

## APPLICATION FOR MATERIAL LICENSE

**INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.**

<p><b>APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:</b></p> <p>U.S. NUCLEAR REGULATORY COMMISSION          DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS          WASHINGTON, DC 20545</p> <p><b>ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS, IF YOU ARE LOCATED IN:</b></p> <p><b>CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:</b></p> <p>U.S. NUCLEAR REGULATORY COMMISSION, REGION I          NUCLEAR MATERIALS SAFETY SECTION B          601 PARK AVENUE          KING OF PRUSSIA, PA 19406</p> <p><b>ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:</b></p> <p>U.S. NUCLEAR REGULATORY COMMISSION, REGION II          NUCLEAR MATERIALS SAFETY SECTION          101 MARIETTA STREET, SUITE 2800          ATLANTA, GA 30333</p>	<p><b>IF YOU ARE LOCATED IN:</b></p> <p>ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:</p> <p>U.S. NUCLEAR REGULATORY COMMISSION, REGION III          MATERIALS LICENSING SECTION          700 ROOSEVELT ROAD          GLEN ELLYN, IL 60137</p> <p><b>ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:</b></p> <p>U.S. NUCLEAR REGULATORY COMMISSION, REGION IV          MATERIAL RADIATION PROTECTION SECTION          611 RYAN PLAZA DRIVE, SUITE 1000          ARLINGTON, TX 75011</p> <p><b>ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:</b></p> <p>U.S. NUCLEAR REGULATORY COMMISSION, REGION V          NUCLEAR MATERIALS SAFETY SECTION          1480 MARIA LANE, SUITE 210          WALNUT CREEK, CA 94698</p>
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PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

<p>1. THIS IS AN APPLICATION FOR (Check appropriate item)</p> <p><input checked="" type="checkbox"/> A. NEW LICENSE</p> <p><input type="checkbox"/> B. AMENDMENT TO LICENSE NUMBER _____</p> <p><input type="checkbox"/> C. RENEWAL OF LICENSE NUMBER _____</p>	<p>2. NAME AND MAILING ADDRESS OF APPLICANT (Include Zip Code)</p> <p>Blackhawk Engineering, Inc.          1036 East 38th Place          Tulsa, Oklahoma 74105</p>
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3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED.

Sources and devices containing licensed material will be permanently stored at the address listed in item 2. Operations will be conducted at temporary jobsites in Oklahoma and other states subject to the NRC's regulatory authority.

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION	TELEPHONE NUMBER
M. S. Hollingsworth	918/745-0502

SUBMIT ITEMS 6 THROUGH 11 ON 8 1/2 x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE

<p>5. RADIOACTIVE MATERIAL  <small>a. Element and mass number, b. chemical end/or physical form, and c. maximum amount which will be possessed at any one time.</small></p>	<p>6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.</p>				
<p>7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.</p>	<p>8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.</p>				
<p>9. FACILITIES AND EQUIPMENT.</p>	<p>10. RADIATION SAFETY PROGRAM.</p>				
<p>11. WASTE MANAGEMENT.</p>	<p>2. LICENSEE FEES (See 10 CFR 170 and Section 170.31)</p> <table style="width: 100%;"> <tr> <td style="width: 70%;">FEE CATEGORY</td> <td style="width: 30%;">AMOUNT ENCLOSED \$</td> </tr> <tr> <td>3P</td> <td>230.00</td> </tr> </table>	FEE CATEGORY	AMOUNT ENCLOSED \$	3P	230.00
FEE CATEGORY	AMOUNT ENCLOSED \$				
3P	230.00				

13. CERTIFICATION. (Must be completed by applicant) THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE—CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
	Maria S. Hollingsworth	President	7/3/89

9001160314 890822  
 REG4 LIC30  
 35-26996-01 PDR

**FOR NRC USE ONLY**

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
App	Jul-5-89	3P		M. M...
AMOUNT RECEIVED	CHECK NUMBER			DATE
\$230	618			7/27/89

5/6. Radioactive Material and Purpose for Which Licensed Material Will Be Used.

Licensed material is contained within sealed sources inside special gages to be used in the testing of engineering properties of construction materials such as asphalt and concrete. Up to a total of 5 gages will be eventually obtained. Table 1 lists those gages from which the choices will be made. The exact models cannot be specified until the time that we are legally able to make a purchase, and the initial purchase will include only 2 gages.

TABLE 1

<u>Element and Mass Number</u>	<u>Manufacturer and Model of Sealed Source/Form</u>	<u>Maximum Amount to be Possessed</u>	<u>Mfg. Model</u>
Cs-137/ Am-241:Be	Sealed source (CPN Model C/N-131)	No single source to exceed 50 mCi of CS-137 and 50 mCi of Am-241	Campbell Pacific Nuclear Corporation Models A, B(R), and 500 series moisture density gages.
Cs-137/ Am-241:Be	Sealed source (CPN Model CPN-131) - Spec. Form USA/0150/S	No single source to exceed 10 mCi. of CS-137 and 50 mCi of Am-241.	Campbell Pacific Nuclear Corporation Models AC and MC series moisture density gages.
Cs-137	Sealed source (CPN Model CPN-131)	No single source to exceed 10 mCi.	Campbell Pacific Nuclear Corporation Model MC series moisture density gages.
Cs-137/ Am-241:Be	Sealed source (TEL Model A-100281, Rev. B)	No single source to exceed 10 mCi of CS-137 and 50 mCi of Am-241.	Troxler Electronic Laboratories Model 2401 series moisture density gages.
Cs-137	Sealed source (TEL Model A-102112) - Spec. Form GB:SFC 140	No single source to exceed 10 mCi.	Troxler Electronic Laboratories Model 3400 series moisture density gages.

ADDENDUM TO APPLICATION FOR MATERIAL LICENSE  
 NRC Form 313 - Application of 03 July 1989  
 Blackhawk Engineering, Inc.  
 Sheet 2

TABLE 1 (Cont'd.)

<u>Element and Mass Number</u>	<u>Manufacturer and Model of Sealed Source/Form</u>	<u>Maximum Amount to be Possessed</u>	<u>Mfg. Model</u>
Am-241:Be	Sealed source (TEL Model A-102451) - Spec. Form GB:SFC 7	No single source to exceed 44 mCi.	Troxler Electronic Laboratories Model 3400 series moisture density gages.
Cs-137	Sealed source (Humboldt 2200064) - Spec. Form GB/24/S	No single source to exceed 11 mCi	Humboldt Scientific, Inc. 5001-P series compaction control gages
Am-241:Be	Sealed source (Humboldt 2200067) - Spec. Form GB/7/S	No single source to exceed 44 mCi.	Humboldt Scientific, Inc. 5001-P series compaction control gages
Am-241:Be	Sealed source (CPN Model CPN-131) - Spec. Form USA/0115/S	No single source to exceed 100 mCi.	Campbell Pacific Nuclear Corporation Model AC-2 Asphalt Content Gage
Am-241:Be	Sealed source (TEL Model A-100608)	No single source to exceed 110 mCi.	Troxler Electronic Laboratories Model 3241-C and previous models of their Asphalt Content Gages

7. Individuals Responsible for for Radiation Safety Program.

Maria S. Hollingsworth, P.E. has been designated the Radiation Safety Officer and will be responsible for the overall management of the company's radiation safety program. Larry Liles and Jeffrey Schmeder, as field superintendents, will be responsible for equipment, personnel, and safety at temporary jobsites. Copies of their Nuclear Gage Training Certificates are attached as Exhibit 1.

8. Training.

The primary supervisors listed in item 7 above have had a number of years' experience in operation of this type of equipment. It is

expected that additional gage operators will become authorized. As a prerequisite, each operator will attend a NRC-approved training seminar and will receive company instruction on our specific training program and safety procedures. The Radiation Safety Officer will assure that each potential operator is knowledgeable and responsible prior to his final approval. Copies of each individual's training certificate and company indoctrination will be maintained on file in a permanent log book.

9. Facilities and Equipment.

Exhibit B shows a sketch of the home office facility, where the gages will be permanently stored. The gage storage area is located within an unoccupied equipment storage room in the office spaces. Within that room, the gages will be stored in a locked steel cabinet. Keys to the cabinet will be held only by the three persons listed in item 7 above.

When not in storage, the gages will remain under constant surveillance and control. During transport to temporary jobsites, the devices will be stored in a locked enclosure within the transport vehicle. On location, the devices will be physically watched by an authorized user at all times.

Nuclear gages are to be obtained as discussed in items 5/6 above.

10. Radiation Safety Program.

Personnel monitoring devices will be required for use by all gage operators. The type and frequency of exchange will be appropriate to the operator's potential exposure, and will include either film badges exchanged on a monthly basis, or TLD badges exchanged every 90 days. These personnel monitoring devices will be provided by one of the following vendors:

1. Troxler Radiation Monitoring Services  
Division of Troxler Electronic Laboratories, Inc.  
P.O. Box 12057  
Research Triangle Park, North Carolina 27709
2. Nuclear Sources and Services, Inc.  
P.O. Box 34042-4042  
Houston, TX 77234

The use of survey instruments is not anticipated.

10. Radiation Safety Program.

A copy of the company Radiation Safety Program is attached as Exhibit C.

11. Waste Management.

The company will maintain file records of the inventory and disposition of all licensed material acquired by the company. Transfer of licensed material from the company to other entities will be only to other specifically licensed entities, to the gage manufacturer, or to a licensed burial ground.

Exhibit A - TRAINING CERTIFICATES  
ADDENDUM TO APPLICATION FOR MATERIAL LICENSE  
BLACKHAWK ENGINEERING, INC.  
03 July 1989

Exhibit A

# NUCLEAR MEASUREMENT SERVICES COMPANY

HEREBY CERTIFIES THAT

JEFFREY L. SCHMIDT

of

HEMPHILL CORPORATION

HAS SUCCESSFULLY COMPLETED THE NUCLEAR MEASUREMENT SERVICES COMPANY TRAINING COURSE FOR THE USE OF NUCLEAR TESTING EQUIPMENT.

Subjects Included in this Course were as Follows:

### Radiological Safety

- |                                                                                    |                                                                                       |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1. Principles and Practices of Radiation Protection.                               | 5. Radioactivity Measurement Standardization and Monitoring Techniques & Instruments. |
| 2. Leak Testing Procedures.                                                        | 6. Accident & Incident Procedures.                                                    |
| 3. Mathematics and Calculations Basic to the Use and Measurement of Radioactivity. | 7. Procedures for Nuclear Gauge Storage & Transportation.                             |
| 4. Biological Effects of Radiation.                                                | 8. General Safety Precautions.                                                        |

### Gauge Operation

- |                          |                          |
|--------------------------|--------------------------|
| 1. Instrument Theory.    | 4. Field Applications.   |
| 2. Operating Procedures. | 5. Gauge Calibration.    |
| 3. Gauge Maintenance.    | 6. Correlations Testing. |

Bill Richardson  
Instructor

4-14-68  
Date

Bill Richardson  
Manager

# TROXLER ELECTRONIC LABORATORIES, INC.

HEREBY CERTIFIES THAT

MARIA HOLLINGSWORTH

of

M. J. LEE CONSTRUCTION COMPANY

HAS SUCCESSFULLY COMPLETED THE TROXLER ELECTRONIC LABORATORIES, INC.  
TRAINING COURSE FOR THE USE OF NUCLEAR TESTING EQUIPMENT.

SUBJECTS INCLUDED IN THIS COURSE WERE AS FOLLOWS:

## Radiological Safety

1. Principles and practices of radiation protection.
2. Leak testing procedures.
3. Mathematics and calculations basic to the use and measurement of radioactivity.
4. Biological effects of radiation.
5. Radioactivity measurement standardization and monitoring techniques and instruments.
6. Accident and incident procedures.
7. Procedures for nuclear gauge storage and transportation.
8. General safety precautions.

## Gauge Operation

1. Instrument theory
2. Operating procedures
3. Maintenance
4. Field application
5. Gauge calibration

*Michael E. Furely*  
INSTRUCTOR

5/1/84

DATE

W.F. TROXLER

PRESIDENT

No 7051



# TROXLER ELECTRONIC LABORATORIES, INC.

HEREBY CERTIFIES THAT

Larry Liles

of

Blackhawk Engineering, Inc.

