of the occurrence of radioactive materials or of radiation in such portions of the restricted area; shall be instructed in the safety problems associated with exposure to such materials or radiation and in precautions or procedures to minimize exposure; shall be instructed in the applicable provisions of Commission regulations and licenses for the protection of personnel from exposures to radiation or radioactive materials; and shall be advised of reports of radiation exposure which employees may request pursuant to these regulations.

(b) Each licensee shall post a current copy of the regulations in this part, a copy of the license, and a copy of operating procedures applicable to work under the license conspicuously in a sufficient number of places in every establishment where employees are employed in activities licensed by the Commission to permit them to observe such documents on the way to or from their place of employment or shall keep such documents available for employees' examination upon request.

25 FR 13952

(c) Form AEC-3, "Notice to Employees", shall be conspicuously posted in a sufficient number of places in every establishment where employees are employed in activities licensed by the Commission to permit employees working in or frequenting any portion of a restricted area to observe a copy on the way to or from their place of employment.

31 FR 4668

NOTE: Copies of Form AEC-3, "Notice to Employees," may be obtained by writing to the Director of the appropriate U.S. Atomic Energy Commission Regional Compliance Office listed in Appendix "D" or the Director, Division of Materials Licensing, U.S. Atomic Energy Commission, Washington, D.C., 20545.

§ 20.207 Storage of licensed materials.

Licensed materials stored in an unrestricted area shall be secured against unauthorized removal from the place of storage.

WASTE DISPOSAL

§ 20.301 General requirement.

No licensee shall dispose of licensed material except:

(a) By transfer to an authorized recipient as provided in the regulations in Part 30, 40, or 70 of this chapter, whichever may be applicable; or

(b) As authorized pursuant to § 20.302; or

(c) As provided in § 20.303 or § 20.304, applicable respectively to the disposal of licensed material by release into sanitary sewerage systems or burial in soil, or in § 20.106 (Concentrations in Effluents to Unrestricted Areas).

25 FR 10914

§ 20.302 Method for obtaining approval of proposed disposal procedures.

Any licensee or applicant for a license may apply to the Commission for approval of proposed procedures to dispose of licensed material in a manner not otherwise authorized in the regulations in this chapter. Each application should include a description of the licensed material and any other radioactive material involved, including the quantities and kinds of such material and the levels of radioactivity involved, and the proposed manner and conditions of disposal. The application should also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, geological, meteorological, and hydrological characteristics; usage of ground and surface waters in the general area; the nature and location of other potentially affected facilities; and procedures to be observed to minimize the risk of unexpected or hazardous exposures.

26 FR 352

The Commission will not approve any application for a license to receive licensed material from other persons for disposal on land not owned by the Federal government or by a State government.

§ 20.303 Disposal by release into sanitary sewerage systems.

No licensee shall discharge licensed material into a sanitary sewerage system unless:

(a) It is readily soluble or dispersible in water; and

(b) The quantity of any licensed or other radioactive material released into the system by the licensee in any one day does not exceed the larger of subparagraphs (1) or (2) of this paragraph:

(1) The quantity which, if diluted by the average daily quantity of sewage released into the sewer by the licensee, will result in an average concentration equal to the limits specified in Appendix B, Table I, Column 2 of this part; or

(2) Ten times the quantity of such material specified in Appendix C of this part; and

(c) The quantity of any licensed or other radioactive material released in any one month, if diluted by the average monthly quantity of water released by the licensee, will not result in an average concentration exceeding the limits specified in Appendix B, Table I, Column 2 of this part; and

25 FR 10914

(d) The gross quantity of licensed and other radioactive material released into the sewerage system by the licensee does not exceed one curie per year.

Excreta from individuals undergoing medical diagnosis or therapy with radioactive material shall be exempt from any limitations contained in this section.

§ 20.304 Disposal by burial in soil.

No licensee shall dispose of licensed material by burial in soil unless:

(a) The total quantity of licensed and other radioactive materials buried at any one location and time does not exceed, at the time of burial, 1,000 times the amount specified in Appendix C of this part; and

(b) Burial is at a minimum depth of four feet; and

(c) Successive burials are separated by distances of at least six feet and not more than 12 burials are made in any year.

[1] For example, containers in locations such as water-filled canals, storage vaults, or hot cells.

§ 20.305 Treatment or disposal by incineration.

No licensee shall treat or dispose of licensed material by incineration except as specifically approved by the Commission pursuant to §§ 20.106(b) and 20.302

RECORDS, REPORTS, AND NOTIFICATION

§ 20.401 Records of surveys, radiation monitoring, and disposal.

(a) Each licensee shall maintain records showing the radiation exposures of all individuals for whom personnel monitoring is required under § 20.202 of the regulations in this part. Such records shall be kept on Form AEC-5, in accordance with the instructions contained in that form or on clear and legible records containing all the information required by Form AEC-5. The doses entered on the forms or records shall be for periods of time not exceeding one calendar quarter. 25 FR 10914

(b) Each licensee shall maintain records in the same units used in this part, showing the results of surveys required by § 20.201 (b), and disposals made under §§ 20.302, 20.303, and 20.304.

(c) Records of individual radiation exposure which must be maintained pursuant to the provisions of paragraph (a) of this section shall be preserved until December 31, 1970, or until a date 5 years after termination of the individual's employment, whichever is later. Records which must be maintained pursuant to this part may be maintained in the form of microfilms. 30 FR 14551

NOTE: Prior to December 31, 1970, the Commission may amend this paragraph to assure the further preservation of records which it determines should not be destroyed.

§ 20.402 Reports of theft or loss of licensed material.

Each licensee shall report by telephone and telegraph to the Director of the appropriate Atomic Energy Commission Regional Compliance Office listed in Appendix D, immediately after its occurrence becomes known to the licensee, any loss or theft of licensed material in such quantities and under such circumstances that it appears to the licensee that a substantial hazard may result to persons in unrestricted areas. 27 FR 5905

§ 20.403 Notifications of incidents.

(a) *Immediate notification.* Each licensee shall immediately notify the Director of the appropriate Atomic Energy Commission Regional Compliance Office shown in Appendix D by telephone and telegraph of any incident involving byproduct, source or special nuclear material possessed by him and which may have caused or threatens to cause:

(1) Exposure of the whole body of any individual to 25 rems or more of radiation; exposure of the skin of the whole body of any individual of 150 rems or more of radiation; or exposure of the feet, ankles, hands or forearms of any individual to 375 rems or more of radiation; or

(2) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limits specified for such materials in Appendix B, Table II; or

(3) A loss of one working week or more of the operation of any facilities affected; or

(4) Damage to property in excess of $100,000.

(b) *Twenty-four hour notification.* Each licensee shall within 24 hours notify the Director of the appropriate Atomic Energy Commission Regional Compliance Office listed in Appendix D by telephone and telegraph of any incident involving licensed material possessed by him and which may have caused or threatens to cause:

(1) Exposure of the whole body of any individual to 5 rems or more of radiation; exposure of the skin of the whole body of any individual to 30 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms to 75 rems or more of radiation; or

(2) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 500 times the limits specified for such materials in Appendix B, Table II; or

(3) A loss of one day or more of the operation of any facilities affected; or

(4) Damage to property in excess of $1,000.

(c) Any report filed with the Commission pursuant to this section shall be prepared so that names of individuals who have received exposure to radiation will be stated in a separate part of the report. 28 FR 6822

§ 20.404 Report to former employees of exposure to radiation.

At the request of a former employee each licensee shall furnish to the former employee a report of the former employee's exposure to radiation as shown in records maintained by the licensee pursuant to § 20.401(a). Such report shall be furnished within 30 days from the time the request is made; shall cover each calendar quarter of the individual's employment involving exposure to radiation, or such lesser period as may be requested by the employee. The report shall also include the results of any calculations and analyses of radioactive material deposited in the body of the employee and made pursuant to the provisions of § 20.108. The report shall be in writing and contain the following statement: 25 FR 10914

This report is furnished to you under the provisions of the Atomic Energy Commission regulations entitled "Standards for Protection Against Radiation" (10 CFR Part 20). You should preserve this report for future reference.

(b) The former employee's request should include appropriate identifying data, such as social security number and dates and locations of employment.

§ 20.405 Reports of overexposures and excessive levels and concentrations.

(a) In addition to any notification required by § 20.403, each licensee shall make a report in writing within 30 days to the * Director, Division of ** Compliance, U.S. Atomic Energy Commission, Washington, D.C., 20545, with a copy to the Director of the appropriate Atomic Energy Commission Regional Compliance Office listed in Appendix D, of (1) each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit in this part or in the licensee's license; (2) any incident for which notification is required by § 20.403; and (3) levels of radiation or concentrations of radioactive material (not involving excessive exposure of any individual) in an unrestricted area in excess of ten times any applicable limit set forth in this part or in the licensee's license. Each report required under this paragraph shall describe the extent of exposure of persons to radiation or to radioactive material; levels of radiation and concentrations of radioactive material involved; the cause of the exposure, levels or concentrations; and corrective steps taken or planned to assure against a recurrence. 27 FR 5905

(b) In any case where a licensee is required pursuant to the provisions of this section to report to the Commission any exposure of an individual to radiation or to concentrations of radioactive material, the licensee shall also notify such individual of the nature and extent of exposure. Such notice shall be in writing and shall contain the following statement: 25 FR 10914

This report is furnished to you under the provisions of the Atomic Energy Commission regulations entitled "Standards for Protection Against Radiation" (10 CFR Part 20). You should preserve this report for future reference.

(c) Any report filed with the Commission pursuant to this section shall be prepared so that names of individuals who have received exposure to radiation will be stated in a separate part of the report. 28 FR 6822

§ 20.406 Notice to employees of exposure to radiation.

At the request of any employee, each licensee shall advise such employee annually of the employee's exposure to radiation as shown in records maintained by the licensee pursuant to § 20.401(a).

EXCEPTIONS AND ADDITIONAL REQUIREMENTS

§ 20.501 Applications for exemptions.

The Commission may, upon application by any licensee or upon its own initiative, grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not result in undue hazard to life or property. 25 FR 10914

§ 20.502 Additional requirements.

The Commission may, by rule, regulation, or order, impose upon any licensee such requirements, in addition to those

*Revised 31 FR 4668
**Revised 32 FR 10432

established in the regulations in this part, as it deems appropriate or necessary to protect health or to minimize danger to life or property.

ENFORCEMENT

§ 20.601 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the act or any regulation or order issued thereunder. Any person who willfully violates any provision of the act or any regulation or order issued thereunder may be guilty of a crime, and upon conviction, may be punished by fine or imprisonment or both, as provided by law.

25 FR 10914

PART 30

RULES OF GENERAL APPLICABILITY TO LICENSING OF BYPRODUCT MATERIAL

GENERAL PROVISIONS

§ 30.1 Purpose and scope.

This part prescribes rules governing licensing of byproduct material under the Atomic Energy Act of 1954, as amended (68 Stat. 919), and exemptions from the licensing requirements permitted by section 81 of the Act, applicable to all persons in the United States.

§ 30.2 Resolution of conflict.

The requirements of this part are in addition to, and not in substitution for, other requirements of this chapter. In any conflict between the requirements in this part and a specific requirement in another part of the regulations in this chapter, the specific requirement governs.

30 FR 8185

§ 30.3 Activities requiring license.

Except for persons exempt as provided in this part and Part 150 of this chapter, no person shall manufacture, produce, transfer, receive, acquire, own, possess, use, import or export byproduct material except as authorized in a specific or general license issued pursuant to the regulations in this chapter.

§ 30.4 Definitions.

As used in this part and Parts 31–36 of this chapter:

(a) "Act" means the Atomic Energy Act of 1954, including any amendments thereto;

(b) Terms defined in section 11 of the Act shall have the same meaning when used in the regulations in this part and Parts 31–36 to the extent such terms are not specifically defined in this part;

(c) "Agreement State" means any State with which the Commission has entered into an effective agreement under subsection 274b. of the Act. "Non-agreement State" means any other State;

(d) "Byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material;

(e) "Commission" means the Atomic Energy Commission and its duly authorized representatives;

(f) "Curie" means that amount of radioactive material which disintegrates at the rate of 37 billion atoms per second;

(g) "Government agency" means any executive department, commission, independent establishment, corporation, wholly or partly owned by the United States of America which is an instrumentality of the United States, or any board, bureau, division, service, office, officer, authority, administration, or other establishment in the executive branch of the Government;

(h) "Human use" means the internal or external administration of byproduct material, or the radiation therefrom, to human beings;

(i) "License", except where otherwise specified means a license for byproduct material issued pursuant to the regulations in this chapter;

(j) "Microcurie" means that amount of radioactive material which disintegrates at the rate of 37 thousand atoms per second;

(k) "Person" means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the Commission, any State or any political subdivision of, or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing;

(l) "Physician" means an individual licensed by a State or territory of the United States, the District of Columbia or the Commonwealth of Puerto Rico to dispense drugs in the practice of medicine;

(m) "Production facility" means production facility as defined in the regulations contained in Part 50 of this chapter;

(n) "Radiographer" means any individual who performs or who, in attendance at the site where the sealed source or sources are being used, personally supervises radiographic operations and who is responsible to the licensee for assuring compliance with the requirements of the Commission's regulations and the conditions of the license;

(o) "Radiographer's assistant" means any individual who, under the personal supervision of a radiographer, uses radiographic exposure devices, sealed sources or related handling tools, or survey instruments in radiography;

(p) "Radiography" means the examination of the structure of materials by nondestructive methods, utilizing sealed sources of byproduct materials;

(q) "Research and development" means (1) theoretical analysis, exploration, or experimentation; or (2) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials and processes. "Research and development" as used in this part and Parts 31–36 does not include the internal or external administration of byproduct material, or the radiation therefrom, to human beings;

(r) "Sealed source" means any byproduct material that is encased in a capsule designed to prevent leakage or escape of the byproduct material;

(s) "Source material" means source material as defined in the regulations contained in Part 40 of this chapter;

(t) "Special nuclear material" means special nuclear material as defined in the regulations contained in Part 70 of this chapter;

(u) "United States", when used in a geographical sense, includes all territories and possessions of the United States, the Canal Zone and Puerto Rico;

(v) "Utilization facility" means a utilization facility as defined in the regulations contained in Part 50 of this chapter.