HAS SUCCESSFULLY COMPLETED THE TROXLER ELECTRONIC LABORATORIES, INC.  
TRAINING COURSE FOR THE USE OF NUCLEAR TESTING EQUIPMENT.

SUBJECTS INCLUDED IN THIS COURSE WERE AS FOLLOWS:

## Radiological Safety

1. Principles and practices of radiation protection.
2. Leak testing procedures.
3. Mathematics and calculations basic to the use and measurement of radioactivity.
4. Biological effects of radiation.
5. Radioactivity measurement standardization and monitoring techniques and instruments.
6. Accident and incident procedures.
7. Procedures for nuclear gauge storage and transportation.
8. General safety precautions.

## Gauge Operation

1. Instrument theory
2. Operating procedures
3. Maintenance
4. Field application
5. Gauge calibration

Samuel Spyma  
INSTRUCTOR

07-02-87

DATE

No 25687

W.F. Troxler

PRESIDENT

Exhibit B - OFFICE FACILITIES LAYOUT  
ADDENDUM TO APPLICATION FOR MATERIAL LICENSE  
BLACKHAWK ENGINEERING, INC.  
03 July 1989

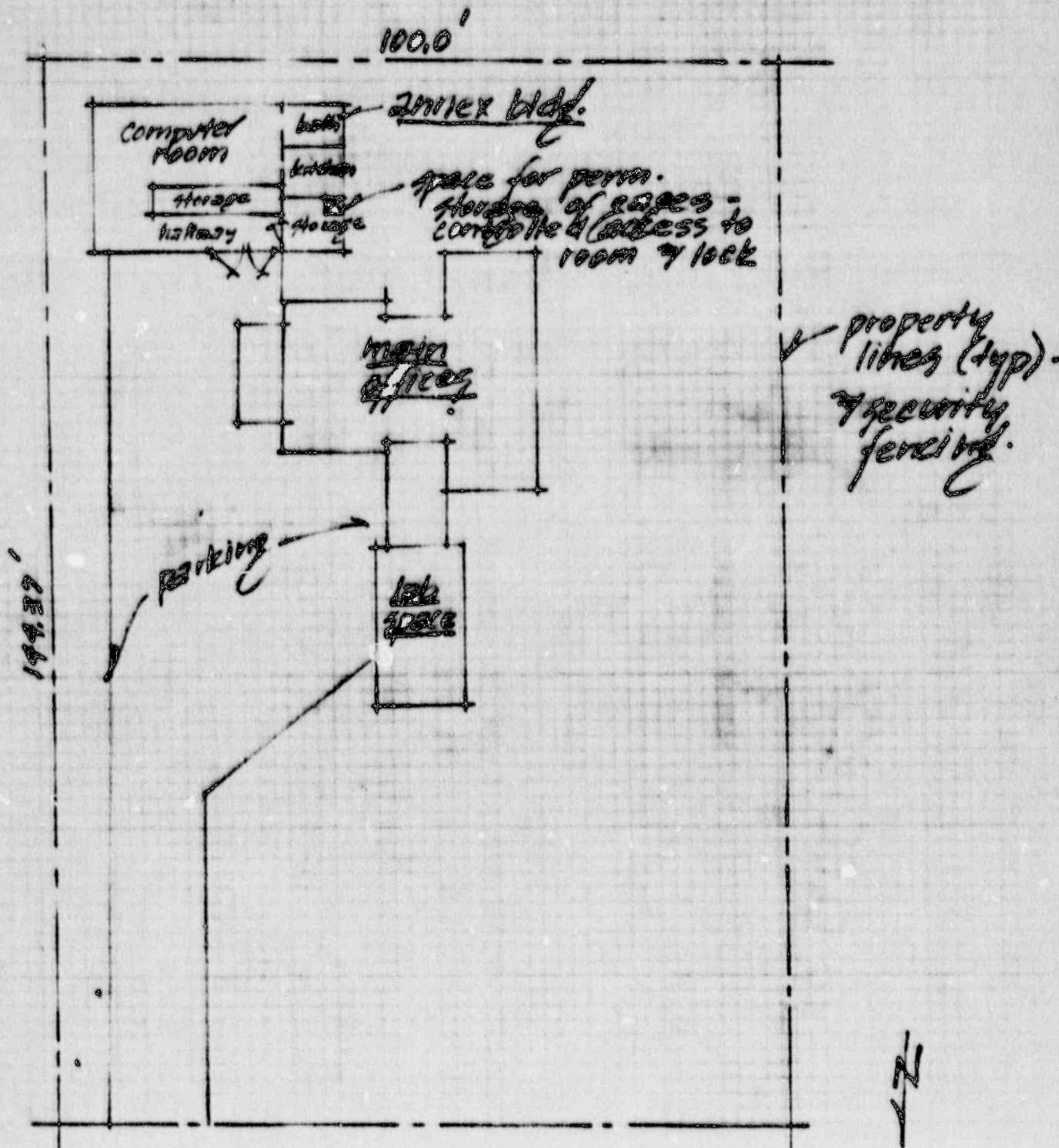


Exhibit B - Office Facilities -

## 1. General.

The purpose of the radiation safety program is to provide a written guide to the procedures and policies instituted by the company concerning the use of nuclear testing equipment, which is necessary to our work. Our policy is to make every reasonable effort to maintain radiation exposures as low as is reasonably achievable.

Use of this testing equipment, which includes the moisture-density gages and the asphalt content gages, is regulated by the U.S. Nuclear Regulatory Commission, and is allowed only through their licensing procedures. The ability to acquire and use this equipment is a privilege based on our adherence to the outlined operation, maintenance, and safety procedures which are the basis of our license. It is the responsibility of all company personnel involved in use of the gages to know and follow the procedures. Maintaining our licensing is essential to our testing business, and failure of company personnel to follow these procedures is grounds for immediate dismissal.

Applicable Federal regulations are contained in Appendix A and must be followed, in addition to the Company program.

## 2. Personnel.

A. Radiation Safety Officer. Maria Hollingsworth has been designated as the company Radiation Safety Officer and is the primary person responsible to insure that the conditions of the NRC license are met. The responsibilities of this position include:

- (1) To maintain a current NRC license and obtain updates as required.
- (2) To approve additional gage users on behalf of the company, and to ensure they understand and follow operation, maintenance, and safety procedures.
- (3) To arrange for general manufacturer's training to be provided by their representatives, and to directly provide specific training on company regulations.
- (4) To ensure that equipment is operated, maintained, and leak tested in accordance with the license requirements.
- (5) To assign appropriate personnel monitoring equipment and insure it is used properly and monitored.
- (6) To maintain a permanent log of activities, to include authorization and training of gage operators, disposition and semi-annual re-inventory of licensed material, and leak test records.
- (7) To serve as a point of contact for emergencies, and give assistance in case of emergency such as equipment damage or theft, and to notify the proper authorities.

B. Gage Operators. Any person operating a gage on behalf of the company must be approved by the Radiation Safety Officer, as evidenced by the entry of their name into the permanent radiation safety log book. The requirements for approval are the following:

1. Successful completion of gage manufacturer's training per NRC requirements, as evidenced by their Training Certificate.
2. Demonstration to the Radiation Safety Officer of the operator's knowledge of NRC and company regulations concerning operation, maintenance, and safety in use of the specific gages.
3. Entry of the approved gage operator's name into the radiation safety log book by the Radiation Safety Officer.

The performance of each authorized gage operator with respect to the specific program requirements will be monitored on a continuing basis, and failure to follow the regulations is a basis for immediate dismissal.

3. Operation and Maintenance Safety.

A. Transportation.

- (1) Gages must remain locked in their manufacturer's shipping cases when being transported by vehicle. This is to provide both protection for the gage, and proper Department of Transportation labeling. This applies at any time the gage is in a moving vehicle.
- (2) At all times the gage is removed from temporary storage at the office, except for the time when the gage is in actual use at the temporary jobsite, the gage in its locked box will be additionally secured within the transporting vehicle. In a truck, the cases will be locked within the locked tool chest if one is present, or securely chained and padlocked to the truck bed. In a closed vehicle, the case will be locked within the trunk if one is present. If the closed vehicle has no trunk, the locked case will remain within the vehicle, with its doors locked at all times.
- (3) A properly completed Bill of Lading will accompany the gages at all times they are removed from the office.

B. Operation Safety.

- (1) The user must maintain control over the gage at all times. Remove the gage from its secured spot within the vehicle only for long enough to take the required measurements, then return it to its locked case and resecure the case to or within the vehicle. At all times the gage is removed from the double-locked

system, the user must maintain visual contact with the gage.

- (2) The gages are to be used for their intended purposes only.
- (3) At all times the gage is in the user's possession and out of permanent storage, the user must wear his individual personnel monitoring device. At all other times, the individual personnel monitoring device is to be stored in the designated radiation-free location in the main office.

C. Normal Maintenance Procedures.

- (1) After each use, the user will clean the gage case as necessary, per the manufacturer's instructions for the particular gage. Individual personnel monitoring devices will be worn during the cleaning, and users will not open the gage cases.
- (2) The Radiation Safety Officer will be responsible to perform or have performed any lubrication procedures, and semi-annual leak testing on 6-month intervals, per the manufacturer's recommendations for the particular gage. During any of these procedures, individual personnel monitoring devices will be worn.
- (3) The gage manufacturer will perform any maintenance which involves removing the licensed material from the gage. No company personnel are authorized to remove source material from the gages.

4. Emergency Procedures.

A. Physical Damage to Gage. If an accident or situation arises in which physical damage to the gage is suspected, the following steps are to be taken immediately:

- (1) Secure the adjacent area. The space within 15 feet of the gage must be secured in such a way that exit or entry of persons or equipment is prevented. If vehicles or equipment are involved, they must remain until the extent of damage can be determined.
- (2) Inspect for damage. Find out whether the source housing and/or its shielding has been damaged. If there is no damage or the damage does not extend to the shielding or the housing, the area may be unsecured. If there is damage, maintain security of the adjacent area and prepare brief summary notes concerning the time, location, individuals and property or equipment involved, and status of the gage.

- (3) Call the office. As soon as possible, contact the Radiation Safety Officer at the office to get further instructions on how to proceed. Make sure that the area remains secure until further instructions are given from the office.

B. Loss or Theft. If a gage is lost or stolen, immediately notify the Radiation Safety Officer.

APPENDIX A - APPLICABLE FEDERAL REGULATIONS  
RADIATION SAFETY PROGRAM FOR NUCLEAR GAGE USERS  
BLACKHAWK ENGINEERING, INC.  
03 July 1989



## RULES and REGULATIONS

TITLE 10, CHAPTER 1, CODE OF FEDERAL REGULATIONS - ENERGY

§ 19.1

§ 19.12

PART  
19NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS;  
INSPECTIONS

- 19.1 Purpose.  
19.2 Scope.  
19.3 Definitions.  
19.4 Interpretations.  
19.5 Communications.  
19.6 Information collection requirements: OMB approval.  
19.7 Posting of notices to workers.  
19.8 Instructions to workers.  
19.9 Notifications and reports to individuals.  
19.10 Presence of representatives of licensees and workers during inspections.  
19.11 Consultation with workers during inspections.  
19.12 Requests by workers for inspections.  
19.13 Inspections not warranted, informal review.  
19.14 Violations.  
19.15 Application for exemptions.  
19.16 Discrimination prohibited.

Authority: Secs. 83, 85, 81, 103, 104, 181, 186, 88 Stat. 820, 823, 828, 836, 837, 848, 855, as amended; sec. 234, 63 Stat. 444, as amended (42 U.S.C. 2078, 2080, 2111, 2133, 2134, 2201, 2290, 2292); sec. 201, 66 Stat. 1242, as amended by Pub. L. 95-79, 69 Stat. 613 (42 U.S.C. 2041); Pub. L. 95-401, sec. 10, 62 Stat. 2801 (42 U.S.C. 2051).

For the purposes of sec. 223, 66 Stat. 964, as amended (42 U.S.C. 2273); §§ 19.11(a), (c), (d), and (e) and 19.12 are issued under sec. 191b, 66 Stat. 964, as amended (42 U.S.C. 2201(b)); and §§ 19.13 and 19.14(a) are issued under sec. 191c, 66 Stat. 965, as amended (42 U.S.C. 2201(c)).

## § 19.1 Purpose.

The regulations in this part establish requirements for notices, instructions, and reports by licensees to individuals participating in licensed activities, and options available to such individuals in connection with Commission inspections of licensees to ascertain compliance with the provisions of the Atomic Energy Act of 1954, as amended, Title II of the Energy Reorganization Act of 1974, and regulations, orders, and licenses thereunder regarding radiological working conditions.

## § 19.2 Scope.

The regulations in this part apply to all persons who receive, possess, use, or transfer material licensed by the Nuclear Regulatory Commission pursuant to the regulations in Parts 30 through 35, 40, 60, 61, 70 or 72 of this chapter, including persons licensed to operate a production or utilization facility pursuant to Part 50 of this chapter and persons licensed to possess power reactor spent fuel in an independent spent fuel storage installation (ISFSI) pursuant to Part 72 of this chapter.

## § 19.3 Definitions.

As used in this part:

(a) "Act" means the Atomic Energy Act of 1954, (66 Stat. 919) including any amendments thereto;

(b) "Commission" means the United States Nuclear Regulatory Commission;

(c) "Worker" means an individual engaged in activities licensed by the Commission and controlled by a licensee, but does not include the licensee.

(d) "License" means a license issued under the regulations in Parts 30 through 35, 40, 60, 61, 70 or 72 of this chapter, including licenses to operate a production or utilization facility pursuant to Part 50 of this chapter and licenses to possess power reactor spent fuel in an independent spent fuel storage installation (ISFSI) pursuant to Part 72 of this chapter. "Licensee" means the holder of such a license.

(e) "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 area used as residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area.

## § 19.4 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.

## § 19.5 Communications.

Except where otherwise specified in this part, all communications and reports concerning the regulations in this part should be addressed to the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Communications, reports, and applications may be delivered in person at the Commission's offices at 1717 H Street, NW., Washington, D.C.; or at 7920 Norfolk Avenue, Bethesda, Maryland.

## § 19.6 Information collection requirements: OMB approval.

(a) The Nuclear Regulatory Commission has submitted the information collection requirements contained in this part to the Office of Management and Budget (OMB) for approval as required by the Paperwork Reduction Act of 1980 (44 U.S.C. 2801 et seq.). OMB has approved the information collection requirements contained in this part under control

number 2150-0044.

(b) The approved information collection requirements contained in this part appear in § 19.13.

## § 19.11 Posting of notices to workers.

(a) Each licensee shall post current copies of the following documents: (1) The regulations in this part and in Part 30 of this chapter; (2) the license, license conditions, or documents incorporated into a license by reference, and amendments thereto; (3) the operating procedures applicable to licensed activities; (4) any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to Subpart B of Part 3 of this chapter, and any response from the licensee.

(b) If posting of a document specified in paragraph (a) (1), (2) or (3) of this section is not practicable, the licensee may post a notice which describes the document and states where it may be examined.

(c) Each licensee and applicant shall post Form NRC-8, (Revision 8-82 or later) "Notice to Employees," as required by Parts 30, 40, 60, 70, 72, and 180 of this chapter.

Note: Copies of Form NRC-8 may be obtained by writing to the Director of the appropriate U.S. Nuclear Regulatory Commission Inspection and Enforcement Regional Office listed in Appendix "D", Part 30 of this chapter, or the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

(d) Documents, notices, or forms posted pursuant to this section shall appear in a sufficient number of places to permit individuals engaged in licensed activities to observe them on the way to or from any particular licensed activity location to which the document applies, shall be conspicuous, and shall be replaced if defaced or altered.

(e) Commission documents posted pursuant to paragraph (a) (4) of this section shall be posted within 3 working days after receipt of the documents from the Commission; the licensee's response, if any, shall be posted within 3 working days after dispatch by the licensee. Such documents shall remain posted for a minimum of 5 working days or until action correcting the violation has been completed, whichever is later.

## § 19.12 Instructions to workers.

All individuals working in or frequenting any portion of a restricted area shall be kept informed of the storage, transfer, or use of radioactive materials or of radiation in such portions of the restricted area; shall be instructed in the health protection problems associated

## PART 19 • NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS; INSPECTIONS

with exposure to such radioactive materials or radiation, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed; shall be instructed in, and instructed to observe, to the extent within the worker's control, the applicable provisions of Commission regulations and licenses for the protection of personnel from exposures to radiation or radioactive materials occurring in such areas; shall be instructed of their responsibility to report promptly to the licensee any condition which may lead to or cause a violation of Commission regulations and licenses or unnecessary exposure to radiation or to radioactive material; shall be instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material; and shall be advised as to the radiation exposure reports which workers may request pursuant to § 19.13. The extent of these instructions shall be commensurate with potential radiological health protection problems in the restricted area.

#### § 19.13 Notification and reports to individuals.

(a) Radiation exposure data for an individual, and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual, shall be reported to the individual as specified in this section. The information reported shall include data and results obtained pursuant to Commission regulations, orders or license conditions, as shown in records maintained by the licensee pursuant to Commission regulations. Each notification and report shall: be in writing; include appropriate identifying data such as the name of the licensee, the name of the individual, the individual's social security number; include the individual's exposure information; and contain the following statement:

This report is furnished to you under the provisions of the Nuclear Regulatory Commission regulation 10 CFR Part 19. You should preserve this report for further reference.

(c) At the request of any worker, each licensee shall advise such worker annually of the worker's exposure to radiation or radioactive material as shown in records maintained by the licensee pursuant to § 20.401(a) and (e).

(e) At the request of a worker formerly engaged in licensed activities controlled by the licensee, each licensee shall furnish to the worker a report of the worker's exposure to radiation or radioactive material. Such report shall be furnished within 90 days from the time the request is made, or within 90 days after the exposure of the individual has been determined by the licensee, whichever is later; shall cover, within the period of time specified in the request, each calendar quarter in which the worker's activities involved exposure to radiation from radioactive materials licensed by the Commission; and shall include the data and locations of licensed activities in which the worker participated during this period.

(d) When a licensee is required pursuant to § 20.406 or § 20.408 of this chapter to report to the Commission any exposure of an individual to radiation or radioactive material the licensee shall also provide the individual a report on his exposure data included therein. Such report shall be transmitted at a time not later than the transmittal to the Commission.

(a) At the request of a worker who is terminating employment in a given calendar quarter with the licensee in work involving radiation dose, or of a worker who, while employed by another person, is terminating assignment to work involving radiation dose in the licensee's facility in that calendar quarter, each licensee shall provide to each such worker, or to the worker's designee, at termination, a written report regarding the radiation dose received by that worker from operations of the licensee during that specifically identified calendar quarter or fraction thereof, or provide a written estimate of that dose if the finally determined personnel monitoring results are not available at that time. Estimated doses shall be clearly indicated as such.

#### § 19.14 Presence of representatives of licensees and workers during inspections.

(a) Each licensee shall afford to the Commission at all reasonable times opportunity to inspect materials, activities, facilities, procedures, and records pursuant to the regulations in this chapter.

(b) During an inspection, Commission inspectors may consult privately with workers as specified in § 19.15. The licensee or licensee's representative may accompany Commission inspectors during other phases of an inspection.

(c) If, at the time of inspection, an individual has been authorized by the workers to represent them during Commission inspections, the licensee shall notify the inspectors of such authorization and shall give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions.

(d) Each workers' representative shall be routinely engaged in licensed activities under control of the licensee and shall have received instructions as specified in § 19.12.

(e) Different representatives of licensees and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one workers' representative at a time may accompany the inspectors.

(f) With the approval of the licensee and the workers' representative an individual who is not routinely engaged in licensed activities under control of the licensee, for example, a consultant to the licensee or to the workers' representative, shall be afforded the opportunity to accompany Commission inspectors during the inspection of physical working conditions.

(g) Notwithstanding the provisions of

of this section, Commission inspectors are authorized to refuse to permit accompaniment by any individual who deliberately interferes with a fair and orderly inspection. With regard to areas containing information classified by an agency of the U.S. Government in the interest of national security, an individual who accompanies an inspector may have access to such information only if authorized to do so. With regard to any area containing proprietary information, the workers' representative for that area shall be an individual previously authorized by the licensee to enter that area.

#### § 19.15 Consultation with workers during inspections.

(a) Commission inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of Commission regulations and licenses to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection.

(b) During the course of an inspection any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which he has reason to believe may have contributed to or caused any violation of the act, the regulations in this chapter, or license condition, or any unnecessary exposure of an individual to radiation from licensed radioactive material under the licensee's control. Any such notice in writing shall comply with the requirements of § 19.16(a).

(c) The provisions of paragraph (b) of this section shall not be interpreted as authorization or disregard instructions pursuant to § 19.12.

#### § 19.16 Requests by workers for inspections.

(a) Any worker or representative of workers who believes that a violation of the Act, the regulations in this chapter, or license conditions exists or has occurred in license activities with regard to radiological working conditions in which the worker is engaged, may request an inspection by giving notice of the alleged violation to the Director of Inspection and Enforcement, in the Director of the appropriate Commission Regional Office, or to Commission inspectors. Any such notice shall be in writing, shall set forth the specific grounds for the notice, and shall be signed by the worker or representative of workers. A copy shall be provided to the licensee by the Director of Inspection and Enforcement, Regional Office Director,

or the inspector no later than at the time of inspection except that, upon the request of the worker giving such notice, his name and the name of individuals referred to therein shall not appear in such copy or on any record published, released, or made available by the Commission, except for good cause shown.

(b) If, upon receipt of such notice, the Director of Inspection and Enforcement or Regional Office Director determines that the complaint meets the requirements set forth in paragraph (a) of this section, and that there are reasonable grounds to believe that the alleged violation exists or has occurred, he shall cause an inspection to be made as soon as practicable to determine if such alleged violation exists or has occurred. Inspections pur-

## PART 19 • NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS; INSPECTIONS

quant to this section need not be limited to matters referred to in the complaint.

**§ 19.17 Inspections not warranted; informal review.**

(a) If the Director of Inspection and Enforcement or of the appropriate Regional Office determines, with respect to a complaint under § 19.16, that an inspection is not warranted because there are no reasonable grounds to believe that a violation exists or has occurred, he shall notify the complainant in writing of such determination. The complainant may obtain review of such determination by submitting a written statement of position with the Executive Director for Operations, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, who will provide the licensee with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant. The licensee may submit an opposing written statement of position with the Executive Director for Operations who will provide the complainant with a copy of such statement by certified mail. Upon the request of the complainant, the Executive Director for Operations or his designee may hold an informal conference in which the complainant and the licensee may orally present their views. An informal conference may also be held at the request of the licensee, but disclosure of the identity of the complainant will be made only following receipt of written authorization from the complainant. After considering all written and oral views presented, the Executive Director for Operations shall affirm, modify, or reverse the determination of the Director of Inspection and Enforcement or of the appropriate Regional Office and furnish the complainant and the licensee a written notification of his decision and the reason therefor.

(b) If the Director of Inspection and Enforcement or of the appropriate Regional Office determines that an inspection is not warranted because the requirements of § 19.16(a) have not been met, he shall notify the complainant in writing of such determination. Such determination shall be without prejudice to the filing of a new complaint meeting the requirements of § 19.16(a).

**§ 19.30 Violations.**

An injunction or other court order may be obtained prohibiting any violation of any provision of the Act or Title II of the Energy Reorganization Act of 1974, or any regulation or order issued thereunder.

A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of section 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act or any rule, regulation, or order issued thereunder, or any term, condition or limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. 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.

**§ 19.31 Application 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.

**§ 19.32 Discrimination prohibited.**

No person shall on the ground of sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity licensed by the Nuclear Regulatory Commission. This provision will be enforced through agency provisions and rules similar to those already established, with respect to racial and other discrimination, under title VI of the Civil Rights Act of 1964. This remedy is not exclusive, however, and will not prejudice or cut off any other legal remedies available to a discriminatee.