§ 30.5 Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part and Parts 31–36 by any officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding upon the Commission.

§ 30.6 Communications.

Except where otherwise specified, all communications and reports concerning the regulations in this part and Parts 31–36 and applications filed under them, should be addressed to the Director of Regulation, U.S. Atomic Energy Commission, Washington, D.C., 20545. Communications, reports and applications may be delivered in person at the Commission's offices at 1717 H Street NW., Washington, D.C.; at 4915 St. Elmo Avenue, Bethesda, Md.; or at Germantown, Md.

EXEMPTIONS

§ 30.11 Exemptions from licensing.

The Commission may upon the application of any interested person, or upon its own initiative, exempt certain classes or quantities of byproduct material or kinds of uses or users from the requirements for a license set forth in section 81 of the Act and in the regulations in this part and Parts 31–36 when it makes a finding that the exemption of such classes or quantities of such material or such kinds of uses or users will not constitute an unreasonable risk to the common defense and security and to the health and safety of the public.**

§ 30.12 Persons using byproduct material under certain Atomic Energy Commission contracts.

Any prime contractor of the Commission is exempt from the requirements for a license set forth in sections 81 and 82 of the Act and from the regulations in this part to the extent that such contractor, under his prime contract with the Commission, manufactures, produces, transfers, receives, acquires, owns, possesses, uses, imports, or exports byproduct material for: (a) The performance of work for the Commission at a United States Government-owned or controlled site, including the transportation of byproduct material to or from such site and the performance of contract services during temporary interruptions of such transportation; (b) research in, or development, manufacture, storage, testing or transportation of, atomic weapons or components thereof; or (c) the use or operation of nuclear reactors or other nuclear devices in a United States Government-owned vehicle or vessel. In addition to the foregoing exemptions, any prime contractor or subcontractor of the Commission is exempt from the requirements for a license set forth in sections 81 and 82 of the Act and from the regulations in this part to the extent that such prime contractor or subcontractor manufactures, produces, transfers, receives, acquires, owns, possesses, uses, imports or exports byproduct material under his prime contract or subcontract when the Commission determines that the exemption of the prime contractor or subcontractor is authorized by law; and that, under the terms of the contract or subcontract, there is adequate assurance that the work thereunder can be accomplished without undue risk to the public health and safety. Any person exempt from licensing under this part prior to the effective date of this amendment who would otherwise be required by virtue of this section to obtain a license shall continue to be so exempt on an interim basis. Such interim exemption shall expire 60 days from the effective date of this amendment, unless within said 60-day period either an application for a license covering the activity or an application for an appropriate exemption under this section is filed with the Commission. If either such application is filed within such 60-day period, the interim exemption shall remain in effect until final action in the matter is taken by the Commission.

§ 30.13 Carriers.

Common and contract carriers and the United States Post Office Department are exempt from the regulations in this part and Parts 31–36 and the requirements for a license set forth in section 81 of the Act to the extent that they transport byproduct material in the regular course of their business as carriers.

§ 30.14 Exempt concentrations.

(a) Except as provided in paragraphs (c) and (d) of this section, any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in this part and Parts 31–36 of this chapter to the extent that such person receives, possesses, uses, transfers, owns or acquires products or materials containing byproduct material in concentrations not in excess of those listed in § 30.70.

(b) This section shall not be deemed to authorize the import of byproduct material or products containing byproduct material.

(c) A manufacturer, processor, or producer of a product or material in an agreement State is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in this part and Parts 31, 32, 33, 34 and 36, to the extent that he transfers byproduct material contained in a product or material in concentrations not in excess of those specified in § 30.70 and introduced into the product or material by a licensee holding a specific license issued by an agreement State or the Commission expressly authorizing such introduction. This exemption does not apply to the transfer of byproduct material contained in any food, beverage, cosmetic, drug, or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

(d) No person may introduce byproduct material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under this section or equivalent regulations of an agreement State, except in accordance with a license issued pursuant to § 32.11 of this chapter or the general license provided in § 150.20 of Part 150.

§ 30.15 Certain items containing tritium or promethium 147.

(a) Except for persons who apply tritium or promethium 147 to, or persons who incorporate tritium or promethium 147 into, the following products, or persons who import for sale or distribution the following products containing tritium or promethium 147, any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in Parts 20 and 30–36 of this chapter to the extent that such person receives, possesses, uses, transfers, exports, owns, or acquires the following products:

(1) Timepieces or hands or dials containing not more than (i) 25 millicuries of tritium per timepiece, (ii) 5 millicuries per hand, or (iii) 15 millicuries per dial (bezels when used shall be considered as part of the dial).

(2) Lock illuminators containing not more than 15 millicuries of tritium or not more than 2 millicuries of promethium 147 installed in automobile locks. The levels of radiation from each lock illuminator containing promethium 147 will not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 50 milligrams per square centimeter of absorber.

(3) Balances of precision containing not more than 1 millicurie of tritium per balance or not more than 0.5 millicurie of tritium per balance part.[2]

(4) Automobile shift quadrants containing not more than 25 millicuries of tritium.

* * (5) Marine compasses containing not more than 750 millicuries of tritium gas and other marine navigational instruments containing not more than 250 millicuries of tritium gas.

(6) Thermostat dials and pointers containing not more than 25 millicuries of tritium per thermostat.

* (7) Glow lamps containing not more than 10 microcuries of tritium per lamp.

31 FR 5315

* Added 31 FR 14349

** Amended 32 FR 785

[2] Export shipment of precision balances is subject to the licensing authority and regulations of the Department of Commerce. Issuance of an exemption by the Atomic Energy Commission for export of tritium contained in balances of precision or the parts thereof does not relieve any person from complying with the licensing requirements and regulations of the Department of Commerce.

centimeter from any surface when measured through 50 milligrams per square centimeter of absorber.

(3) Balances of precision containing not more than 1 millicurie of tritium per balance or not more than 0.5 millicurie of tritium per balance part.[3]

(4) Automobile shift quadrants containing not more than 25 millicuries of tritium.

***(5) Marine compasses containing not more than 750 millicuries of tritium gas and other marine navigational instruments containing not more than 250 millicuries of tritium gas.

(6) Thermostat dials and pointers containing not more than 25 millicuries of tritium per thermostat.

**(7) Glow lamps containing not more than 10 microcuries of tritium per lamp.

****(8) Spark gap tubes containing not more than 30 microcuries of promethium 147. The levels of radiation from each spark gap tube containing promethium 147 will not exceed 0.5 millirad per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber.

(b) Any person who desires to apply tritium or promethium 147 to, or to incorporate tritium or promethium 147 into, the products exempted in paragraph (a) of this section, or who desires to import for sale or distribution such products containing tritium or promethium 147, should apply for a specific license, pursuant to § 32.14 of this chapter, which license states that the product may be distributed by the licensee to persons exempt from the regulations pursuant to paragraph (a) of this section.

31 FR 5315

*§ 30.16 Resins containing scandium 46 and designed for sand-consolidation in oil wells.

Any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in Parts 20 and 30–36 of this chapter to the extent that such person receives, possesses, uses, transfers, exports, owns, or acquires synthetic plastic resins containing scandium 46 which are designed for sand-consolidation in oil wells, and which have been manufactured or imported for sale or distribution, in accordance with a specific license issued pursuant to § 32.17 of this chapter or equivalent regulations of an agreement State. The exemption in this section does not authorize the manufacture or import of any resins containing scandium 46.

[3] Export shipment of precision balances is subject to the licensing authority and regulations of the Department of Commerce. Issuance of an exemption by the Atomic Energy Commission for export of tritium contained in balances of precision or the parts thereof does not relieve any person from complying with the licensing requirements and regulations of the Department of Commerce.

** Added 31 FR 14349

*** Amended 32 FR 785

**** Added 32 FR 6433

* Added 32 FR 4241

LICENSES

§ 30.31 Types of licenses.

Licenses for byproduct material are of two types: General and specific. Specific licenses are issued to named persons upon applications filed pursuant to the regulations in this part and Parts 32–36. General licenses are effective without the filing of applications with the Commission or the issuance of licensing documents to particular persons.

30 FR 8185

§ 30.32 Applications for specific licenses.

(a) Applications for specific licenses should be filed on Form AEC–313, "Application for Byproduct Material License", with the Director, Division of Materials Licensing, U.S. Atomic Energy Commission, Washington, D.C., 20545. Applications may be filed in person at the Commission's offices at 1717 H Street NW., Washington, D.C.; at 4915 St. Elmo Avenue, Bethesda, Md.; or at Germantown, Md. Information contained in previous applications, statements or reports filed with the Commission may be incorporated by reference, provided that such references are clear and specific.

(b) The Commission may at any time after the filing of the original application, and before the expiration of the license, require further statements in order to enable the Commission to determine whether the application should be granted or denied or whether a license should be modified or revoked.

(c) Each application shall be signed by the applicant or licensee or a person duly authorized to act for and on his behalf.

(d) An application for license filed pursuant to the regulations in this part and Parts 32–36 will be considered also as an application for licenses authorizing other activities for which licenses are required by the Act, provided that the application specifies the additional activ-

ities for which licenses are requested and complies with regulations of the Commission as to applications for such licenses.

§ 30.33 General requirements for issuance of specific licenses.

(a) An application for a specific license will be approved if:

(1) The application is for a purpose authorized by the Act;

(2) The applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life or property;

(3) The applicant is qualified by training and experience to use the material for the purpose requested in such manner as to protect health and minimize danger to life or property; and

(4) The applicant satisfies any special requirements contained in Parts 32–36.

(b) Upon a determination that an application meets the requirements of the Act, and the regulations of the Commission, the Commission will issue a specific license authorizing the possession and use of byproduct material (Form AEC 374, "Byproduct Material License").

§ 30.34 Terms and conditions of licenses.

(a) Each license issued pursuant to the regulations in this part and the regulations in Parts 31–36 shall be subject to all the provisions of the Act, now or hereafter in effect, and to all valid rules, regulations and orders of the Commission.

(b) No license issued or granted pursuant to the regulations in this part and Parts 31–36, nor any right under a license shall be transferred, assigned or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person, unless the Commission shall, after securing full information, find that the transfer is in accordance with the provisions of the Act and shall give its consent in writing.

(c) Each person licensed by the Commission pursuant to the regulations in this part and Parts 31–36 shall confine his possession and use of the byproduct material to the locations and purposes authorized in the license. Except as otherwise provided in the license, a license issued pursuant to the regulations in this part and Parts 31–36 shall carry with it the right to receive, acquire, own, possess and import byproduct material and to transfer such material to other licensees within the United States authorized to receive such material.

(d) Each license issued pursuant to the regulations in this part and Parts 31–36 shall be deemed to contain the provisions set forth in section 183b.–d., inclusive, of the Act, whether or not these provisions are expressly set forth in the license.

(e) The Commission may incorporate, in any license issued pursuant to the regulations in this part and Parts 31–36, at the time of issuance, or thereafter by appropriate rule, regulation or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use and transfer of byproduct material as it deems appropriate or necessary in order to:

(1) Promote the common defense and security;

(2) Protect health or to minimize danger to life or property;

(3) Protect restricted data;

(4) Require such reports and the keeping of such records, and to provide for such inspections of activities under the license as may be necessary or appropriate to effectuate the purposes of the Act and regulations thereunder.

§ 30.35 References in licenses outstanding on effective date of recodification of this part.

References to sections of Parts 30 and 31 and to Parts 30 and 31 in licenses outstanding on the effective date of this recodification shall be deemed to be references to the sections of Parts 30–36 and to Parts 30–36 superseding those denoted in the outstanding licenses.

§ 30.36 Expiration of licenses.

Except as provided in § 30.37(b), each specific license shall expire at the end of the day, in the month and year stated therein.

§ 30.37 Applications for renewal of licenses.

(a) Applications for renewal of a specific license shall be filed in accordance with § 30.32.

(b) In any case in which a licensee, not less than thirty (30) days prior to the expiration of his existing license, has filed an application in proper form for renewal or for a new license, such existing license shall not expire until the application has been finally determined by the Commission.

§ 30.38 Applications for amendment of licenses.

Applications for amendment of a license shall be filed in accordance with § 30.32 and shall specify the respects in which the licensee desires his license to be amended and the grounds for such amendment.

§ 30.39 Commission action on applications to renew or amend.

In considering an application by a licensee to renew or amend his license the Commission will apply the applicable criteria set forth in § 30.33 and Parts 32–36 of this chapter.

RECORDS, INSPECTIONS AND TESTS

§ 30.51 Records.

Each person who receives byproduct material pursuant to a license issued pursuant to the regulations in this part and Parts 31–36 shall keep records showing the receipt, transfer, export and disposal of such byproduct material.

§ 30.52 Inspections.

(a) Each licensee shall afford to the Commission at all reasonable times opportunity to inspect byproduct material and the premises and facilities wherein byproduct material is used or stored.

(b) Each licensee shall make available to the Commission for inspection, upon reasonable notice, records kept by him pursuant to the regulations in this chapter.

§ 30.53 Tests.

Each licensee shall perform, or permit the Commission to perform, such tests as the Commission deems appropriate or necessary for the administration of the regulations in this part and Parts 31–36, including tests of:

(a) Byproduct material;

(b) Facilities wherein byproduct material is utilized or stored;

(c) Radiation detection and monitoring instruments; and

(d) Other equipment and devices used in connection with the utilization or storage of byproduct material.

ENFORCEMENT

§ 30.61 Modification and revocation of licenses.

(a) The terms and conditions of each license issued pursuant to the regulations in this part and Parts 31–36 shall be subject to amendment, revision or modification by reason of amendments to the Act, or by reason of rules, regulations and orders issued in accordance with the terms of the Act.

(b) Any license may be revoked, suspended or modified, in whole or in part, for any material false statement in the application or any statement of fact required under section 182 of the Act, or because of conditions revealed by such application or statement of fact or any report, record or inspection or other means which would warrant the Commission to refuse to grant a license on an original application, or for violation of, or failure to observe any of the terms and provisions of the Act or of any rule, regulation or order of the Commission.

(c) Except in cases of willfulness or those in which the public health, interest or safety requires otherwise, no license shall be modified, suspended or revoked unless, prior to the institution of proceedings therefor, facts or conduct which may warrant such action shall have been called to the attention of the licensee in writing and the licensee shall have been accorded an opportunity to demonstrate or achieve compliance with all lawful requirements.

§ 30.62 Right to withhold or recall byproduct material.

The Commission may withhold, recall or order the withholding or recall of byproduct material from any licensee who is not equipped to observe or fails to observe such safety standards to protect health as may be established by the Commission, or who uses such materials in violation of law or regulation of the Commission, or in a manner other than as disclosed in the application therefor or approved by the Commission.

§ 30.63 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the Act or any regulation or order issued thereunder. Any person who willfully violates any provision of the Act or any regulation or order issued thereunder may be guilty of a crime and, upon conviction, may be punished by fine or imprisonment or both, as provided by law.

30 FR 8185

April 29, 1967

SCHEDULES

§ 30.70 Schedule A—Exempt concentrations.

Element (atomic number)	Isotope	Column I Gas concentration uc/ml [1]	Column II Liquid and solid concentration uc/ml [2]
Antimony (51)	Sb 122		3×10^{-4}
	Sb 124		2×10^{-4}
	Sb 125		1×10^{-3}
Argon (18)	A 37	1×10^{-3}	
	A 41	4×10^{-7}	
Arsenic (33)	As 73		5×10^{-3}
	As 74		5×10^{-4}
	As 76		2×10^{-4}
	As 77		8×10^{-4}
Barium (56)	Ba 131		2×10^{-3}
	Ba 140		3×10^{-4}
Beryllium (4)	Be 7		2×10^{-2}
Bismuth (83)	Bi 206		4×10^{-4}
Bromine (35)	Br 82	4×10^{-7}	3×10^{-3}
Cadmium (48)	Cd 109		2×10^{-3}
	Cd 115m		3×10^{-4}
	Cd 115		3×10^{-4}
Calcium (20)	Ca 45		9×10^{-5}
	Ca 47		5×10^{-4}
Carbon (6)	C 14	1×10^{-6}	8×10^{-3}
Cerium (58)	Ce 141		9×10^{-4}
	Ce 143		4×10^{-4}
	Ce 144		1×10^{-4}
Cesium (55)	Cs 131		2×10^{-3}
	Cs 134m		6×10^{-3}
	Cs 134		9×10^{-5}
Chlorine (17)	Cl 38	9×10^{-7}	4×10^{-3}
Chromium (24)	Cr 51		2×10^{-3}
Cobalt (27)	Co 57		5×10^{-3}
	Co 58		1×10^{-3}
	Co 60		5×10^{-4}
Copper (29)	Cu 64		3×10^{-3}
Dysprosium (66)	Dy 165		4×10^{-3}
	Dy 166		4×10^{-4}
Erbium (68)	Er 169		9×10^{-4}
	Er 171		1×10^{-3}
Europium (63)	Eu 152 (T/2=9.2 Hrs)		6×10^{-4}
	Eu 155		2×10^{-3}
Fluorine (9)	F 18	2×10^{-4}	8×10^{-3}
Gadolinium (64)	Gd 153		2×10^{-4}
	Gd 159		8×10^{-4}
Gallium (31)	Ga 72		4×10^{-4}
Germanium (32)	Ge 71		2×10^{-2}
Gold (79)	Au 196		2×10^{-3}
	Au 198		5×10^{-4}
	Au 199		2×10^{-3}
Hafnium (72)	Hf 181		7×10^{-4}
Hydrogen (1)	H 3	5×10^{-6}	3×10^{-3}
Indium (49)	In 113m		1×10^{-2}
	In 114m		2×10^{-4}
Iodine (53)	I 126	3×10^{-9}	2×10^{-4}
	I 131	3×10^{-9}	2×10^{-3}
	I 132	8×10^{-8}	6×10^{-4}
	I 133	1×10^{-8}	7×10^{-4}
	I 134	2×10^{-7}	1×10^{-3}
Iridium (77)	Ir 190		2×10^{-3}
	Ir 192		4×10^{-4}
	Ir 194		3×10^{-4}
Iron (26)	Fe 55		8×10^{-2}
	Fe 59		6×10^{-4}
Krypton (36)	Kr 85m	1×10^{-6}	
	Kr 85	3×10^{-6}	
Lanthanum (57)	La 140		2×10^{-4}
Lead (82)	Pb 203		4×10^{-3}
Lutetium (71)	Lu 177		1×10^{-3}
Manganese (25)	Mn 52		3×10^{-4}
	Mn 54		1×10^{-3}
	Mn 56		1×10^{-3}
Mercury (80)	Hg 197m		2×10^{-3}
	Hg 197		3×10^{-3}
	Hg 203		2×10^{-4}
Molybdenum (42)	Mo 99		2×10^{-3}
Neodymium (60)	Nd 147		6×10^{-4}
	Nd 149		3×10^{-3}
Nickel (28)	Ni 65		1×10^{-3}
Niobium (Columbium) (41)	Nb 95		1×10^{-3}
	Nb 97		9×10^{-3}
Osmium (76)	Os 185		7×10^{-4}
	Os 191m		3×10^{-2}
	Os 191		2×10^{-3}
	Os 193		6×10^{-4}
Palladium (46)	Pd 103		3×10^{-2}
	Pd 109		9×10^{-4}
Phosphorus (15)	P 32		2×10^{-4}
Platinum (78)	Pt 191		1×10^{-3}
	Pt 193m		1×10^{-2}
	Pt 197m		1×10^{-3}
	Pt 197		1×10^{-3}
Potassium (19)	K 42		3×10^{-3}
Praseodymium (59)	Pr 142		3×10^{-4}
	Pr 143		5×10^{-4}
Promethium (61)	Pm 147		2×10^{-3}
	Pm 149		4×10^{-4}
Rhenium (75)	Re 183		6×10^{-3}
	Re 186		9×10^{-4}
	Re 188		6×10^{-4}
Rhodium (45)	Rh 103m		1×10^{-1}
	Rh 105		1×10^{-3}
Rubidium (37)	Rb 86		7×10^{-4}
Ruthenium (44)	Ru 97		4×10^{-3}
	Ru 103		8×10^{-4}
	Ru 105		1×10^{-3}
	Ru 106		1×10^{-4}
Samarium (62)	Sm 153		8×10^{-4}
Scandium (21)	Sc 46		4×10^{-4}
	Sc 47		9×10^{-4}
	Sc 48		3×10^{-4}
Selenium (34)	Se 75		3×10^{-3}
Silicon (14)	Si 31		9×10^{-3}
Silver (47)	Ag 105		1×10^{-3}
	Ag 110m		3×10^{-4}
	Ag 111		4×10^{-4}
Sodium (11)	Na 24		2×10^{-3}
Strontium (38)	Sr 89		1×10^{-4}
	Sr 91		7×10^{-4}
	Sr 92		7×10^{-4}
Sulfur (16)	S 35	9×10^{-8}	6×10^{-4}
Tantalum (73)	Ta 182		4×10^{-4}
Technetium (43)	Tc 96m		1×10^{-1}
	Tc 96		1×10^{-3}
Tellurium (52)	Te 125m		2×10^{-3}
	Te 127m		6×10^{-4}
	Te 127		3×10^{-3}
	Te 129m		3×10^{-4}
	Te 131m		6×10^{-4}
	Te 132		3×10^{-4}
Terbium (65)	Tb 160		4×10^{-4}
Thallium (81)	Tl 200		4×10^{-3}
	Tl 201		3×10^{-3}
	Tl 202		1×10^{-3}
	Tl 204		1×10^{-3}
Thulium (69)	Tm 170		5×10^{-4}
	Tm 171		5×10^{-3}
Tin (50)	Sn 113		9×10^{-4}
	Sn 125		2×10^{-3}
Tungsten (Wolfram) (74)	W 181		4×10^{-3}
	W 187		7×10^{-4}
Vanadium (23)	V 48		3×10^{-4}
Xenon (54)	Xe 131m	4×10^{-6}	
	Xe 133	2×10^{-6}	
	Xe 135	1×10^{-6}	
Ytterbium (70)	Yb 175		1×10^{-3}
Yttrium (39)	Y 90		2×10^{-4}
	Y 91m		3×10^{-3}
	Y 91		3×10^{-4}
	Y 92		6×10^{-4}
	Y 93		3×10^{-4}
Zinc (30)	Zn 65		1×10^{-3}
	Zn 69m		7×10^{-4}
	Zn 69		2×10^{-2}
Zirconium (40)	Zr 95		6×10^{-4}
	Zr 97		2×10^{-4}
Beta and/or gamma emitting byproduct material not listed above with half-life less than 3 years.		1×10^{-10}	1×10^{-4}

NOTE 1: Many radioisotopes disintegrate into isotopes which are also radioactive. In expressing the concentrations in Schedule A, the activity stated is that of the parent isotope and takes into account the daughters.

NOTE 2: For purposes of § 30.14 where there is involved a combination of isotopes, the limit for the combination should be derived as follows:

Determine for each isotope in the product the ratio between the concentration present in the product and the exempt concentration established in Schedule A for the specific isotope when not in combination. The sum of such ratios may not exceed "1" (i.e., unity).

Example:

$$\frac{\text{Concentration of Isotope A in Product}}{\text{Exempt concentration of Isotope A}} + \frac{\text{Concentration of Isotope B in Product}}{\text{Exempt concentration of Isotope B}} \leq 1$$

[1] Values are given only for those materials normally used as gases.

[2] uc/gm for solids.

CROSS REFERENCE TABLE

New section	Old section
30.1	30.1, 30.2
30.2	New
30.3	30.3
30.4	30.4
30.5	30.5
30.6	New
30.11	30.8
30.12	30.6
30.13	30.7
30.14	30.9, 30.32(f)
30.15	30.10
30.16	30.12
30.17	30.14
30.31	30.20
30.32	30.22
30.33	30.23, 30.31(a)
30.34	30.32(a)–(d), 30.31(b), 30.38
30.35	New
30.36	30.34
30.37	30.35
30.38	30.36
30.39	30.37
30.51	30.41
30.52	30.43
30.53	30.44
30.61	30.51
30.62	30.52
30.63	30.61
30.70	30.73

30 FR 8185

307-892 O - 68 - 4

PART 31

GENERAL LICENSES FOR CERTAIN QUANTITIES OF BYPRODUCT MATERIAL AND BYPRODUCT MATERIAL CONTAINED IN CERTAIN ITEMS

Sec.

§ 31.1 Purpose and scope.

This part establishes general licenses for certain quantities of byproduct material and byproduct material contained in certain items. Part 30 of this chapter also contains provisions applicable to the subject matter of this part.