**§ 19.33 Employee protection.**

Employment discrimination by a licensee or a contractor or subcontractor of a licensee against an employee for engaging in protected activities under this part or Parts 30, 40, 50, 60, 70, 72, or 100 of this chapter is prohibited.

UNITED STATES NUCLEAR REGULATORY COMMISSION  
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**PART  
19**

**NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS;  
INSPECTIONS**

**PROPOSED RULE MAKING**

40 FR 799  
Published 1/3/76  
Comment Period expires 3/5/76

*Radiation Protection; Implementation of  
NCRP Recommendations for Lower Radia-  
tion Exposure Levels for Fertile Women*

See Part 20 Proposed Rule Making.

50 FR 13787  
Published 4/8/85  
Comment period expires 7/8/85

*Licenses and Radiation Safety  
Requirements for Well-Logging  
Operations*

See Part 20 Proposed Rule Making

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**PART  
19**

**NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS;  
INSPECTIONS**

**STATEMENTS OF CONSIDERATION**

38 FR 22217  
Published 8/17/73  
Effective 8/17/73

The Atomic Energy Commission has adopted a new regulation, 10 CFR Part 19, Notices, Instructions and Reports to Workers; Inspections, which includes certain provisions for the options of workers engaged in licensed activities concerning Commission inspections. These provisions are comparable with those provided by the Department of Labor for inspections pursuant to the Occupational Safety and Health Act of 1970 (OSHA), as set out in 29 CFR Part 1903. Several requirements from 10 CFR Part 20 regarding information that licensees must provide for these workers are included in Part 19.

The basic purpose of the new Part 19 is to provide options to workers concerning inspections of working conditions regulated by the Commission comparable to those afforded for working conditions regulated by the Department of Labor.

The Commission published a notice of proposed rulemaking in the *Federal Register* on January 4, 1973 (38 FR 502) that included the proposed Part 19. Interested persons were invited to submit written comments or suggestions for consideration in connection with the proposed amendments within 60 days after publication of the notice of proposed rulemaking in the *Federal Register*.

After consideration of the comments received and other factors involved, the Commission has adopted the proposed new part and associated amendments to Part 20 published for comment, with certain modifications and editorial changes, and has amended 10 CFR Parts 21, 24, 26, 40, 70, 115 and 180, to clarify the applicability of Part 19. The more important changes made in Part 19 and the amendments based largely on these comments, are as follows:

(1) In many cases, the licensee may not be the employer of the individual workers protected by the amendments. Since it is the responsibility of the licensee rather than the individual's employer to control radiological working conditions, the terms "employer" and "employee" have been eliminated. The terms "licensee" and "worker" or "individual" as appropriate are used instead.

(2) Licensees frequently conduct li-

icensed activities at two or more locations often involving different kinds of work. It has been made clear that the intent of the posting requirements in the proposed § 19.11 was to make the relevant documents accessible to workers involved in the licensed activities at the location to which the documents, e.g., notices of violation, apply.

(3) It has been clarified that the requirement in § 19.11 for posting notices of violations, notices of proposed imposition of civil penalty, or orders issued pursuant to Subpart B of Part 3 of this chapter, applies only to documents relevant to radiological working conditions.

(4) In many cases, the documents required to be posted by the provisions of § 19.11 are complex, bulky, and of little interest to any but the workers engaged in the particular licensed activity. If adequate accessibility of these documents to workers is assured, it is considered acceptable instead to post a notice describing such documents, stating where they may be examined.

(5) Because of the time required to disseminate and post a notice of violation, proposed imposition of civil penalty, or order issued by the Commission, and to prepare a preliminary response if desired, the time within which documents are required to be posted has been changed in § 19.11 from 24 hours to 3 working days. Similarly, to take into account prompt corrective action, the time required for the documents to remain posted is changed from 10 working days (or until correction, whichever is later) to 3 working days (or until correction, whichever is later).

(6) Section 19.15 permits the worker to bring occupational radiological protection matters privately to the attention of the inspector; § 19.16 permits the worker to notify the Commission in writing about working conditions he believes are in violation of the Act, the regulations, or license conditions; on the other hand, § 19.13 requires the licensee to instruct the worker to report promptly to the licensee certain matters regarding working conditions. The interests of worker safety are best served in matters concerning working conditions if supervisors, who can act promptly to correct undesirable conditions, are notified promptly. It is the intent of this regulation to encourage the worker to notify

the licensee of possibly undesirable conditions prior to his notifying the Commission, thus avoiding unnecessary delays in corrective action. The point is clarified.

In addition, a number of other minor and editorial changes have been made that reflect written comments received.

Pursuant to the Atomic Energy Act of 1954, as amended, and sections 882 and 883 of title 5 of the United States Code, the following new Part 19 of Title 10, Chapter 1, Code of Federal Regulations is published as a document subject to codification, to be effective on September 17, 1973.

40 FR 8774  
Published 3/3/75  
Effective 3/3/75

*Energy Reorganization Act; Revision to Chapter 1 to Reflect Organizational and Procedural Changes*

See Part 2 Statements of Consideration.

44 FR 32349  
Published 6/8/79  
Effective 8/20/79

*Control of Radiation Exposure to Transient Workers*

See Part 20 Statements of Consideration.

46 FR 92391  
Published 12/1/81  
Effective 12/1/81

*Licensing Requirements for the Storage of Spent Fuel in an Independent Spent Fuel Storage Installation; Minor Clarifying and Conforming Amendments*

See Part 72 Statements of Consideration

## PART 19 • STATEMENTS OF CONSIDERATION

47 FR 30452  
Published 7/14/82  
Effective 10/12/82

16 CFR Parts 19, 30, 40, 50, 60, 70, 72,  
and 180

Protection of Employees Who Provide  
Information

Agency: Nuclear Regulatory  
Commission.

STATUS: Final rule.

**SUMMARY:** The NRC is amending its regulations in regard to job protection for employees who provide information to the Commission. These amendments emphasize to employers—that is, licensees, permittees, applicants, and their contractors and subcontractors—that termination or other acts of job discrimination against employees who engage in activities furthering the purposes of the Atomic Energy Act and the Energy Reorganization Act is prohibited. In addition, these amendments will make the employee aware that if discrimination of this nature is believed to have occurred, a remedy is available through the Wage and Hour Division of the Department of Labor. To ensure that employees of licensees, permittees, and applicants are aware of these amendments, these organizations are required to post their premises with explanatory material related to the prohibition of discrimination and availability of a remedy in the event of discrimination.

**EFFECTIVE DATE:** October 12, 1982.

**FOR FURTHER INFORMATION CONTACT:**

Mr. A. J. DiPalo, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C. 20548. (301-443-6931).

**SUPPLEMENTARY INFORMATION:** On March 30, 1980, NRC published in the Federal Register (45 FR 15184) proposed amendments related to employee protection. Those proposed amendments were intended (1) to implement section 216, "Employee Protection," of the Energy Reorganization Act of 1974, 42 U.S.C. 5851, as amended, (2) to incorporate into the regulations the Commission's authority under Section 181 of the Atomic Energy Act of 1954, as amended, to investigate an alleged unlawful discrimination against an employee and to take appropriate action, and (3) to complement the Department of Labor's program that is related to this matter (29 CFR Part 24). Section 216 identifies specific acts of employees as protected activities and prohibits employers from discriminating against employees who engage in those activities, provides the Department of Labor with new authority to investigate

an alleged act of such discrimination, and provides a remedy to the discrimination by means of an administrative proceeding in the Department of Labor.

Those proposed amendments would announce the statutory prohibition of discrimination of the type described in section 216 above, indicate the availability through the Department of Labor of a remedy for employees who believe they have been unlawfully discriminated against, and also require posting by specific types of licensees, permittees, and applicants of a revised NRC Form 8 that explains the prohibition and remedy. In addition, those amendments would delete 30 CFR 19.10(c) of the Commission's regulations, but at the same time amend Part 19 by the addition of a new § 19.20. This new section, when combined with proposed changes to Parts 30, 40, 50, 60, 70, and 72 of the regulations, would extend the current prohibition of unlawful discrimination against workers who provide information concerning radiological working conditions to NRC to include employees who provide information relating to radiological health protection matters and matters that could affect the public health and safety. The prohibition of unlawful discrimination also extends to information relating to antitrust matters and safeguard matters that could affect the common defense and security if these matters are considered in connection with an application for a license. The amendments continue the exemption from the requirement to post NRC Form 8 for most "general licensees," for example, those granted under § 40.25(e). This exemption is based on the nature of the licensed activity and therefore has not been granted to the general licensee carrier of special nuclear material (30 CFR 70.30(a)).

### Comments on the Proposed Rule

The Commission received 20 letters commenting on the proposed rule. Copies of those letters and an analysis of the comments are available for public inspection and copying for a fee at the Commission's Public Document Room at 3717 M Street NW., Washington, D.C.

A number of commenters stated that the proposed rule would extend the NRC activities beyond the regulatory area of radiological working conditions that is applicable to all licensees. The commenters interpreted the rulemaking preamble as a Commission attempt to become involved in antitrust, safety, and security matters of all licensees. This was not the Commission's intent. Matters pertaining to radiological working conditions and radiological safety of all licensees are of concern to the Commission. However, antitrust and

security matters are relevant only to certain types of licensees. For example, antitrust information is considered by the Commission only with respect to certain production and utilization facilities (primarily nuclear reactors).

This rule is not intended to extend the Commission's involvement with antitrust or security matters to licensees with whom such matters are not presently considered. As noted earlier, the final rule involves the Commission in radiological safety aspects of all licensees (and their contractors and subcontractors) that are beyond the area of radiological working conditions. This involvement is appropriate since an individual fabricating a component that is destined for use in connection with a regulated facility or activity may be fabricating such component in a nonradiological work area but that individual may possess information that indicates the component, when installed at the regulated facility or activity, may contribute to a degradation of public health or safety. At times this information has not been readily available from those responsible for component fabrication, for example, licensees and their subcontractors. The Commission, to effectively fulfill its mandate, requires complete, factual, and current information concerning the regulated activities of its licensees. Employees are an important source of such information and should be encouraged to come forth with any items of potential significance to safety without fear of retribution from their employers. The purpose of the final rule is to ensure that employees are aware that employment discrimination for engaging in a protected activity, for example, contacting the Commission, is illegal and that a remedy exists through the Department of Labor. The organizations subject to the rule should understand that the Commission will not permit any interference with communications between the Commission's representatives and employees of such organization. In addition to redress being available to the individual employee, the Commission may, upon learning of an adverse finding against an employer by the Department of Labor, take enforcement action against the employer because the employer engaged in illegal discrimination.

Based on the comments received, the following substantive changes have been incorporated into the final rule:

(1) The definition of discrimination has been revised to more closely track the statutory language (see § 30.7(a)).<sup>1</sup>

(2) The statute expressly provides that an employee is not protected from actions taken by the employer when the employer's action is in response to the employee's deliberate action to violate the Atomic Energy Act of 1954, as amended, or the Energy Reorganization Act of 1974, as amended. This concept was not included in the proposed rule but has been incorporated in the final rule for completeness (see § 30.7(a)).

(3) The statement of available NRC enforcement actions that are derived from the Atomic Energy Act, as amended, (see § 30.7(c)) has been revised to more clearly state the policy of enforcement in the event of unlawful discrimination.

(4) A new § 30.7(d) has been added to clarify the fact that some actions taken by an employer that adversely affect an employee are not prohibited by the new regulation.

The final rule requires, in a manner similar to the proposed amendments, that the premises of licensees—including permit holders—and applicants be posted, e.g., 30 CFR 30.7(e). In the course of construction of a nuclear facility an organization may transfer administrative control of a portion of its premises to a contractor or subcontractor, e.g., an office or supply trailer or a large area for concrete construction. Such transfer does not eliminate the requirement for posting by the licensee, permit holder or applicant of those premises in a manner adequate to ensure that employees of a contractor or subcontractor are able to observe the posted information on the way to or from their place of work.

In developing the final rule the Commission considered including in its requirements that would, by one of various means, cause information related to employee protection to be posted on the premises of contractors and subcontractors of licensees—including permit holders—and applicants. Based on, among other things, the experience gained in the drafting and implementing of 30 CFR Part 21 the Commission has determined that contractors and subcontractors should be required to post NRC Form 8. Accordingly, the staff has underway a rulemaking proposing an amendment of 30 CFR 30.7(e) to require contractors and subcontractors to post NRC Form 8 at their premises.