§ 31.2 Terms and conditions.

(a) The general licenses provided in this part are subject to the provisions of §§ 30.14(d), 30.34 (a) to (e), 30.51 to 30.63 and Parts 20 and 36 of this chapter[1] unless indicated otherwise in the language of the general license.

(b) Persons who transfer, receive, acquire, own, possess, use or import items and quantities of byproduct material pursuant to the general licenses provided in §§ 31.3 and 31.4:

30 FR 8185

(1) Shall not effect an increase in the radioactivity of said items or quantities by adding other radioactive material thereto, by combining byproduct material from two or more such items or quantities, or by altering them in any other manner so as to increase thereby the rate of radiation therefrom;

(2) Shall not administer externally or internally, or direct the administration of, said items or quantities or any part thereof to a human being for any purpose, including, but not limited to, diagnostic, therapeutic, and research purposes;

(3) Shall not add, or direct the addition of, said items or quantities or any part thereof to any food, beverage, cosmetic, drug, or other product designed for ingestion or inhalation by, or application to, a human being;

(4) Shall not include said items or quantities or any part thereof in any device, instrument, apparatus (including component parts and accessories thereto) intended for use in diagnosis, treatment or prevention of disease in human beings or animals or otherwise intended to affect the structure or any function of the body of human beings or animals.

§ 31.3 Certain devices and equipment.

A general license is hereby issued to transfer, receive, acquire, own, possess and use byproduct material incorporated in the following devices or equipment which have been manufactured, tested and labeled by the manufacturer in accordance with the specifications contained in a specific license issued to him by the Commission.

(a) *Static elimination device.* Devices designed for use as static eliminators which contain, as a sealed source or sources, byproduct material consisting of a total of not more than 500 microcuries of polonium 210 per device.

(b) *Spark gap and electronic tubes.* Spark gap tubes and electronic tubes which contain byproduct material consisting of not more than 5 microcuries per tube of cesium 137, or nickel 63, or krypton 85 gas, or not more than one microcurie per tube of cobalt 60.

(c) *Light meter.* Devices designed for use in measuring or determining light intensity which contain, as a sealed source or sources, byproduct material consisting of a total of not more than 200 microcuries of strontium 90 per device.

(d) *Ion generating tube.* Devices designed for ionization of air which contain, as a sealed source or sources, byproduct material consisting of a total of not more than 500 microcuries of polonium 210 per device or of a total of not more than 50 millicuries of hydrogen 3 (tritium) per device.

§ 31.4 Certain quantities of byproduct material.

A general license is hereby issued to transfer, receive, acquire, own, possess, use and import the quantities of byproduct material listed in § 31.100, Schedule A, provided that no person shall at any one time possess or use, pursuant to the general licensing provisions of this section, more than a total of ten such scheduled quantities.

§ 31.5 Certain measuring, gauging or controlling devices.

(a) Subject to the provisions of this section, a general license is hereby issued to own, receive, acquire, possess and use byproduct material when contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

(b) The general license contained in this section applies only to devices which have been:

(1) Manufactured in accordance with the specifications contained in a specific license issued by the Commission to the manufacturer of the device pursuant to § 32.51 of this chapter, or in accordance with the specifications contained in a specific license issued to the manufacturer by an agreement State which authorizes the manufacture of the device for distribution to persons generally licensed by the agreement State; and

(2) Installed on the premises of the general licensee by a person authorized to install such devices under a specific license issued to the installer by the Commission pursuant to Parts 30 and 32 of this chapter or by an agreement State, if a label affixed to the devices at the time of receipt states that installation by a specific licensee is required. The requirement of this subparagraph (2) does not apply while devices are held in storage in the original shipping container pending installation by a specific licensee.

30 FR 10947

(c) The general license contained in this section applies only to devices which (1) are labeled in accordance with the provisions of the specific license which authorizes the distribution of the device to general licensees, and (2) bear a label containing the following or a substantially similar statement which contains the information called for in the following statement:[1]

> The receipt, possession, use, and transfer of this device, Model *_____, Serial No.* _____, are subject to a general license or the equivalent and the regulations of the U.S. AEC or of a State with which the AEC has entered into an agreement for the exercise of regulatory authority. Removal of this label is prohibited.
>
> CAUTION—RADIOACTIVE MATERIAL
>
> _____
> (Name of supplier)*
>
> *The model, serial number, and name of supplier may be omitted from this label provided they are elsewhere specified in labeling affixed to the device.

(d) Persons who own, receive, acquire, possess or use a device pursuant to the general license contained in this section:

30 FR 8185

(1) Shall not transfer, abandon or dispose of the device except by transfer to a person authorized by a specific license from the Commission or an agreement State to receive such device and shall furnish to the Director of the appropriate Atomic Energy Commission Regional Compliance Office listed in Appendix "D" of Part 20 of this chapter, "Standards for Protection Against Radiation", within 30 days after any trans-

[1] Attention is directed particularly to the provisions of the regulations in Part 20 of this chapter which relate to the labeling of containers.

[1] Devices generally licensed under this section acquired prior to July 1, 1966, may bear labels authorized by the regulations in effect on Jan. 1, 1965.

fer, a report containing the name of the manufacturer of the device, the type of device, the manufacturer's serial number of the device, and the name and address of the person receiving the device;

• (2) Shall assure that all labels affixed to the device at the time of receipt and bearing a statement that removal of the label is prohibited are maintained thereon and shall comply with all instructions contained in such labels;

(3) Shall have the device tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at the time of installation of the device or replacement of the byproduct material on the premises of the general licensee and thereafter at no longer than six-month intervals or at such longer intervals not to exceed three years as are specified in the label required by § 31.5(c); provided that devices containing only krypton need not be tested for leakage, and devices containing only tritium need not be tested for any purpose;

(4) Shall have the tests required by subparagraph (3) of this paragraph and all other services involving the radioactive material, its shielding and containment, performed by the supplier or other person holding a specific license from the Commission or an agreement State to manufacture, install or service such devices;

(5) Shall, within 30 days after the occurrence of a failure of or damage to the shielding of the radioactive material or the on-off mechanism or indicator or upon the detection of 0.005 microcurie or more of removable radioactive material, furnish to the Director of the appropriate Atomic Energy Commission Regional Compliance Office listed in Appendix "D" of Part 20 of this chapter, "Standards for Protection Against Radiation", a report containing the name of the manufacturer of the device, the type of device, the manufacturer's serial number of the device and a brief description of the event and the remedial action taken; and shall maintain records of all tests performed on the devices as required under this section, including the dates and results of the tests and the names of the persons conducting the tests;

(6) Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding or containment of the radioactive material or the on-off mechanism or indicator, shall immediately suspend operation of the device until it has been repaired by the supplier or other person holding a specific license from the Commission or an agreement State to manufacture, install or service such devices, or disposed of by transfer to a person authorized to receive the byproduct material contained in the device; and

(7) Shall be exempt from the requirements of Part 20 of this chapter, except that such persons shall comply with the provisions of §§ 20.402 and 20.403 of this chapter.

(e) Persons who possess byproduct material pursuant to this general license shall not export such byproduct material without a specific license from the Commission authorizing such export.

§ 31.6 General license to install devices generally licensed in § 31.5.

Any person who holds a specific license issued by an agreement State authorizing the holder to manufacture, install or service a device described in § 31.5 within such agreement State is hereby granted a general license to install and service such device in any non-agreement State; *Provided*, That:

(a) Such person shall file a report with the Director, Division of Materials Licensing, U.S. Atomic Energy Commission, Washington, D.C., 20545, within 30 days after the end of each calendar quarter in which any device is transferred or installed. Each such report shall identify each general licensee under § 31.5 by name and address, the type of device transferred, and the quantity and type of byproduct material contained in the device.

(b) The device has been manufactured, labeled, installed, and serviced in accordance with applicable provisions of the specific license issued to such person by the agreement State.

• (c) Such person assures that any labels required to be affixed to the device under regulations of the agreement State which licensed manufacture of the device bear a statement that removal of the label is prohibited.

(d) Such person shall furnish to each general licensee to whom he transfers such device or on whose premises he installs such device a copy of the general license contained in § 31.5.

§ 31.7 Luminous safety devices for use in aircraft. **

(a) A general license is hereby issued to own, receive, acquire, possess, and use tritium or promethium 147 contained in luminous safety devices for use in aircraft, provided each device contains not more than 10 curies of tritium or 100 millicuries of promethium 147 and that each device has been manufactured, assembled or imported in accordance with a license issued under the provisions of § 32.53 of this chapter or manufactured or assembled in accordance with a specific license issued by an agreement State which authorizes manufacture or assembly of the device for distribution to persons generally licensed by the agreement State.

(b) Persons who own, receive, acquire, possess or use luminous safety devices pursuant to the general license in this section are exempt from the requirements of Part 20 of this chapter, except that they shall comply with the provisions of §§ 20.402 and 20.403 of this chapter.

(c) This general license does not authorize the manufacture, assembly, repair or import of luminous safety devices containing tritium or promethium 147.

(d) This general license does not authorize the export of luminous safety devices containing tritium or promethium 147 except in accordance with the provisions of Part 36 of this chapter.

(e) This general license does not authorize the ownership, receipt, acquisition, possession or use of promethium 147 contained in instrument dials.

§ 31.8 Americium 241 in the form of calibration or reference sources.

(a) A general license is hereby issued to those persons listed below to own, receive, acquire, possess, use and transfer, in accordance with the provisions of paragraphs (b) and (c) of this section, americium 241 in the form of calibration or reference sources:

(1) Any person in a non-agreement State who holds a specific license issued by the Commission which authorizes him to receive, possess, use and transfer byproduct material, source material, or special nuclear material; and

(2) Any Government agency, as defined in § 30.4(g) of this chapter, which holds a specific license issued by the Commission which authorizes it to receive, possess, use and transfer byproduct material, source material, or special nuclear material.

(b) The general license in paragraph (a) of this section applies only to calibration or reference sources which have been manufactured in accordance with the specifications contained in a specific license issued by the Commission to the manufacturer or importer of the sources pursuant to § 32.57 of this chapter or in accordance with the specifications contained in a specific license issued to the manufacturer by an agreement State which authorizes manufacture of the sources for distribution to persons generally licensed by the agreement State.

(c) The general license in paragraph (a) of this section is subject to the provisions of §§ 30.14(d), 30.34 (a) to (e), and 30.51 to 30.63 of this chapter, and to the provisions of Part 20 of this chapter. In addition, persons who own, receive, acquire, possess, use and transfer one or more calibration or reference sources pursuant to this general license:

(1) Shall not possess at any one time, at any one location of storage or use, more than 5 microcuries of americium 241 in such sources;

(2) Shall not receive, possess, use or transfer such source unless the source, or the storage container, bears a label which includes the following statement or a substantially similar statement which contains the information called for in the following statement:

The receipt, possession, use and transfer of this source, Model ------, Serial No. ------, are subject to a general license and the regulations of the United States Atomic Energy Commission or of a State with which the Commission has entered into an agreement for the exercise of regulatory authority. Do not remove this label.

CAUTION — RADIOACTIVE MATERIAL — THIS SOURCE CONTAINS AMERICIUM 241. DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE.

(Name of manufacturer or importer)

(3) Shall not transfer, abandon, or dispose of such source except by transfer to a person authorized by a license from the Commission or an agreement State to receive the source.

(4) Shall store such source, except when the source is being used, in a closed container adequately designed and con-

30 FR 8185

• 30 FR 10947

** Revised 32 FR 7247

structed to contain americium 241 which might otherwise escape during storage.

(5) Shall not use such source for any purpose other than the calibration of radiation detectors or the standardization of other sources.

(d) This general license does not authorize the manufacture or import of calibration or reference sources containing americium 241.

(e) This general license does not authorize the export of calibration or reference sources containing americium 241.

30 FR 8185

§ 31.9 General license to own byproduct material.

A general license is hereby issued to own byproduct material without regard to quantity. Notwithstanding any other provision of this chapter, a general licensee under this paragraph is not authorized to manufacture, produce, transfer, receive, possess, use, import or export byproduct material, except as authorized in a specific license.

§ 31.10 General license for strontium 90 in ice detection devices.

(a) A general license is hereby issued to own, receive, acquire, possess, use, and transfer strontium 90 contained in ice detection devices, provided each device contains not more than fifty microcuries of strontium 90 and each device has been manufactured or imported in accordance with the specifications contained in a license issued by the Commission pursuant to § 32.61 of this chapter or in accordance with the specifications contained in a specific license issued to the manufacturer by an agreement State which authorizes manufacture of the ice detection devices for distribution to persons generally licensed by the agreement State.

(b) Persons who own, receive, acquire, possess, use, or transfer strontium 90 contained in ice detection devices pursuant to the general license in paragraph (a) of this section:

30 FR 9904

(1) Shall, upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating, to the device, discontinue use of the device until it has been inspected, tested for leakage and repaired by a person holding a specific license from the Commission or an agreement State to manufacture or service such devices; or shall dispose of the device pursuant to the provisions of § 20.301 of this chapter;

(2) Shall assure that all labels affixed to the device at the time of receipt, and which bear a statement which prohibits removal of the labels, are maintained thereon;

(3) Are exempt from the requirements of Part 20 of this chapter except that such persons shall comply with the provisions of §§ 20.301, 20.402, and 20.403 of this chapter.

(c) This general license does not authorize the manufacture, assembly, disassembly, repair, or import of strontium 90 in ice detection devices.

30 FR 8185

SCHEDULES

§ 31.100 Schedule A—Generally licensed quantities.

The following quantities of byproduct material are generally licensed pursuant to § 31.4.

Byproduct material	Column No. I Not as a sealed source (microcuries)	Column No. II As a sealed source (microcuries)
Antimony (Sb 124)	1	10
Arsenic 76 (As 76)	10	10
Arsenic 77 (As 77)	10	10
Barium 140—Lanthanum 140 (Ba-La 140)	1	10
Beryllium (Be 7)	50	50
Cadmium 109—Silver 109 (CdAg 109)	10	10
Calcium 45 (Ca 45)	10	10
Carbon 14 (C14)	50	50
Cerium 144 — Praseodymium (CePr 144)	1	10
Cesium—Barium 137 (CsBa 137)	1	10
Chlorine 36 (Cl 36)	1	10
Chromium 51 (Cr 51)	50	50
Cobalt 60 (Co 60)	1	10
Copper 64 (Cu 64)	50	50
Europium 154 (Eu 154)	1	10
Fluorine 18	50	50
Gallium 72 (Ga 72)	10	10
Germanium 71 (Ge 71)	50	50
Gold 198 (Au 198)	10	10
Gold 199 (Au 199)	10	10
Hydrogen 3 (Tritium)(H 3)	250	250
Indium 114 (In 114)	1	10
Iodine 131 (I 131)	10	10
Iridium 192 (Ir 192)	10	10
Iron 55 (Fe 55)	50	50
Iron 59 (Fe 59)	1	10
Lanthanum 140 (La 140)	10	10
Manganese 52 (Mn 52)	1	10
Manganese 56 (Mn 56)	50	50
Molybdenum 99 (Mo 99)	10	10
Nickel 59 (Ni 59)	1	10
Nickel 63 (Ni 63)	1	10
Niobium 95 (Nb 95)	10	10
Palladium 109 (Pd 109)	10	10
Palladium 103—Rhodium 103 (Pd-Rh 103)	50	50
Phosphorus 32 (P 32)	10	10
Polonium 210 (Po 210)	0.1	1
Potassium 42 (K-42)	10	10
Praseodymium 143 (Pr 143)	10	10
Promethium 147 (Pm 147)	10	10
Rhenium 186 (Re 186)	10	10
Rhodium 105 (Rh 105)	10	10
Rubidium 86 (Rb 86)	10	10
Ruthenium 106—Rhodium 106 (RuRh 106)	1	10
Samarium 153 (Sm 153)	10	10
Scandium 46 (Sc 46)	1	10
Silver 105 (Ag 105)	1	10
Silver 111 (Ag 111)	10	10
Sodium 22 (Na 22)	10	10
Sodium 24 (Na 24)	10	10
Strontium 89 (Sr 89)	1	10
Strontium 90—Yttrium 90 (SrY)	0.1	1
Sulfur 35 (S 35)	50	50
Tantalum 182 (Ta 182)	10	10
Technetium 96 (Tc 96)	1	10
Technetium 99 (Tc 99)	1	10
Tellurium 127 (Te 127)	10	10
Tellurium 129 (Te 129)	1	10
Thallium 204 (Tl 204)	50	50
Tin 113 (Sn 113)	10	10
Tungsten 185 (W 185)	10	10
Vanadium 48 (V 48)	1	10
Yttrium 90 (Y 90)	1	10
Yttrium 91 (Y 91)	1	10
Zinc 65 (Zn 65)	10	10
Beta and/or Gamma emitting byproduct material not listed above.	1	10

CROSS REFERENCE TABLE

New section	*Old section*
31.1	New
31.2	30.21(b)
31.3	30.21(a)(1), 30.71
31.4	30.21(a)(2)
31.5	30.21(c)(1)–(5)
31.6	30.21(c)(6)
31.7	30.21(d)
31.8	30.21(e)
31.9	30.21(f)
31.100	30.72

PROCEDURES AND REGULATIONS FOR THE CARE AND USE OF THE OCD CD V-778 RADIATION TRAINING SOURCE SET*

A.1 Only those source handling and maintenance techniques which are directly related to the specific handling of the Office of Civil Defense CD V-778 Radiation Training Source Sets will be discussed in this publication. These will include information on the equipment in the Sets; preparation and activity of the sealed sources; Atomic Energy Commission and Office of Civil Defense rules and regulations governing the receipt, use, storage, and transfer of the Sets; and instructions for the replacement of rings and tags, and for leak testing the sealed sources. This publication supersedes Procedures and Regulations for the Care and Use of OCD Training Source Sets, published October 1, 1961.

EQUIPMENT

A.2 The OCD CD V-778 Radiation Training Source Set consists of the following items:

- 6 5.0 mc Cobalt 60 Sealed Sources totaling 30 mc (CD V-784)
- or
- 12 0.5-5.0 mc Cobalt 60 Sealed Sources totaling 30 mc (CD V-786)
- 1 Lead Container, small (CD V-791)
- 1 Lead Container, medium (CD V-792)
- 2 Locks for Lead Container (CD V-792)
- 1 Long-Handled Tongs for Handling Sources (CD V-788)
- 8 Radiation Area Signs
- 2 0-200 mr Dosimeters (CD V-138)
- 1 Dosimeter Charger (CD V-750)
- 1 Geiger Counter (CD V-700)

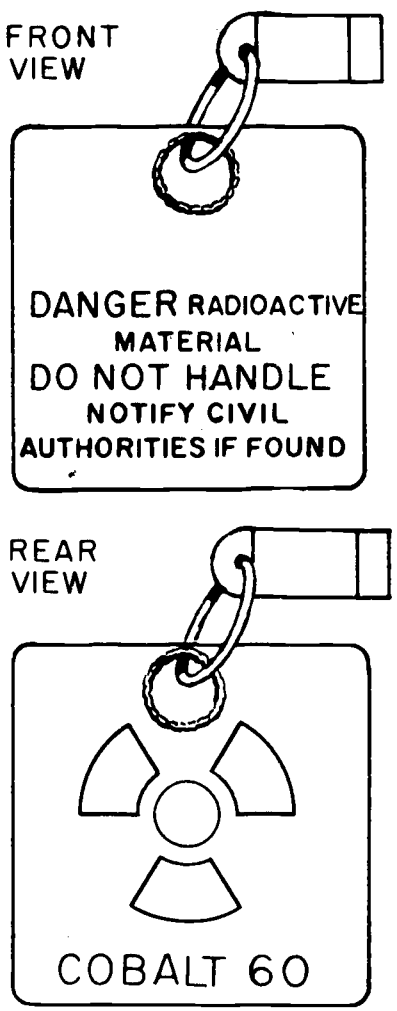
A.3 This Training Source Set has been designed specifically for use in training exercises and is not intended as an accurate calibration source. You will note that two different training source sets have been procured by OCD which differ only in the number and activity of the individual sealed sources. In this publication, reference will be made to the CD V-784 and CD V-786 to distinguish between the two sets. ISSUANCE OF A PARTICULAR SET WILL BE AT THE DISCRETION OF OCD.

*Available separately as TM-67-1.

PREPARATION OF THE SEALED SOURCES

A.4 Any radioactive material that is encased in, and is to be used in, a container in a manner intended to prevent leakage of the radioactive material, or any of its daughter products, is referred to as a sealed source. The sources in the OCD Training Source Set are of such a nature. The radioactive material is Cobalt 60, which was prepared by the neutron irradiation of Cobalt 59 in a nuclear reactor.

$$_{27}Co^{59} + {}_{0}n^{1} \longrightarrow {}_{27}Co^{60}$$



An OCD Sealed Source

A.5 The Cobalt 60 decays with a 5.3-year half-life by beta and gamma emission to Nickel 60.

$$_{27}Co^{60} \xrightarrow{(5.3\ yrs.)} {}_{-1}\beta^{0}(.32\ Mev) + {}_{28}Ni^{60} + 2\gamma's(1.17 + 1.33\ Mev)$$

A.6 The Cobalt 60 is gold or nickel plated and is encapsulated in a standard Oak Ridge screw-type capsule. The CD V–784 capsules have a nonmagnetic stainless steel base with a magnetic noncorrosive stainless-steel screw-type cap. The CD V–786 capsules are brass. As a minimum, the cap is sealed to the base of each capsule with silver solder having a melting point of 1,100° F or above. Each capsule has an approximately 1-inch-square yellow warning tag attached to it.

ACTIVITY OF TRAINING SOURCE SETS

A.7 Each of the six CD V–784 sealed sources was 5 millicuries plus 20% or minus 10% on the date of encapsulation. This date and activity is marked on the tag attached to each source. As indicated in the following example, the table below can be used to compute the total activity of the set or the activity of an individual capsule at any time after encapsulation.

Example:

What will be the activity of one of the 5 millicurie sealed sources (CD V–784) and the total activity of the Set 19 months after the date of encapsulation?

Source activity on date of encapsulation	=5 millicuries
Elapsed time	=19 months
Decay correction factor from table below	=0.812
Source activity 19 months after encapsulation	=0.812×5=4.06 =4.1 mc+20%−10%
Total activity of the CD V–784 Set	=6 capsules × 4.1 mc/capsule =24.6 mc + 20% −10%

Table of Decay Correction Factors for Cobalt 60

Months	0	1	2	3	4	5	6	7	8	9
0	1.000	0.9891	0.9783	0.9676	0.9571	0.9467	0.9363	0.9262	0.9160	0.9061
10	.8962	.8864	.8768	.8673	.8578	.8484	.8391	.8300	.8209	.8120
20	.8032	.7944	.7858	.7772	.7687	.7603	.7520	.7439	.7357	.7277
30	.7198	.7120	.7042	.6965	.6889	.6814	.6739	.6666	.6594	.6521
40	.6451	.6380	.6311	.6242	.6174	.6107	.6040	.5974	.5909	.5844
50	.5781	.5718	.5655	.5594	.5533	.5473	.5413	.5354	.5296	.5238
60	.5181	.5124	.5068	.5013	.4958	.4905	.4851	.4798	.4746	.4694
70	.4643	.4592	.4540	.4493	.4444	.4396	.4347	.4300	.4253	.4207
80	.4161	.4116	.4071	.4026	.3982	.3939	.3896	.3854	.3812	.3770

A.8 The CD V–786 sealed sources were procured in January 1956, and at that time each Set was 30 millicuries ±25%. Present activity of a CD V–786 Set can be computed from the table above, as indicated in the following example.

Example

What was the total activity of a CD V–786 Training Source Set in January 1960?

Elapsed time	=48 months
Decay correction factor from table above	=0.591
Activity in January 1960 =30 mc×0.591	=17.7 mc±25%

A.9 The individual sources in the CD V–786 Sets are not calibrated. However, they can be calibrated using the CD V–138, 0–200 mr dosimeters. For the calibration range, select a point and lay out a circle with a radius of 1 to 2 feet. This point should be in a large open area to minimize the contribution from

scattered radiation. Zero the two CD V–138 dosimeters which are component parts of the Set, and several additional CD V–138's if they are available. Check all dosimeters for leakage. Locate the lead container with the sources at such a distance from the calibration range that they will not affect the dosimeter readings. Place the dosimeters in an upright position on the circle. Make certain that nothing shields the dosimeters from the source. Place one source in position and expose the dosimeters for as long as necessary to obtain at least a 50 mr exposure. The time will vary depending on the size of the source. Compute the activity of the source as indicated in the following example. Remember to keep radiation exposures of individuals to a minimum. All calculations should be done before the sources are used in training, or after they have been returned to the storage area.

Example

Average reading of dosimeters placed at 1 foot for 1.5 hours=96 mr

Dose rate (mr/hr)

$$=\frac{\text{Dosimeter reading (mr)}}{\text{Time (hr)}}=\frac{96\text{ mr}}{1.5\text{ hr}}$$

$=64$ mr/hr

Calibration formula

$$\text{dose rate (mr/hr)}=\frac{13.2\times \text{Co}^{60}\text{ activity (mc)}}{\text{distance}^2\text{ (ft)}}$$

$$64\text{ mr/hr}=\frac{(13.2)\ (\text{Co}^{60}\text{ activity})}{(1)^2}$$

$$\text{Co}^{60}\text{ activity}=\frac{(64)\ (1)}{(13.2)}$$

$$\text{Co}^{60}\text{ activity}=4.9\text{ mc}$$

A.10 Once a source is calibrated, it should be marked to indicate its activity, and the date of calibration should be recorded. A grease pencil or paint can be used to mark the activity on the yellow warning tags attached to the CD V–786 sources. Mark the source very quickly to keep your exposure to a minimum. The activity of each source at a later date can be determined as outlined in paragraph A.7.