Based on NRC staff comments, the Parts of Title 30 that are included in the rulemaking have been revised to delete Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions," to add Part 80, "Disposal of High Level Radioactive Wastes in Geologic Repositories," and to add Part 72, "Licensing Requirements for the Storage of Spent Fuel in an Independent Spent Fuel Storage Installation (ISFSI)." Part 71 was deleted since all general licensees under Part 71 are also specific licensees under another Part, e.g., Part 80, and are, therefore, included in this rulemaking. Conforming amendments to Parts 80 and 72 are included in this final rulemaking to effectuate the Commission's intent that all specific licensees will have similar responsibilities under the Employee Protection amendments. Parts 80 and 72 were not included in the proposed rulemaking since they had not been codified at that time. Conforming amendments will be made to Part 81, "Licensing Requirements for Land Disposal of Radioactive Waste" when that proposed rule (40 FR 38081, July 24, 1981) becomes final.

A number of comments from licensees and their consultants stated that the proposed rule would allow the individuals to harass the employer with accusations that are false, frivolous, or unwarranted. To prevent this, it was recommended that either civil penalties be imposed on the individual that knowingly supplies false information or that compensation be provided to an employer to defray the cost of defending against the allegations. The Commission has rejected these comments since the statutory authority of the Commission under section 210 neither provides for penalties against individuals or for any reimbursement to an employer. Based on a review of allegations of employment discrimination complaints filed with DOL, it appears that at an early stage, DOL denies complaints that are without merit.

#### List of Subjects

##### 30 CFR Part 19

Environmental protection, Nuclear materials, nuclear power plants and reactors, Occupational safety and health, Penalty, Radiation protection, Reporting requirements, Sex discrimination.

##### 30 CFR Part 30

Byproduct material, Labeling, Nuclear materials, Packaging and containers, Penalty, Radiation protection, Reporting requirements, Scientific equipment.

##### 10 CFR Part 40

Government contracts, Hazardous materials—transportation, Nuclear materials, Penalty, Reporting requirements, Source material, Uranium.

##### 10 CFR Part 80

Antitrust, Classified information, Fire prevention, Intergovernmental relations, Nuclear power plants and reactors, Penalty, Radiation protection, Reactor siting criteria, Reporting requirements.

##### 10 CFR Part 80

High-level waste, Nuclear power plants and reactors, Nuclear materials, Penalty, Reporting requirements, Waste treatment and disposal.

##### 10 CFR Part 70

Hazardous materials—transportation, Nuclear materials, Packaging and containers, Penalty, Radiation protection, Reporting requirements.

##### 10 CFR Part 72

Manpower training programs, Nuclear materials, Occupational safety and health, Reporting requirements, Security measures, Spent fuel.

##### 10 CFR Part 180

Hazardous materials—transportation, Intergovernmental relations, Nuclear materials, Penalty, Reporting requirements, Security measures, Source material, Special nuclear material.

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and sections 552 and 553 of title 5 of the United States Code, notice is hereby given that the following amendments to Title 30, Chapter I, Code of Federal Regulations, are published as a document subject to codification.

49 FR 57448

Published 12/27/83

Effective date:

30 CFR 30.311 of Part 30 effective

date is 12/27/83; 10 CFR Part 81 and

all other changes effective 1/28/84.

#### Licensing Requirements for Land Disposal of Radioactive Waste

See Part 81 Statements of Consideration

49 FR 19623

Published 5/8/84

Effective 5/8/84

#### Information Collection Requirements; Display of OMB Control Numbers

See Part 9 Statements of Consideration

<sup>1</sup> For simplification in the preamble, reference is made only to the changes to Part 20. Conforming changes have also been made to Parts 69, 80, 90, 91 and 92.

UNITED STATES NUCLEAR REGULATORY COMMISSION  
RULES and REGULATIONS

TITLE 10, CHAPTER 1, CODE OF FEDERAL REGULATIONS - ENERGY

§ 20.1

**PART  
20**

§ 20.3(a)

**STANDARDS FOR PROTECTION AGAINST RADIATION**

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**APPENDIX B—CONCENTRATIONS IN AIR AND WATER ABOVE NATURAL BACKGROUND**

**APPENDIX C**

**APPENDIX D—UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICES**

Authority: Secs. 53, 63, 65, 67, 108, 104, 161, 88 Stat. 830, 833, 835, 836, 837, 848, as amended (42 U.S.C. 2073, 2088, 2088, 2111, 2133, 2134, 2201); secs. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246 (42 U.S.C. 8941, 8942, 8946).

Section 20.408 also issued under secs. 134, 141, Pub. L. 87-425, 88 Stat. 2232, 2241 (42 U.S.C. 10155, 10161).

For the purposes of sec. 223, 88 Stat. 888, as amended (42 U.S.C. 2273), §§ 20.101, 20.102, 20.103 (a), (b) and (f), 20.104 (a) and (b), 20.103(b), 20.106(a), 20.301, 20.302(a), 20.305, 20.307, 20.301, 20.303, 20.304, and 20.306 are issued under sec. 161b, 88 Stat. 848, as amended (42 U.S.C. 2201(b)); and §§ 20.102, 20.103(e), 20.401-20.407, 20.408(b) and 20.409 are issued under sec. 161c, 88 Stat. 850, as amended (42 U.S.C. 2201(c)).

**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 Nuclear Regulatory Commission and are issued pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974.

(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 the total dose to an individual (including exposures to licensed and unlicensed radioactive material and to other unlicensed sources of radiation, whether in the possession of the licensee or any other person, but not including exposures to radiation from natural background sources or medical diagnosis and therapy) does not exceed the standards of radiation protection prescribed in the regulations in this part.

(c) In accordance with recommendations of the Federal Radiation Council, approved by the President, persons engaged in activities under licenses issued by the Nuclear Regulatory Commission pursuant to the Atomic

Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974 should, in addition to complying with the requirements set forth in this part, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable. The term "as low as is reasonably achievable" means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest.

**§ 20.2 Scope.**

The regulations in this part apply to all persons who receive, possess, use, or transfer material licensed pursuant to the regulations in Parts 30 through 35, 39, 40, 60, 61, 70, or 72 of this chapter, including persons licensed to operate a production or utilization facility pursuant to Part 50 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 not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be such that no day is included in more than one calendar quarter or omitted from inclusion within a calendar quarter. No licensee shall change the method observed by him of determining calendar quarters except at the beginning of a calendar year.

(5) "Commission" means the Nuclear Regulatory 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) "Licensee" means a license issued under the regulations in Parts 30 through 35, 39, 40, 60, 61, 70, or Part 72 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.

(11) "Person" means: (i) Any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the Commission or the Department (except that the Department shall be considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to section 202 of the Energy Reorganization Act of 1974 (88 Stat. 1244)), any State, any foreign government or nation or any political subdivision of any such government or nation, 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;

(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. "Re-

stricted 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;

(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.

(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;

(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.

(18) "Department" means the Department of Energy established by the Department of Energy Organization Act (Pub. L. 95-91, 91 Stat. 565, 42 U.S.C. 7101 et seq.) to the extent that the Department, or its duly authorized representatives, exercises functions formerly vested in the U.S. Atomic Energy Commission, its Chairman, members, officers and components and transferred to the U.S. Energy Research and Development Administration and to the Administrator thereof pursuant to sections 104 (b), (c) and (d) of the Energy Reorganization Act of 1974 (Pub. L. 93-438, 88 Stat. 1233 at 1237, 42 U.S.C. 5814) and retransferred to the Secretary of Energy pursuant to section 301(a) of the Department of Energy Organization Act (Pub. L. 95-91, 91 Stat. 565 at 577-578, 42 U.S.C. 7151).

(19) "Termination" means the end of employment with the licensee or, in the case of individuals not employed by the licensee, the end of a work assignment in the licensee's restricted areas in a given calendar quarter, without expectation or specific scheduling of reentry into the licensee's restricted areas during the remainder of that calendar quarter.

(20) "Dosimetry processor" means an individual or an organization that processes and evaluates personnel monitoring equipment in order to determine the radiation dose delivered to the equipment.

(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.

#### § 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 tissues 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;

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(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 paragraph (c)(3) of this section, 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/cm <sup>2</sup> )	Average flux to deliver 100 millirem in 40 hours (neutrons/cm <sup>2</sup> sec.)
Thermal	870 × 10 <sup>4</sup>	870
0.0001	780 × 10 <sup>4</sup>	500
0.005	620 × 10 <sup>4</sup>	570
0.02	400 × 10 <sup>4</sup>	280
0.1	120 × 10 <sup>4</sup>	80
0.5	43 × 10 <sup>4</sup>	30
1.0	26 × 10 <sup>4</sup>	19
2.5	26 × 10 <sup>4</sup>	20
5.0	26 × 10 <sup>4</sup>	18
7.5	24 × 10 <sup>4</sup>	17
10	24 × 10 <sup>4</sup>	17
10 to 30	14 × 10 <sup>4</sup>	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 = 3.7 × 10<sup>10</sup> disintegrations per second (dps) = 3.2 × 10<sup>11</sup> disintegrations per minute (dpm). Commonly used submultiples of the curie are the millicurie and the microcurie:

- (1) One millicurie (mCi) = 0.001 curie (Ci) = 3.7 × 10<sup>7</sup> dps.
- (2) One microcurie (μCi) = 0.000001 curie = 3.7 × 10<sup>4</sup> dps.

(b) [Deleted 40 FR 50704.]

(c) [Deleted 39 FR 23990.]

§ 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.

Except where otherwise specified in this part, all communications and reports concerning the regulations in this part should be addressed to the Executive Director for Operations, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Communications, reports, and applications may be delivered in person at the Commission's offices at 2120 L Street NW, Washington, DC, or at 11555 Rockville Pike, Rockville, Maryland.

§ 20.8 Information collection requirements: OMB approval.

(a) The Nuclear Regulatory Commission has submitted the information collection requirements contained in this part to the Office of Management and Budget (OMB) for approval as required by the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). OMB has approved the information collection requirements contained in this part under control number 3150-0016.

(b) The approved information collection requirements contained in this part appear in §§ 20.102, 20.103, 20.108, 20.203, 20.208, 20.302, 20.811, 20.401, 20.402, 20.403, 20.405, 20.407, 20.408, and 20.409.

(c) This part contains information collection requirements in addition to those approved under the control number specified in paragraph (a) of this section. These information collection requirements and the control numbers under which they are approved are as follows:

- (1) In §§ 20.101 and 20.102, Form NRC-4 is approved under control number 3150-0005.
- (2) In § 20.401, Form NRC-5 is approved under control number 3150-0008.

PERMISSIBLE DOSES, LEVELS, AND CONCENTRATIONS

§ 20.101 Radiation dose standards for individuals in restricted areas.

(a) In accordance with the provisions of § 20.102(a), and 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 a total occupational dose in excess of the standards specified in the following table:

REMS PER CALENDAR QUARTER

1 Whole body head and trunk, active blood-forming organs, lens of eyes or gonads	5 m
2 Hands and forearms, feet and ankles	15 m
3 Skin of whole body	75 m

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

(1) During any calendar quarter the total occupational dose to the whole body 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 NRC-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 prior dose.

(a) Each licensee shall require any individual, prior to first entry of the individual into the licensee's restricted area during each employment or work assignment under such circumstances that the individual will receive or is likely to receive in any period of one calendar quarter an occupational dose in excess of 25 percent of the applicable standards specified in § 20.101(a) and § 20.104(a), to disclose in a written, signed statement, either: (1) That the individual had no prior occupational dose during the current calendar quarter, or (2) the nature and amount of any occupational dose which the individual may have received during that specifically identified current calendar quarter from sources of radiation possessed or controlled by other persons. Each licensee shall maintain records of such statements until the Commission authorizes their disposition.