PROCEDURES FOR INITIAL CHECK ON RECEIPT OF AN OCD TRAINING SOURCE SET

A.11 The transportation of radioactive materials moving in interstate commerce by rail, water, or by public highway (except in U.S. mail), is regulated by the Interstate Commerce Commission, and some States extend the ICC regulations to intrastate transportation. In addition, local authorities may impose additional limitations on the transportation of radioactive materials, as in the case of their movement through tunnels or within port areas. (See par. A.49 and A.50.)

A.12 The OCD Training Source Sets are normally shipped to the licensed custodian by motor freight or railway express, with the auxiliary equipment being packed separately from the lead containers. The keys to the Sets are sent to the licensee by registered mail, return receipt requested. The step-by-step procedure listed below should be followed when a Training Source Set is received by a licensee from OCD or on permanent transfer from another licensee. *The licensee must wear a CD V–138 dosimeter at all times when the Training Source Set is being used, checked, or repaired. Remember to keep radiation exposures to a minimum.*

a. Check to see that each of the lead containers, CD V–791 and CD V–792, bears a label including the following information: radioisotope, number of sealed sources, total activity of the sources, and the date of encapsulation, or date of last calibration.

b. Count the number of sealed sources, and place them on disposable paper. The CD V–784 Set should contain six sources. The CD V–786 Set should contain 12 sources. If the Set is issued directly from OCD, any discrepancy should be noted on Form DD 1149–2, Requisition and Invoice/Shipping Document (EAM). If the Set is permanently transferred from another licensee, the new custodian should note any discrepancies on the letter of receipt furnished OCD. (See par. A.45.) In both cases, the custodian should also advise the State of any discrepancy.

c. Leak test each sealed source in accordance with the instructions, beginning with

paragraph A.13. Record the results of the initial leak test and keep them on file. Each sealed source must be leak tested every 6 months from the date of the initial test.

d. Replace rings or tags on any sealed source which is not properly ringed or tagged. Replace rings and/or tags in accordance with the instructions beginning with paragraph A.21.

e. Return the sources to the lead containers, and place the OCD Training Source Set in the authorized storage area.

LEAK TESTING PROCEDURES FOR OCD TRAINING SOURCE SETS

A.13 Immediately upon receipt and thereafter at intervals not to exceed every 6 months, each recipient of an OCD Training Source Set, in accordance with a condition on his byproduct material license, is responsible for performing the following test for external leakage, and/or contamination of individual sources. Records of leak tests must be maintained by the licensee.

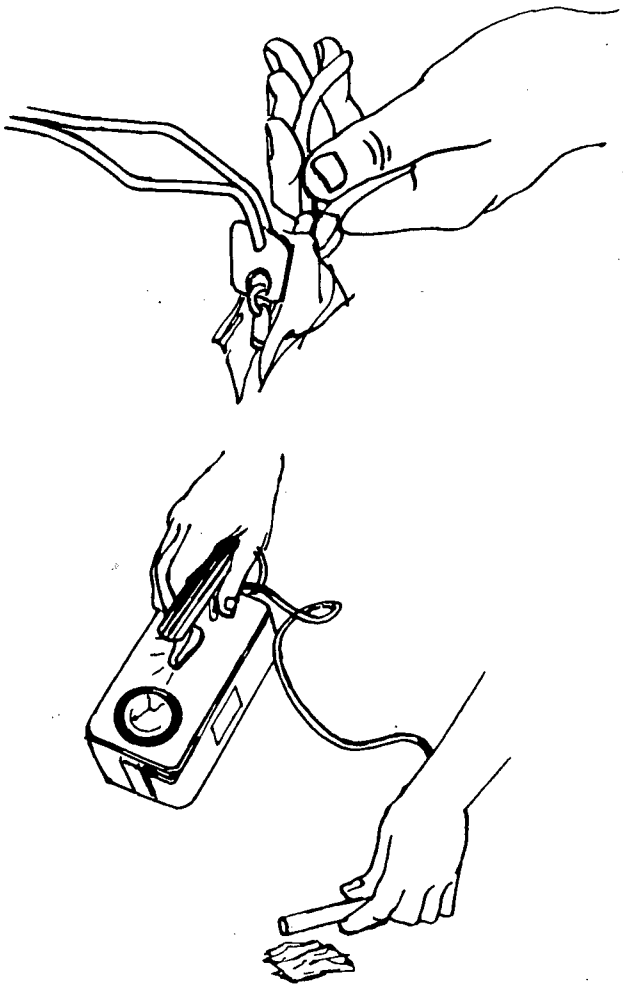
A.14 Remove the CD V–791 lead container from the CD V–792 lead container. Moisten a piece of paper which has a high wet strength, such as filter paper or a paper towel, and wipe the inside of the CD V–792 lead container.

A.15 Using a CD V–700 Geiger counter, with the shield open, the earphones attached, the range set to the most sensitive scale (X1), and the window as close as possible to, but not in contact with, the filter paper or paper towel, thoroughly monitor the paper. Since gamma radiation is of primary interest, the filter paper can be measured while wet. A careful check of the background radiation should be made prior to monitoring the paper. Care should be taken that the monitoring is performed at a distance from the sealed sources where they do not affect the CD V–700 natural background readings during the monitoring operation.

A.16 Any average reading of the CD V–700 above normal background must be attributed to contamination. Do not be concerned with an apparent momentary slight increase in the counting rate of the paper as the variation in normal background and meter deflections may cause this.

A.17 If the test reveals any removable radioactive material, the licensee must take immediate action to prevent the spread of contamination. The sources and the contaminated filter paper must be placed in the lead container, and the licensee must immediately notify the Radef officer in his OCD region. The entire Set must be kept secure and locked pending disposition instructions. In accordance with the leak test condition on his license, the licensee must also notify the AEC of the leaking capsules within 30 days after the completion of the test.

A.18 If the CD V–792 shows no evidence of radioactive contamination, remove one of the sealed sources from the CD V–791 container, using the 18-inch handling tongs (CD V–788). Using the tongs and/or pliers, so the licensee's



Leak Testing of Sealed Sources

hands will not come close to or in contact with the source, wrap and wipe each individual source on a piece of the high wet strength paper which has been moistened with water. Sufficient pressure to effect a thorough removal of any contamination should be applied. A separate paper should be used for each source.

A.19 Remove the sealed source from the paper, and place it on disposable paper. Using the CD V–700, thoroughly monitor the paper to determine if the source is leaking or contaminated. Any average reading of the CD V–700 above normal background must be attributed to leakage and/or contamination. As the test for each capsule is completed, place the capsule in the CD V–792 lead container until all capsules have been tested. This will further reduce exposure doses.

A.20 Leak test each source and wipe test the CD V–791 small lead container in the same manner as the CD V–792. If the leak test results are negative, return the sources to the CD V–791 small lead container, and place the Set in its normal storage location.

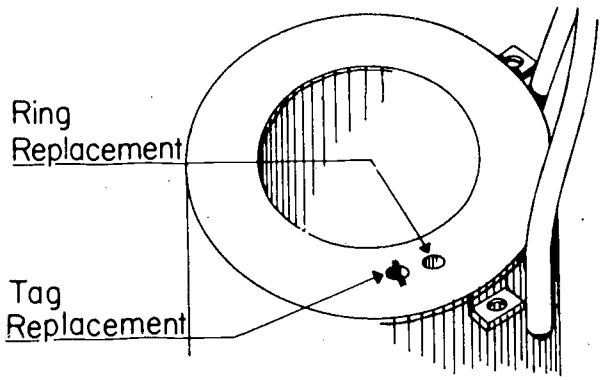
REPLACEMENT OF RINGS AND TAGS ON SEALED SOURCES

A.21 A second condition on byproduct material licenses issued to civil defense organizations or personnel requires the replacement of the one inch yellow warning tag and/or ring attached to each source, should they become detached through usage or accident. It is the responsibility of the licensed custodian of the Training Source Set to replace the rings and tags in accordance with the following instructions. New tags and rings and new radiation area signs may be obtained from—

Defense General Supply Center
Civil Defense Supply Division
Richmond, Va. 23212

A.22 The CD V–792 lead container housing the CD V–784 sources is equipped with special holes for the replacement of tags and rings. See the following illustration.

A.23 The CD V–792 lead container housing the CD V–786 sources does not provide similar holes. Therefore, the licensee must prepare them. Using an ordinary power drill, make a 1-inch-deep ⅜-inch hole in the top of the CD V–792. The hole should be placed about one-half inch from the inside rim. With a screwdriver, make a small slot on each side of the hole to accommodate the metal ring on the source. This hole is for the replacement of tags and will allow you to work on the ring in an upright position. (NOTE.—The slot should not be so deep that it hinders the separation of the ring in replacing the tag.)



Location of Tag and Ring Replacement Holes in the CD V–792

A.24 A second hole ⅜-inch deep and ⅜-inch in diameter should be drilled adjacent to the tag replacement hole. This second hole will hold the source in an upright position, yet will expose the hole in the source which accommodates the ring. The slots on the tag replacement hole will distinguish it from the ring replacement hole.

A.25 Tags should be replaced in accordance with the following step-by-step procedure:

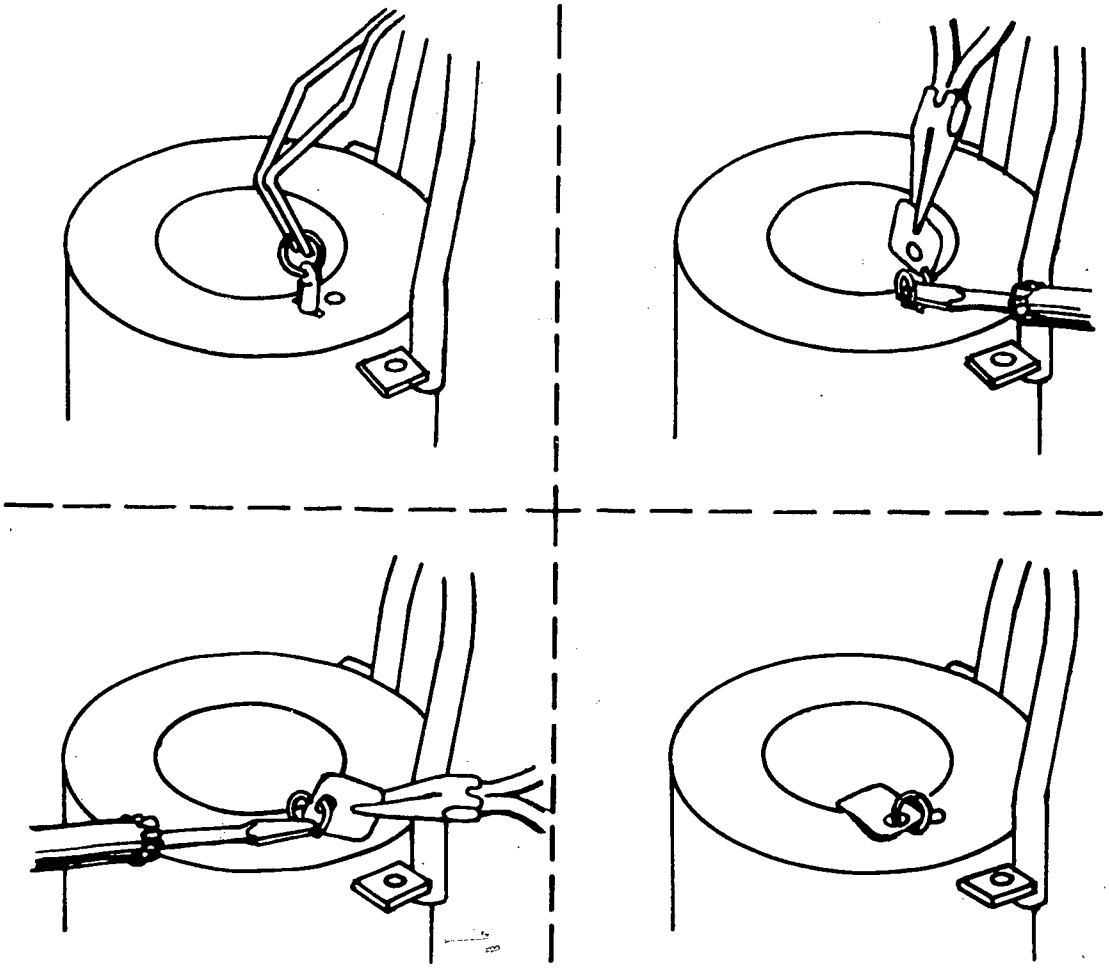
a. Place the CD V–792 on a table strong enough to support it. In this position you will be able to work on the sealed source and keep your radiation exposure to a minimum.

b. Place the screwdriver, long-nosed pliers, and new tag on the table where they can be easily and quickly reached when needed.

c. Place the untagged source in the proper hole with the aid of the 18-inch handling tongs. Make certain that the separation portion of the ring is at the top. Make no attempt to remove any portion of the old tag from the sealed source.

d. With the source and ring in position, insert the blade of the screwdriver into one end of the separation portion of the ring.

e. Place the new tag on the ring with the aid of the long-nosed pliers.



Replacement of Tags

f. Remove the screwdriver and with the long-nosed pliers carefully slide the tag along the separation portion until it is permanently attached to the ring.

A.26 Rings should be replaced in accordance with the following step-by-step procedure.

a. Place the CD V–792 on a table strong enough to support it.

b. Place the screwdriver, long-nosed pliers, tag, and ring on the table where they can be easily and quickly reached when they are needed.

c. Place the 1-inch yellow warning tag on the new ring.

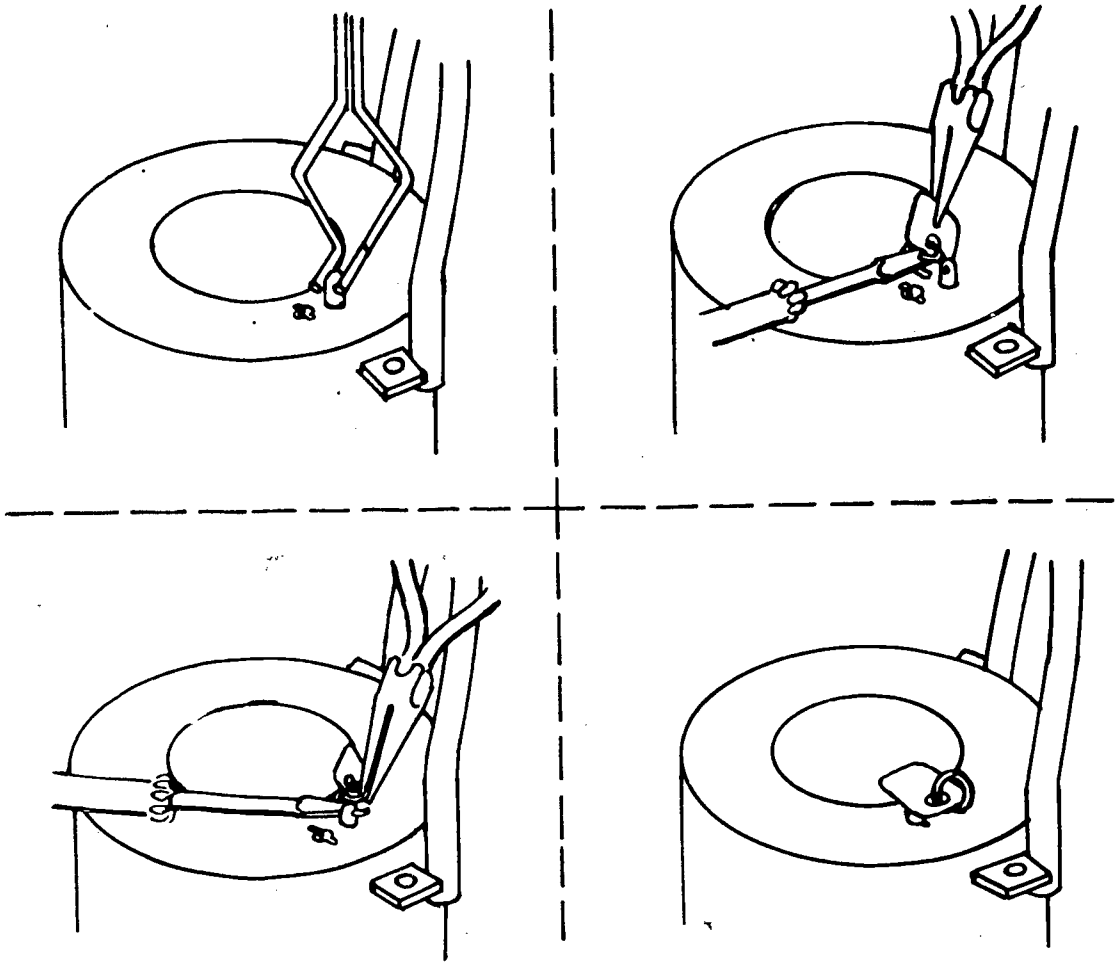
d. Using the 18-inch handling tongs, place the source without the ring into the proper hole in the CD V–792.

e. Insert the blade of the screwdriver into one end of the separation portion of the ring.

f. Insert the ring through the hole in the source.

g. Remove the screwdriver and with the long-nosed pliers carefully slide the ring through the hole until it is permanently attached to the source.

A.27 The replacement of rings and tags should be completed as quickly as possible to keep radiation exposures to a minimum. As much as possible, perform the operations at arm's length. Only the individuals whose names appear on the byproduct material license as individual users should replace either the rings or tags on the sealed sources.



Replacement of Rings

REGULATIONS GOVERNING THE USE AND STORAGE OF OCD TRAINING SOURCE SETS

A.28 An Atomic Energy Commission Byproduct Material License requires the licensee to be responsible to the AEC for the proper care, handling, and storage of the OCD Training Source Set in his custody as well as reporting to the AEC any loss, damage, or accident resulting from violations of AEC standards. The acceptance of the license binds the licensee (not OCD) to the conditions set by the AEC under which the Training Source Set is placed in his jurisdiction. These regulations are clearly outlined in Title 10, Chapter 1, Part 20, of the Code of Federal Regulations entitled, "Standards for Protection Against Radiation." A copy of these regulations (10–CFR–20) is issued to each licensee with his byproduct material license.

A.29 In addition to the AEC requirements, OCD requires each licensee possessing an OCD Training Source Set *loaned* to him through the State civil defense office to comply with additional regulations. This means the licensee is responsible to the AEC for the proper care, use, and storage of the Training Source Set but is responsible to the State which, in turn, is responsible to OCD for the property accountability of the Set. Important AEC regulations and all OCD regulations are contained in the remaining paragraphs of this section. The licensee is referred to 10–CFR–20 for the additional AEC regulations.

A.30 *Storage*—The preferred location for the storage of the Training Source Set is in a locked, unoccupied, and isolated area. Only work necessary to normal storage operations shall be performed in the storage area. Only authorized personnel shall be allowed to enter the storage area and their duration of occupancy shall be kept to a minimum. Determination of the radiation levels in the immediate storage area shall be made with a CD V–700 and the readings recorded, dated, and filed. Normally, the Set shall be stored only at those locations specifically authorized on the license. Temporary storage is permitted at other locations when training activities make it impractical to return the Set to its normal storage site after each use.

A.31 *Posting*—Each area or room in which an OCD Training Source Set is used or stored, regardless of whether it is the normal or a temporary storage area, will be considered a restricted area and shall be conspicuously posted with the radiation area signs issued with the Training Source Set. Restricted area means any area to which access is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials. Restricted area shall not include any area used as residential headquarters, although a separate room or rooms in a residential building may be set apart as a restricted area.

The following information must be posted on all entrances to the storage area: (1) radioisotopes stored, (2) number of Sets and number of sources per Set, (3) total activity and date of calibration, and (4) whom to call in case of an emergency. In addition, the standard radiation area signs which are included with the OCD Training Source Set will be posted in conspicuous places in areas where the Source Set is used or stored. Signs will be sufficient in number and placed so as to be clearly visible from any approach to the area.

A.32 *Caution Signs*—Standard radiation area signs shall include the conventional three-bladed symbol and the words, "Caution (or Danger) Radiation Area," printed in magenta on a yellow background. The signs included with the Training Source Sets meet these requirements.

A.33 *Uses*—The licensee shall use the Training Source Set for only those activities specifically authorized under item 9 of his byproduct material license. An authorized use which reads: "To be used in training of instrument operators, and for instrument calibration purposes" does *NOT* allow the licensee to use the Training Source Set for the training of radiological defense instructors.

A.34 *Supervision*—The OCD Cobalt 60 Sealed Source Set may only be used for the purposes stated in the AEC Byproduct Material License. It must be used by, or under the supervision and in the physical presence of, one of the individual users designated in the license.

A.35 *Instruction of Personnel*—Before entering a restricted area, all individuals shall be informed of the presence of radioactive materials and shall be instructed in the hazards of excessive exposure to such materials and in precautions or procedures to minimize exposure.

A.36 *Exposure of Individuals*—Under no circumstances shall the licensee use the Training Source Set in such a manner as to cause any individual in a restricted area to receive in any period of 7 consecutive days from radioactive material and other sources of radiation in the licensee's possession, a whole body gamma dose in excess of 100 mr, or a whole body gamma dose in excess of 5 r in any one year. No licensee shall use the Training Source Set in training exercises or classes involving individuals under 18 years of age.

A.37 *Personnel Monitoring Equipment*—Each licensee shall issue a CD V–138 dosimeter or an equivalent dose recording instrument to each individual entering a restricted area.

A.38 *Records*—Each licensee shall maintain records showing the radiation exposure of all individuals exposed to radiation from radioactive materials in his possession. These records shall show the name, age, date of birth, Social Security number, method of determining the dose (i.e., film badge, CD V–138 dosimeter, etc.) and the total weekly whole body gamma radiation dose of each individual. Summaries of the total whole body gamma dose for each calendar quarter, or 3-month period, and the total yearly whole body gamma dose shall be

maintained for each individual who has an exposure history which extends for a time period of 2 weeks or 14 consecutive days or more. When the exposure history of an individual exceeds 1 year, totals of the yearly accumulated whole body gamma dose and calculations of the permissible accumulated gamma dose shall also be maintained. The permissible accumulated dose to gamma radiation can be obtained from the formula,

$$PAD = 5(N-18)$$

where PAD is the permissible accumulated gamma dose in roentgens (r) and N is the age of the individual being considered in years and is greater than 18. These radiation exposure records of each individual must be preserved by the licensee until December 31, 1965, or until 5 years after the date of the last exposure of the individual to radioactive material in the custody of the licensee. Each licensee shall maintain records showing the results of surveys as required by paragraph A.30. Each licensee shall keep records showing the use, receipt, and transfer of an OCD Training Source Set. It is suggested that the licensee maintain a log of the activities involving the Set issued to him.

A.39 *Inspection*—Each licensee shall afford to the AEC and to OCD at all reasonable times opportunity to inspect the Training Source Set, the premises, and the facilities where the Set is used or stored, and shall make available for inspection, upon reasonable notice, required records kept by him.

A.40 *Inspection of Source Capsules*—When the sources are returned to their lead containers after being removed for any purpose, each source must be monitored with a CD V–700 to insure that the Co^{60} source material is contained inside each capsule. This monitoring should be performed at a distance from the other sources where the gamma radiation levels are not significantly above natural background. Each source capsule must be inspected each time the source set is used.

A.41 *Loss or Theft of Sealed Sources*—The licensee is required to report promptly to the AEC any loss or theft of radioactive material in such quantities and under such circumstances that it appears to the licensee that a substantial hazard may result to persons in unrestricted areas. However, the licensee is requested to notify the OCD Regional Radiological Defense Officer *immediately* in the event of a suspected loss or theft of a sealed source or sources or of an accident resulting from a leaking source. This will enable the Radiological Defense Officer to assist the licensee in determining whether or not a loss has occurred, in determining the seriousness of an accident, and in notification of the AEC, if required.

A.42 *Loss of Co^{60} Source Material from the Capsule*—In the event that an empty source capsule is discovered during the inspection, required by paragraph A.40, the remaining source capsules should be secured in the lead containers. After monitoring personnel in the area for possible contamination and wipe testing the outside of the CD V–792 to insure that it is not contaminated, move the sources in the lead containers out of the general area where they were in use. Using a CD V–700, monitor the entire area until the Co^{60} is located within a small area (less than 1 square foot). If the Co^{60} material, which is a small needle, can be seen with the naked eye, it should be picked up and placed in the lead container along with the other sources and the empty source capsule, using the CD V–788 handling tongs or a pair of long-handled forceps or pliers. *The Co^{60} material should not be picked up with the fingers under any circumstances, nor should any attempt be made to return the Co^{60} needle to the empty source capsule.* If the Co^{60} material is on an earth, sand, or gravel surface, it can be carefully scooped up with a shovel and placed along with the earth, etc., in the large CD V–792 container. *No attempt should be made to separate the Co^{60} needle from the extraneous material.* Once the Co^{60} material is inside the lead containers, they should be marked, sealed, and the sources treated as if they were leaking, as described in paragraph A.17.

A.43 After completing the operations described in paragraph A.42, the general area and the personnel and equipment used to pick up the Co^{60} material should again be monitored to insure that they are free of radioactive contamination. Until the Co^{60} material is found, the general area should be restricted to all personnel except those involved in the monitoring opera-

tions. If monitoring of the area fails to indicate the presence of contamination after the Co^{60} material has been located and removed, the area may be returned to unrestricted status if necessary. However, it is suggested that the area be monitored by someone qualified in the field of health physics, at the request of the licensee, prior to returning it to unrestricted use. The licensee must report the incident to the OCD Regional Radiological Defense Officer as soon as possible to request disposition and replacement of the Source Set. In accordance with the conditions of his license, the licensee must also report the incident to the AEC within 30 days.