(b) Before permitting, pursuant to § 20.101(b), any individual in a restricted area to receive an occupational radiation dose in excess of the standards specified in § 20.101(a), each licensee shall:

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(1) Obtain a certificate on Form NRC-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 NRC-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 NRC-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 the licensee is unable to obtain reports of an 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 rooms for calendar quarters beginning on Jan 1, 1961	Column 2— Assumed exposure in rooms for calendar quarters beginning on or after Jan 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye	3%	1%

(2) The licensee shall retain and preserve records used in preparing Form NRC-4 until the Commission authorizes their disposition.

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 materials in air in restricted areas.

(a)(1) No licensee shall possess, use, or transfer licensed material in such a manner as to permit any individual in a restricted area to inhale a quantity of radioactive material in any period of one calendar quarter greater than the quantity which would result from inhalation for 40 hours per week for 13 weeks at uniform concentrations of radioactive material in air specified in Appendix B, Table I, Column 1. <sup>103</sup> If

the radioactive material is of such form that intake by absorption through the skin is likely, individual exposures to radioactive material shall be controlled so that the uptake of radioactive material by any organ from either inhalation or absorption or both routes of intake " in any calendar quarter does not exceed that which would result from inhaling such radioactive material for 40 hours per week for 13 weeks at uniform concentrations specified in Appendix B, Table I, Column 1.

(2) No licensee shall possess, use, or transfer mixtures of U-234, U-235, and U-238 in soluble form in such a

manner as to permit any individual in a restricted area to inhale a quantity of such material in excess of the intake limits specified in Appendix B, Table I, Column 1 of this part. If such soluble uranium is of a form such that absorption through the skin is likely, individual exposures to such material shall be controlled so that the uptake of such material by any organ from

either inhalation or absorption or both routes of intake " does not exceed that which would result from inhaling such material at the limits specified in Appendix B, Table I, Column 1 and footnote 4 thereto.

(3) For purposes of determining compliance with the requirements of this section the licensee shall use suitable measurements of concentrations of radioactive materials in air for detecting and evaluating airborne radioactivity in restricted areas and in addition, as appropriate, shall use measurements of radioactivity in the body, measurements of radioactivity excreted from the body, or any combination of such measurements as may be necessary for timely detection and assessment of individual intakes of radioactivity by exposed individuals. It is assumed that an individual inhales radioactive material at the airborne concentration in which he is present unless he uses respiratory protective equipment pursuant to paragraph (c) of this section. When assessment of a particular individual's intake of radioactive material is necessary, intakes less than those which would result from inhalation for 2 hours in any one day or for 10 hours in any one week at uniform concentrations specified in Appendix B, Table I, Column 1 need not be included in such assessment, provided that for any assessment in excess of these amounts the entire amount is included.

(b)(1) The licensee shall, as a precautionary procedure, use process or other engineering controls, to the extent practicable, to limit concentrations of radioactive materials in air to levels below those which delimit an airborne radioactivity area as defined in § 20.203(d)(1)(ii).

(2) When it is impracticable to apply process or other engineering controls to limit concentrations of radioactive material in air below those defined in § 20.203(d)(1)(ii), other precautionary procedures, such as increased surveillance, limitation of working times, or provision of respiratory protective equipment, shall be used to maintain intake of radioactive material by any individual within any period of seven consecutive days as far below that intake of radioactive material which

would result from inhalation of such material for 40 hours at the uniform concentrations specified in Appendix B, Table I, Column 1 as is reasonably achievable. Whenever the intake of radioactive material by any individual exceeds this 40-hour control measure, the licensee shall make such evaluations and take such actions as are necessary to assure against recurrence. The licensee shall maintain records of such occurrences, evaluations, and actions taken in a clear and readily identifiable form suitable for summary review and evaluation.

(c) When respiratory protective equipment is used to limit the inhalation of airborne radioactive material pursuant to paragraph (b)(2) of this section, the licensee shall use equipment that is certified or has certification extended by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA). The licensee may make allowance for this use of respiratory protective equipment in estimating exposures of individuals to this material provided that:

<sup>1</sup> Since the concentration specified for tritium oxide vapor assumes equal intakes by skin absorption and inhalation, the total intake permitted is twice that which would result from inhalation alone at the concentration specified for H-3 in Appendix B, Table I, Column 1 for 40 hours per week for 13 weeks.

<sup>2</sup> For radon-222, the limiting quantity is that inhaled in a period of one calendar year. For radioactive materials designated "Sub" in the "Isotope" column of the table, the concentration value specified is based upon exposure to the material as an external radiation source. Individual exposures to these materials may be accounted for as part of the limitation on individual dose in § 20.101. Those nuclides shall be subject to the precautionary procedures required by § 20.103(b)(1).

<sup>3</sup> Multiply the concentration values specified in Appendix B, Table I, Column 1, by  $6.3 \times 10^4$  ml to obtain the quarterly quantity limit. Multiply the concentration value specified in Appendix B, Table I, Column 1, by  $2.5 \times 10^4$  ml to obtain the annual quantity limit for Rn-222.

<sup>4</sup> Significant intake by ingestion or injection is presumed to occur only as a result of circumstances such as accident, inadvertence, poor procedure, or similar special conditions. Such intakes must be evaluated and accounted for by techniques and procedures as may be appropriate to the circumstances of the occurrence. Exposures so evaluated shall be included in determining whether the limitation on individual exposures in § 20.103(a)(1) has been exceeded.

<sup>5</sup> Regulatory guidance on assessment of individual intakes of radioactive material is given in Regulatory Guide 8.9, "Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program." Single copies of which are available from the Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, upon written request.

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(1) The licensee selects respiratory protective equipment that provides a protection factor greater than the multiple by which peak concentrations of airborne radioactive materials in the working area are expected to exceed the values specified in Appendix B, Table I, Column 1 of this part. The equipment so selected shall be used so that the average concentration of radioactive material in the air that is inhaled during any period of uninterrupted use in an airborne radioactivity area, on any day, by any individual using the equipment, does not exceed the values specified in Appendix B, Table I, Column 1 of this part. For the purposes of this paragraph, the concentration of radioactive material in the air that is inhaled when respirators are worn may be estimated by dividing the ambient concentration in air by the protection factor specified in Appendix A of this part. If the exposure is later found to be greater than estimated, the corrected value shall be used; if the exposure is later found to be less than estimated, the corrected value may be used.

(2) The licensee maintains and implements a respiratory protection program that includes, as a minimum: air sampling sufficient to identify the hazard, permit proper equipment selection and estimate exposures; surveys and bioassays as appropriate to evaluate actual exposures; written procedures regarding selection, fitting, and maintenance of respirators, and testing of respirators for operability immediately prior to each use; written procedures regarding supervision and training of personnel and issuance records; and determination by a physician prior to initial use of respirators, and at least every 12 months thereafter, that the individual user is physically able to use the respiratory protective equipment.

(3) A written policy statement on respirator usage shall be issued covering such things as: use of practicable engineering controls instead of respirators; routine, nonroutine, and emergency use of respirators; and periods of respirator use and relief from respirator use. The licensee shall advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other condition that might require such relief.

(4) The licensee uses equipment within limitations for type and mode of use and provides proper visual, communication, and other special capabilities (such as adequate skin protection) when needed.

(d) Unless otherwise authorized by the Commission, the licensee shall not assign protection factors in excess of

those specified in Appendix A of this part in selecting and using respiratory protective equipment. The Commission may authorize a licensee to use higher protection factors on receipt of an application (1) describing the situation for which a need exists for higher protection factors, and (2) demonstrating that the respiratory protective equipment will provide these higher protection factors under the proposed conditions of use.

(e) Where equipment of a particular type has not been tested and certified, or had certification extended, by NIOSH/MSHA, or where there is no existing schedule for test and certification of certain equipment, the licensee shall not make allowance for this equipment without specific authorization by the Commission. An application for this authorization must include a demonstration by testing, or on the basis of reliable test information, that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use.

(f) Only equipment that has been specifically certified or had certification extended for emergency use by NIOSH/MSHA shall be used as emergency devices.

(g) The licensee shall notify, in writing, the Regional Administrator of the appropriate Nuclear Regulatory Commission Regional Office listed in Appendix D at least 30 days before the date that respiratory protective equipment is first used under the provisions of this section.

§ 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.

(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 §§ 20.103(b)(2) and 20.103(c) shall apply to exposures subject to paragraph (b) of this section except that the references in §§ 20.103(b)(2) and 20.103(c) to Appendix B, Table I, Column 1 shall be deemed to be references to Appendix B, Table II, Column 1.

§ 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.

(c) In addition to other requirements of this part, licensees engaged in uranium fuel cycle operations subject to the provisions of 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," shall comply with that part.

§ 20.106 Radioactivity 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.

47 FR 16162

47 FR 16162

53 FR 17688

47 FR 10914

41 FR 2302

47 FR 10914

40 FR 16328

47 FR 1439

(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.

(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 recon-

centrations 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 paragraphs (a) through (e) of this section do not apply to disposal of radioactive material into sanitary sewerage systems, which is governed by § 20.303.

(g) In addition to other requirements of this part, licensees engaged in uranium fuel cycle operations subject to the provisions of 40 CFR Part 190, "Environmental Radiation Protection Standard for Nuclear Power Operations," shall comply with that part.

#### § 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 (1) may be necessary for the licensee to comply with the regulations in this part, and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

#### § 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.

(c) All personnel dosimeters (except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to hands and forearms, feet and ankles) that require processing to determine the radiation dose and that are utilized by licensees to comply with paragraph (a) of this section, with other applicable provisions of 10 CFR Chapter I, or with conditions specified in a licensee's license must be processed and evaluated by a dosimetry processor:

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

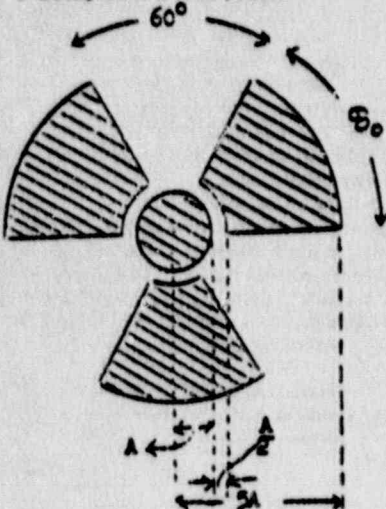
Note: (c) effective 2/12/88.

§ 20.203 Caution signs, labels, signals and controls.

(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  
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  
HIGH RADIATION AREA

(2) Each entrance or access point to a high radiation area shall be:

(i) Equipped with a control device which shall cause the level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in 1 hour upon entry into the area; or

(ii) Equipped with a control device which shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering the high radiation area and the licensee or a supervisor of the activity are made aware of the entry; or

(iii) Maintained locked except during periods when access to the area is required, with positive control over each individual entry.

(3) The controls required by paragraph (c)(2) of this section shall be established in such a way that no individual will be prevented from leaving a high radiation area.

(4) In the case of a high radiation area established for a period of 30 days or less, direct surveillance to prevent unauthorized entry may be substituted for the controls required by paragraph (c)(2) of this section.

(5) Any licensee, or applicant for a license, may apply to the Commission for approval of methods not included in paragraphs (c)(2) and (4) of this section for controlling access to high radiation areas. The Commission will approve the proposed alternatives if the licensee or applicant demonstrates that the alternative methods of control will prevent unauthorized entry into a high radiation area, and that the requirement of paragraph (c)(3) of this section is met.

(6) Each area in which there may exist radiation levels in excess of 500 rems in one hour at one meter from a sealed radio-active source\* that is used to irradiate materials shall:

\*Or "Danger".

\*This paragraph (c)(6) does not apply to radioactive sources that are used in teletherapy, in radiography, or in completely self-shielded irradiators in which the source is both stored and operated within the same shielding radiation barrier and, in the designed configuration of the irradiator, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual. This paragraph (c)(6) also does not apply to sources from which the radiation is incidental to some other use nor to nuclear reactor generated radiation other than radiation from byproduct, source, or special nuclear materials that are used in sealed

(i) Have each entrance or access point equipped with entry control devices which shall function automatically to prevent any individual from inadvertently entering the area when such radiation levels exist; permit deliberate entry into the area only after a control device is actuated that shall cause the radiation level within the area, from the sealed source, to be reduced below that at which it would be possible for an individual to receive a dose in excess of 100 mrem in one hour; and prevent operation of the source if the source would produce radiation levels in the area that could result in a dose to an individual in excess of 100 mrem in one hour. The entry control devices required by this paragraph (c)(6) shall be established in such a way that no individual will be prevented from leaving the area.

(ii) Be equipped with additional control devices such that upon failure of the entry control devices to function as required by paragraph (c)(6)(i) of this section the radiation level within the area, from the sealed source, shall be reduced below that at which it would be possible for an individual to receive a dose in excess of 100 mrem in one hour; and visible and audible alarm signals shall be generated to make an individual attempting to enter the area aware of the hazard and the licensee or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of such failure of the entry control devices.

(iii) Be equipped with control devices such that upon failure or removal of physical radiation barriers other than the source's shielded storage container the radiation level from the source shall be reduced below that at which it would be possible for an individual to receive a dose in excess of 100 mrem in one hour; and visible and audible alarm signals shall be generated to make potentially affected individuals aware of the hazard and the licensee or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of the failure or removal of the physical barrier. When the shield for the stored source is a liquid, means shall be provided to monitor the integrity of the shield and to signal, automatically, loss of adequate shielding. Physical radiation barriers that com-

sources in non-self-shielded irradiators.

\*These requirements apply after Mar. 14, 1978. Each person licensed to conduct activities to which this paragraph (c)(6) applies and who is not in compliance with the provisions of this paragraph on Mar. 14, 1978, shall file with the Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, on or before June 14, 1978, information describing in detail the actions taken or to be taken to achieve compliance with this paragraph by Dec. 14, 1978, and may continue activities in conformance with present license conditions and the provisions of the previously effective § 20.2034 until such compliance is achieved. For such persons compliance must be achieved not later than Dec. 14, 1978.

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prise permanent structural components, such as walls, that have no credible probability of failure or removal in ordinary circumstances need not meet the requirements of this paragraph (c)(6)(iii).

(iv) Be equipped with devices that will automatically generate visible and audible alarm signals to alert personnel in the area before the source can be put into operation and in sufficient time for any individual in the area to operate a clearly identified control device which shall be installed in the area and which can prevent the source from being put into operation.

(v) Be controlled by use of such administrative procedure and such devices as are necessary to assure that the area is cleared of personnel prior to each use of the source preceding which use it might have been possible for an individual to have entered the area.

(vi) Be checked by a physical radiation measurement to assure that prior to the first individual's entry into the area after any use of the source, the radiation level from the source in the area is below that at which it would be possible for an individual to receive a dose in excess of 100 mrem in one hour.

(vii) Have entry control devices required in paragraph (c)(6)(i) of this section which have been tested for proper functioning prior to initial operation with such source of radiation on any day that operations are not uninterruptedly continued from the previous day or before resuming operations after any unintended interruption, and for which records are kept of the dates, times, and results of such tests of function. No operations other than those necessary to place the source in safe condition or to effect repairs on controls shall be conducted with such source unless control devices are functioning properly. The licensee shall submit an acceptable schedule for more complete periodic tests of the entry control and warning systems to be established and adhered to as a condition of the license.

(viii) Have those entry and exit portals that are used in transporting materials to and from the irradiation area, and that are not intended for use by individuals, controlled by such devices and administrative procedures as are necessary to physically protect and warn against inadvertent entry by any individual through such portals. Exit portals for processed materials shall be equipped to detect and signal the presence of loose radiation sources that are carried toward such an exit and to automatically prevent such loose sources from being carried out of the area.

(7) Licensees with, or applicants for, licenses for radiation sources that are within the purview of paragraph (c)(6) of this section, and that must be used in a variety of positions or in peculiar locations, such as open fields or forests, that make it impracticable to comply with certain requirements of paragraph (c)(6) of this section, such as those for the automatic control of radiation levels, may apply to the Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, for approval, prior to use of safety measures that are alternative to those specified in paragraph (c)(6) of this section, and that will provide at least an equivalent degree of personnel protection in the use of such sources. At least one of the alternative measures must include an entry-preventing interlock control based on a physical measurement of radiation that assures the absence of high radiation levels before an individual can gain access to an area where such sources are used.

(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

## 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:

"Or "Danger".

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

## CAUTION

## RADIOACTIVE MATERIAL(S)

(2) Each area or room in which natural uranium or thorium is used or stored in any 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 paragraph (f)(3) of this section, each container of licensed material shall bear a durable, clearly visible label identifying the radioactive contents.

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

(3) Notwithstanding the provisions of paragraph (f)(1) of this section 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 greater than the applicable concentrations listed in Appendix B, Table I, Column 2, 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 Department of Transportation.

(vi) For containers which are accessible 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.



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(4) Each licensee shall, prior to disposal of an empty uncontaminated container to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

§ 20.204 Same exceptions. 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, and control of entrance or access thereto pursuant to § 20.203(c) is not required, because of the presence of patients containing by-product material provided that there are personnel in attendance who will 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.

(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.

(d) A room or other area is not required to be posted with a caution sign, and control is not required for each entrance or access point to a room or other area which is a high radiation area solely because of the presence of radioactive materials prepared for transport and packaged and labeled in accordance with regulations of the Department of Transportation.

§ 20.205 Procedures for picking up, receiving, and opening packages.

(a)(1) Each licensee who expects to receive a package containing quantities of radioactive material in excess of the Type A quantities specified in paragraph (b) of this section shall:

(i) If the package is to be delivered to the licensee's facility by the carrier, make arrangements to receive the package when it is offered for delivery by the carrier; or

(ii) If the package is to be picked up by the licensee at the carrier's terminal, make arrangements to receive notification from the carrier of the arrival of the package, at the time of arrival.

(2) Each licensee who picks up a package of radioactive material from a carrier's terminal shall pick up the package expeditiously upon receipt of notification from the carrier of its arrival.

(b)(1) Each licensee, upon receipt of a package of radioactive material, shall monitor the external surfaces of the package for radioactive contamination caused by leakage of the radioactive contents, except:

(i) Packages containing no more than the exempt quantity specified in the table in this paragraph;

(ii) Packages containing no more than 10 millicuries of radioactive material consisting solely of tritium, carbon-14, sulfur-35, or iodine-125;

(iii) Packages containing only radioactive material as gases or in special form;

(iv) Packages containing only radioactive material in other than liquid form (including Mo-99/Tc-99m generators) and not exceeding the Type A quantity limit specified in the table in this paragraph; and

(v) Packages containing only radionuclides with half-lives of less than 30 days and a total quantity of no more than 100 millicuries.

The monitoring shall be performed as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or eighteen hours if received after normal working hours.

(2) If removable radioactive contamination in excess of 0.01 microcuries (22,000 disintegrations per minute) per 100 square centimeters of package surface is found on the external surfaces of the package, the licensee shall immediately notify the final delivering carrier and, by telephone and telegraph, mailgram or facsimile, the appropriate Nuclear Regulatory Commission Inspection and Enforcement Regional Office shown in Appendix D of this part.

TABLE OF EXEMPT AND TYPE A QUANTITIES

Table with 3 columns: Transport group, Exempt quantity limit (in curies), Type A quantity limit (in curies). Rows include I, II, III, IV, V, VI, VII, and Special Form.

The definitions of "transport group" and "special form" are specified in § 71.4 of this chapter.

[Footnote 1 removed 49 FR 19623]

(c)(1) Each licensee, upon receipt of a package containing quantities of radioactive material in excess of the Type A quantities specified in paragraph (b) of this section, other than those transported by exclusive use vehicle, shall monitor the radiation levels external to the package. The package shall be monitored as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or 18 hours if received after normal working hours.

(2) If radiation levels are found on the external surface of the package in excess of 200 millirem per hour, or at three feet from the external surface of the package in excess of 10 millirem per hour,

the licensee shall immediately notify by telephone and telegraph mailgram, or facsimile, the director of the appropriate NRC Regional Office listed in Appendix D, and the final delivering carrier.

(d) Each licensee shall establish and maintain procedures for safely opening packages in which licensed material is received, and shall assure that such procedures are followed and that due consideration is given to special instructions for the type of package being opened.

§ 20.206 Instruction of personnel.

Instructions required for individuals working in or frequenting any portion of a restricted area are specified in § 19.12 of this chapter.

§ 20.207 Storage and control of licensed materials in unrestricted areas.

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

(b) Licensed materials in an unrestricted area and not in storage shall be

\* For example, containers in locations such as water-filled canals, storage vaults, or hot cells.

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tended under the constant surveillance and immediate control of the licensee.

## 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 Parts 30, 40, 60, 61, 70 or 72 of this chapter, whichever may be applicable; or

(b) As authorized under § 20.303 or Part 61 of this chapter; or

(c) As provided in § 20.303, applicable to the disposal of licensed material by release into sanitary sewerage systems, or in § 20.306 for disposal of specific wastes, or in § 20.106 (Radioactivity in effluents to unrestricted areas).

## § 20.302 Method for obtaining approval of proposed disposal procedures.

(a) 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.

(b) The Commission will not approve any application for a license for disposal of licensed material at sea unless the applicant shows that sea disposal offers less harm to man or the environment than other practical alternative methods of disposal.

## § 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 paragraphs (b)(1) or (2) of this section.

(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 limit 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

(d) The gross quantity of licensed and other radioactive material, excluding hydrogen-3 and carbon-14, released into the sewerage system by the licensee does not exceed one curie per year. The quantities of hydrogen-3 and carbon-14 released into the sanitary sewerage system may not exceed 5 curies per year for hydrogen-3 and 1 curie per year for carbon-14. Excreta from individuals undergoing medical diagnosis or therapy with radioactive material shall be exempt from any limitations contained in this section.

## § 20.305 Treatment or disposal by incineration.

No licensee shall treat or dispose of licensed material by incineration, except for materials listed under § 20.306 or as specifically approved by the Commission pursuant to §§ 20.106(b) and 20.302.

## § 20.306 Disposal of specific wastes.

Any licensee may dispose of the following licensed material without regard to its radioactivity:

(a) 0.05 microcuries or less of hydrogen-3 or carbon-14, per gram of medium, used for liquid scintillation counting; and

(b) 0.05 microcuries or less of hydrogen-3 or carbon-14, per gram of animal tissue averaged over the weight of the entire animal; provided however, tissue may not be disposed of under this section in a manner that would permit its use either as food for humans or as animal feed.

(c) Nothing in this section, however, relieves the licensee of maintaining records showing the receipt, transfer and disposal of such byproduct material as specified in § 30.51 of this chapter; and

(d) Nothing in this section relieves the licensee from complying with other applicable Federal, State and local regulations governing any other toxic or hazardous property of these materials.

## § 20.311 Transfer for disposal and manifests.

(a) Purpose. The requirements of this section are designed to control transfers of radioactive waste intended for disposal at a land disposal facility and establish a manifest tracking system and supplement existing requirements concerning transfers and recordkeeping for such wastes. The reporting and recordkeeping requirements contained in this section have been approved by the Office of Management and Budget; OMB approval No. 3150-0014.

(b) Each shipment of radioactive waste to a licensed land disposal facility must be accompanied by a shipment manifest that contains the name, address, and telephone number of the person generating the waste. The manifest shall also include the name, address, and telephone number or the name and EPA hazardous waste identification number of the person transporting the waste to the land disposal facility. The manifest must also indicate as completely as practicable: a physical description of the waste; the volume; radionuclide identity and quantity; the total radioactivity; and the principal chemical form. The solidification agent must be specified. Waste containing more than 0.1% chelating agents by weight must be identified and the weight percentage of the chelating agent estimated. Wastes classified as Class A, Class B, or Class C in § 61.55 of this chapter must be clearly identified as such in the manifest. The total quantity of the radionuclides H-3, C-14, Tc-99 and I-129 must be shown. The manifest required by this paragraph may be shipping papers used to meet Department of Transportation or

Environmental Protection Agency regulations or requirements of the receiver, provided all the required information is included. Copies of manifests required by this section may be legible carbon copies or legible photocopies.

(c) Each manifest must include a certification by the waste generator that the transported materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the Department of Transportation and the Commission. An authorized representative of the waste generator shall sign and date the manifest.