A.44 If the Co^{60} source material cannot be located, or the presence of radioactive contamination is detected as a result of the incident, the OCD Regional Radiological Defense Officer *must* be contacted *immediately* for assistance.

A.45 *Transfer*—Temporary loan of OCD Training Source Sets to other licensees within the United States authorized to receive such material is allowed. However, if a licensee possessing an OCD Training Source Set anticipates moving from his present location to another, and, if the new location will prohibit him from exercising the required control and supervision of the Source Set, he must report this intention as soon as possible to the State civil defense office. The State office may permanently transfer the Set to another licensee with the approval of OCD or return the Set to OCD. If it is transferred to another licensee, the new custodian must furnish to the State civil defense office for transmittal to OCD: (1) a copy of his byproduct material license, and (2) a letter indicating receipt of the Training Source Set and acceptance of responsibility for it. If the Set is to be returned to OCD, the State must notify the OCD regional office and action will be initiated for the return of the Set directly from the custodian.

A.46 *Renewal of Byproduct Material Licenses*—A Training Source Set custodian must make application for renewal of his license 60 days prior to its expiration or he must notify OCD, through the State civil defense office, of his intentions not to initiate license renewal and request disposition instructions for the Set.

A.47 *Violations*—The licensee is responsible to the AEC for the proper use and storage of the Training Source Set and for compliance with 10-CFR-20, Standards for Protection Against Radiation, or 10-CFR-30, Licensing of Byproduct Material.

A.48 *Return of Sets*—All OCD Training Source Sets *loaned* to the States shall be returned to OCD when the licensee and the State desire to be relieved of the responsibility for the Sets. Arrangements for the disposition of the Source Sets should be made with the OCD Regional Office through the State civil defense office.

A.49 *Transport of Training Source Sets*—The OCD Training Source Sets may be transported to the training site in a vehicle, provided the source set is padlocked, the vehicle is locked, and the vehicle is posted on both sides and the rear with radiation signs with the statement "Dangerous—Radioactive Material" in 3-inch letters on a contrasting background. This type of sign may be obtained from some local trucker's associations. The automobile should be monitored to determine radiation levels within it, and the occupants should wear CD V-138 dosimeters to measure their exposure during transport of the Set.

A.50 *State and City Regulations*—In addition to AEC and OCD regulations, many States and cities have additional requirements which govern the use, storage, and particularly the transportation of radioactive materials. It is the licensee's responsibility to contact the appropriate State and city departments for information on such regulations.

AEC LICENSING OF OCD SOURCE SETS FOR RADIOLOGICAL MONITOR TRAINING

The Division of Materials Licensing of the Atomic Energy Commission has the responsibility for the licensing of byproduct material (radioisotopes). This means, therefore, that the AEC has the responsibility and authority to license the possession and use of any radioisotope which is produced in a nuclear reactor. The Cobalt 60 used in the sealed sources in the OCD Training Source Sets is a byproduct material and, therefore, is subject to AEC regulations. The conduct of a Radiological Monitoring Course requires that the instructor be licensed to possess and use the OCD Cobalt 60 Sealed Source Set (CD V–784).* This licensing authority has been delegated to several of the States, but their regulations have to be consistent with the USAEC regulations. For further details, see Title 10—Atomic Energy, Code of Federal Regulations, Part 150, "Exemptions and Continued Regulatory Authority in Agreement States Under Section 274."

In order to implement this licensing authority, the AEC has issued a specific regulation which sets forth the basic criteria for issuance of byproduct material licenses (Form AEC 374). This regulation is Title 10—Atomic Energy, Code of Federal Regulations, Part 30, "Rules of General Applicability to Licensing of Byproduct Material" (10 CFR 30). The USAEC rules and regulations for the safe use of radioactive material are contained in Title 10—Atomic Energy, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation" (10 CFR 20). This regulation establishes standards under which all licensed radioactive materials must be used. One of the first provisions in 10 CFR 30 is a statement of who must have a license for possession and use of byproduct material. The regulation states that no person in the United States shall acquire, possess, use or transfer byproduct material except as authorized by a license issued by the AEC.

The possession and use of any OCD Model CD V–784 Cobalt 60 Source Set requires a specific license. Specific licenses are those for which an application must be submitted to the AEC. The minimum requirements for approval of an application and issue of a license are that the applicant has (1) proposed a use authorized by the Atomic Energy Act of 1954; (2) equipment and facilities adequate to protect health and minimize danger to life or property; and (3) personnel qualified by training and experience to use the material for the proposed use in such a manner as to protect health and minimized danger to life or property. These are broad requirements and not specific for any particular type of program. Each application for a specific license must, therefore, contain complete and detailed information describing the applicant's qualifications and proposed procedures.

A problem that has been frequently encountered in the licensing program is the determination of who is responsible for the OCD Training Source Set and who should be the applicant and, subsequently, the licensee. The licensee by definition must be a legally responsible "person." A "person" is defined in 10 CFR 30 as an individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the AEC, any State or any political subdivision thereof, or any political entity within a State. Therefore, when a legally constituted sponsoring organization exists, whether a governmental agency at the State, county, city, or Federal level or a corporate organization, and the individual who will actually use the Source Set acts as an agent of the sponsoring organization, then the organization must be the licensee. The Office of Civil Defense has legal authority under section 201(h) of Public Law 920, 81st Congress, as amended, to dis-

*The CD V–784 is a set of six sealed capsules, each containing nominally 5 mc of Cobalt 60. The CD V–784, and associated containers, handling and monitoring equipment comprises the CD V–778 Training Source Set.

307-892 O - 68 - 5

tribute the Cobalt 60 Training Source Sets by loan for civil defense purposes *only* to the States. Therefore, training source sets have been loaned to State Civil Defense organizations, who in turn have made them available to localities in support of their civil defense programs.

In past years many AEC licenses have been issued to individuals who have satisfactorily completed the Radiological Monitoring for Instructors course. There have been numerous applications for individual licenses where the individual would more appropriately have been named as a "user" under a State or local Civil Defense organization license. OCD and the AEC have completed a review of the licensing of OCD Cobalt 60 Sealed Source Sets for the training of radiological monitors. Since the applicant, and subsequently, the licensee is legally responsible for the safe use and possession of the OCD Training Source Set, it is inappropriate that an individual be the licensee. It is most appropriate that each *State* Civil Defense agency have one license for the use of all training source sets for all radiological monitor training within the State.

Effective immediately, it is the joint policy of OCD and AEC not to issue or renew a byproduct material license to an individual for monitor training in a State subsequent to issuance of a license to the State Civil Defense agency for the use, possession, and storage of all OCD Cobalt 60 Sealed Source Sets.

Each person who will use the OCD sealed sources for radiological monitor training must have an understanding of the basic principles of nuclear radiation and radiation safety. Section 30.33(a)(3), Title 10 CFR, Part 30, requires only that an applicant be qualified by training and experience to use the byproduct material for the purpose requested in such a manner as to protect health and minimize danger to life and property. A person who (1) has satisfactorily completed an OCD Radiological Monitoring for Instructors course given by an authorized organization and instructor and (2) has a general background which would permit him to comprehend the subject matter presented in such a course, can generally be authorized as a user on an agency's specific license to use an OCD source set to train monitors. It is impossible to define the exact nature of the background which someone must have because definite requirements would probably restrict and hamper the radiological monitor training program. As a general guideline, a person should have a scientific/technical background that would enable him to understand the basic principles of radiation to the extent that he may be in a position to impart necessary technical information to others.

When adequate selection criteria have been established by an applicant such as the State Civil Defense agency and sufficient source handling procedures have been developed and published, the AEC will issue a specific license to the State organization that will allow it to authorize any individual that meets the stated minimum formal training and experience criteria to use a training source set for the training of monitors. Individuals by name need not be listed on the license (or application). In those States where this type of procedure is in effect, some type of "user permit" is normally issued to each individual that has a need to use, possess or store a source set.

Since the civil defense training program involves both the training of monitors and monitor instructors, OCD and the AEC differentiate between the minimal required formal training and experience for persons who will train only monitors and that required for persons who will train monitor instructors. Persons who will train instructors must have a broad background in the radiation field. Such a person must have a knowledge of radiation beyond the scope of the principles presented in the OCD Radiological Monitoring for Instructors course. Additional information regarding the minimal required formal training and experience for persons who will train monitor instructors is contained in OCD memorandum dated September 14, 1964, Subject: "Guidelines for Byproduct Material Licensing in Connection with the Conduct of the Radiological Monitoring for Instructors Course." The training of monitor instructors is conducted primarily at selected universities.

Each RMI instructor is familiar with the details of the licensing program for monitor training in his State. Additional specific information about the current details of the licensing program for training monitors in each State is to be obtained from the State Civil Defense office. Before a local Civil Defense organization

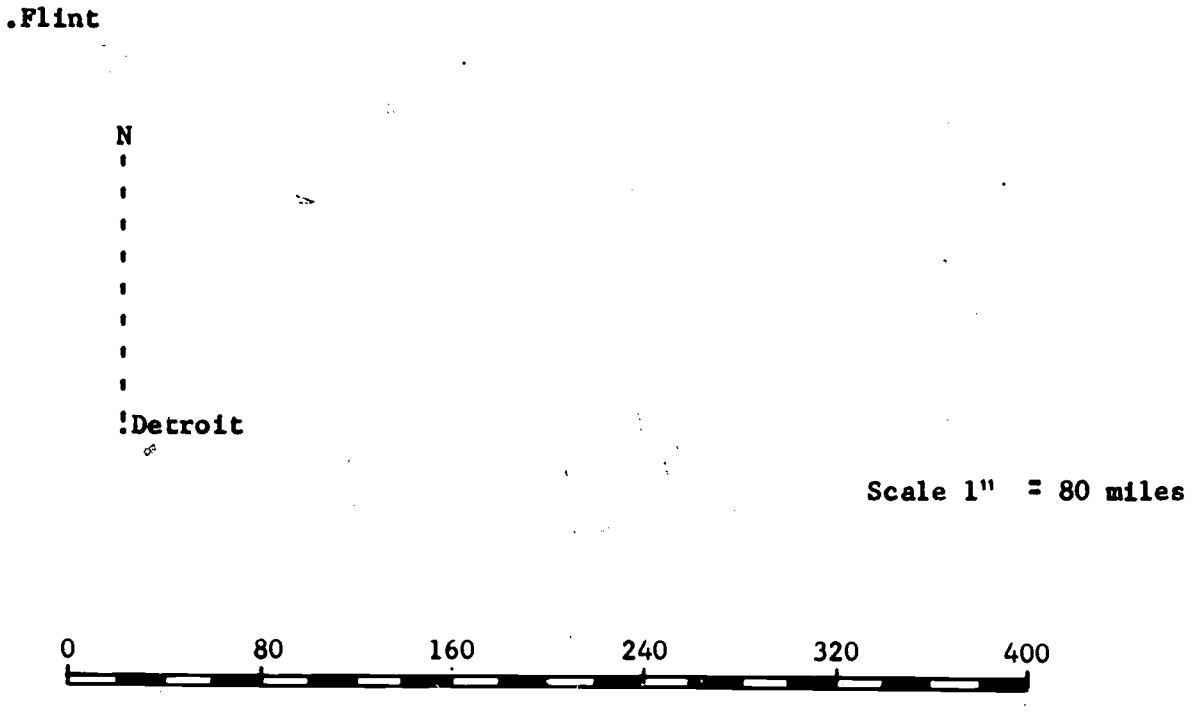
applies for a license, the State Civil Defense office should be contacted to see if they do not already have a license under which the prospective applicant is covered for any necessary use of an OCD Training Source Set. About one half of the States presently have in effect a State license and issue a user permit to qualified individuals. The remainder of the States are expected to have a State license in effect before the end of September, 1968.

DIST:
OCD Regions, Staff College.

Quiz—Fallout Forecasting

ANSWER SHEET

COURSE: Radiological Monitoring for Intructors



DATE _____ SCORE _____ NAME AND STUDENT NUMBER _____

65/66

Quiz—Use of Radiological Instruments

ANSWER SHEET

COURSE: Radiological Monitoring for Instructors

PART I—A.

Answer _____

B.

Answer _____

PART II—A. _____

B. _____

C. _____

D. _____

PART III—1. _____

2. _____

3. _____

4. _____

_____ _____ _____

DATE SCORE NAME AND STUDENT NUMBER

67/68

Quiz—Dose and Dose Rate Calculations

ANSWER SHEET

COURSE: Radiological Monitoring for Instructors

Problem 1

D =

R_i =

R_t =

D/R_i =

T_s =

T_e =

Problem 2

D =

R_i =

R_t =

D/R_i =

T_s =

T_e =

DATE _____ SCORE _____ NAME AND STUDENT NUMBER _____

69/70

Quiz—Source Handling Techniques

ANSWER SHEET

COURSE: Radiological Monitoring for Instructors

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DATE _____ SCORE _____ NAME AND STUDENT NUMBER _____

71/72

RMI COURSE EXAMINATION ANSWER SHEET

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QUIZ SCORES _____ COURSE EXAM SCORE _____ FINAL SCORE _____

_____ DATE

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73

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