(d) Any generating licensee who transfers radioactive waste to a land disposal facility or a licensed waste collector shall comply with the requirements in paragraphs (d)(1) through (6) of this section. Any generating licensee who transfers waste to a licensed waste processor who treats or repackages waste shall comply with the requirements of paragraphs (d)(4) through (6) of this section. A licensee shall:

- (1) Prepare all wastes so that the waste is classified according to § 61.55 and meets the waste characteristics requirements in § 61.56 of this chapter;
  - (2) Label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with § 61.55 of this chapter;
  - (3) Conduct a quality control program to assure compliance with §§ 61.55 and 61.56 of this chapter; the program must include management evaluation of audits;
  - (4) Prepare shipping manifests to meet the requirements of §§ 20.311 (b) and (c) of this part;
  - (5) Forward a copy of the manifest to the intended recipient, at the time of shipment; or, deliver to a collector at the time the waste is collected, obtaining acknowledgement of receipt in the form of a signed copy of the manifest or equivalent documentation from the collector;
  - (6) Include one copy of the manifest with the shipment;
  - (7) Retain a copy of the manifest and documentation of acknowledgement of receipt as the record of transfer of licensed material as required by Parts 30, 40, and 70 of this chapter; and,
  - (8) For any shipments or any part of a shipment for which acknowledgement of receipt has not been received within the times set forth in this section, conduct an investigation in accordance with paragraph (h) of this section.
- (e) Any waste collector licensee who handles only prepackaged waste shall:

- (1) Acknowledge receipt of the waste from the generator within one week of receipt by returning a signed copy of the manifest or equivalent documentation;
  - (2) Prepare a new manifest to reflect consolidated shipments; the new manifest shall serve as a listing or index for the detailed generator manifests. Copies of the generator manifests shall be a part of the new manifest. The waste collector may prepare a new manifest without attaching the generator manifests, provided the new manifest contains for each package the information specified in paragraph (b) of this section. The collector licensee shall certify that nothing has been done to the waste which would invalidate the generator's certification;
  - (3) Forward a copy of the new manifest to the land disposal facility operator at the time of shipment;
  - (4) Include the new manifest with the shipment to the disposal site;
  - (5) Retain a copy of the manifest and documentation of acknowledgement of receipt as the record of transfer of licensed material as required by Parts 30, 40, and 70 of this chapter, and retain information from generator manifests until disposition is authorized by the Commission; and,
  - (6) For any shipments or any part of a shipment for which acknowledgement of receipt is not received within the times set forth in this section, conduct an investigation in accordance with paragraph (h) of this section.
- (f) Any licensed waste processor who treats or repackages wastes shall:
- (1) Acknowledge receipt of the waste from the generator within one week of receipt by returning a signed copy of the manifest or equivalent documentation;
  - (2) Prepare a new manifest that meets the requirements of paragraphs (b) and (c) of this section. Preparation of the new manifest reflects that the processor is responsible for the waste;
  - (3) Prepare all wastes so that the waste is classified according to § 61.55 and meets the waste characteristic requirements in § 61.56 of this chapter;
  - (4) Label each package of waste to identify whether it is Class A waste, Class B waste, or Class C waste, in accordance with §§ 61.55 and 61.57 of this chapter;
  - (5) Conduct a quality control program to assure compliance with §§ 61.55 and 61.56 of this chapter. The program shall include management evaluation of audits;
- (g) Forward a copy of the new manifest to the disposal site operator or waste collector at the time of shipment, or deliver to a collector at the time the waste is collected, obtaining acknowledgement of receipt in the form of a signed copy of the manifest or

equivalent documentation by the collector;

- (7) Include the new manifest with the shipment;
  - (8) Retain copies of original manifests and new manifests and documentation of acknowledgement of receipt as the record of transfer of licensed material required by Parts 30, 40, and 70 of this chapter; and
  - (9) For any shipment or part of a shipment for which acknowledgement is not received within the times set forth in this section, conduct an investigation in accordance with paragraph (h) of this section.
- (g) The land disposal facility operator shall:
- (1) Acknowledge receipt of the waste within one week of receipt by returning a signed copy of the manifest or equivalent documentation to the shipper. The shipper to be notified is the licensee who last possessed the waste and transferred the waste to the operator. The returned copy of the manifest or equivalent documentation shall indicate any discrepancies between materials listed on the manifest and materials received;
  - (2) Maintain copies of all completed manifests or equivalent documentation until the Commission authorizes their disposition; and

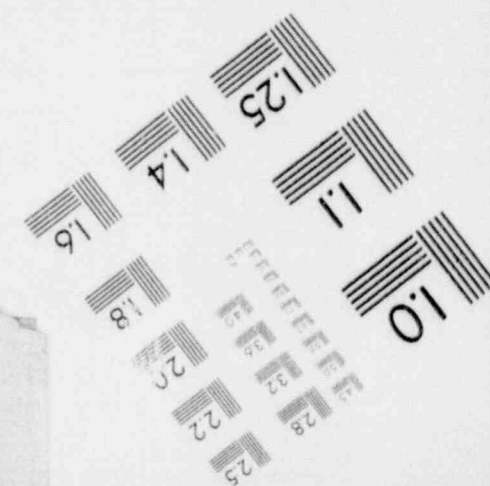
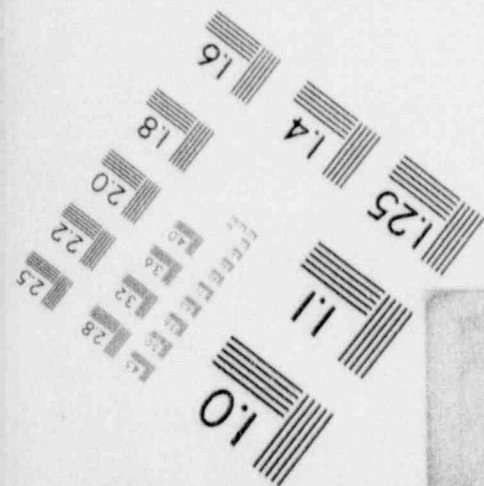
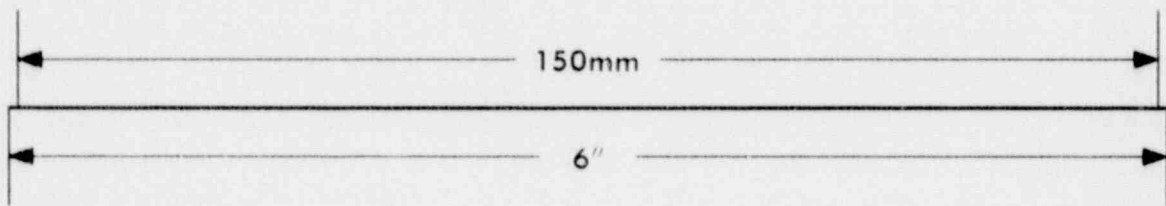
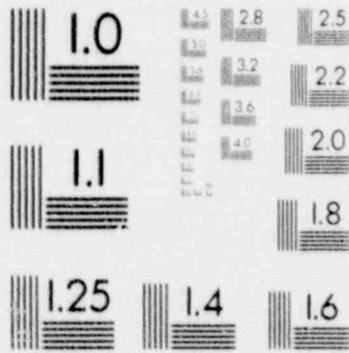
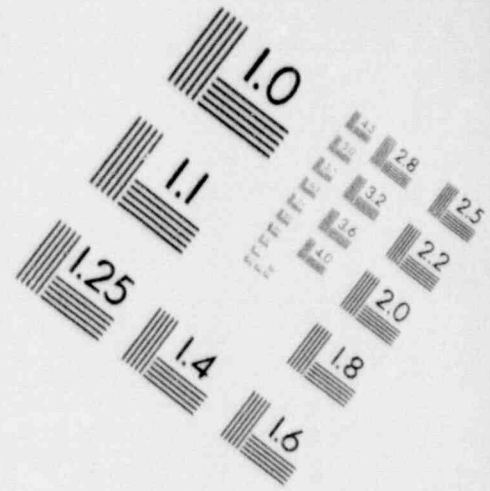
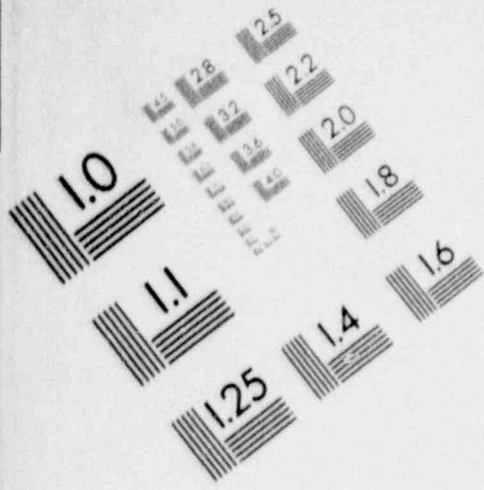
(3) Notify the shipper (i.e., the generator, the collector, or processor) and the Regional Administrator of the nearest Commission Regional Office listed in Appendix D of this part when any shipment or part of a shipment has not arrived within 60 days after the advance manifest was received.

(h) Any shipment or part of a shipment for which acknowledgement is not received within the times set forth in this section, must:

- (1) Be investigated by the shipper if the shipper has not received notification of receipt within 20 days after transfer; and
- (2) Be traced and reported. The investigation shall include tracing the shipment and filing a report with the nearest Commission Regional Office listed in Appendix D of this part. Each licensee who conducts a trace investigation shall file a written report with the nearest Commission's Regional office within 2 weeks of completion of the investigation.

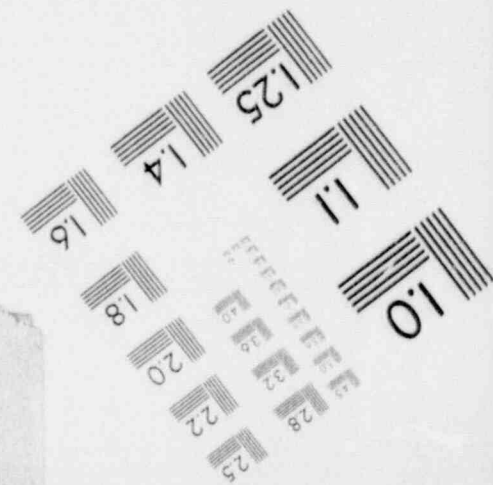
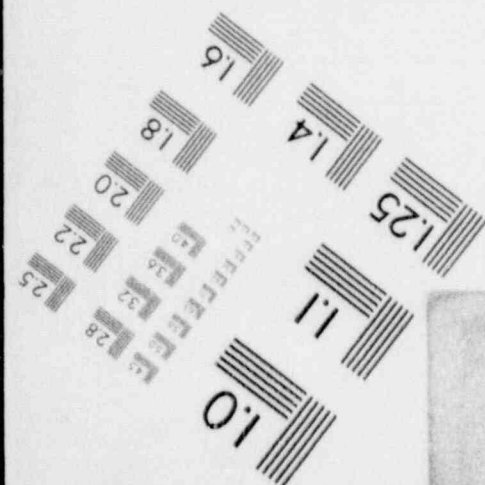
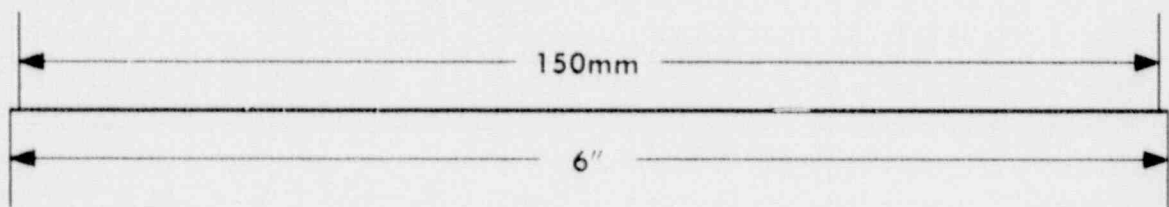
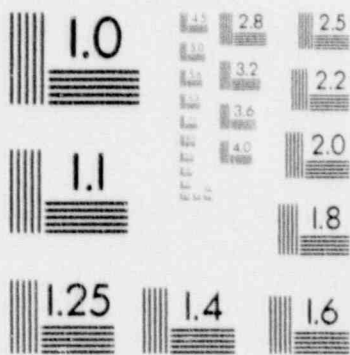
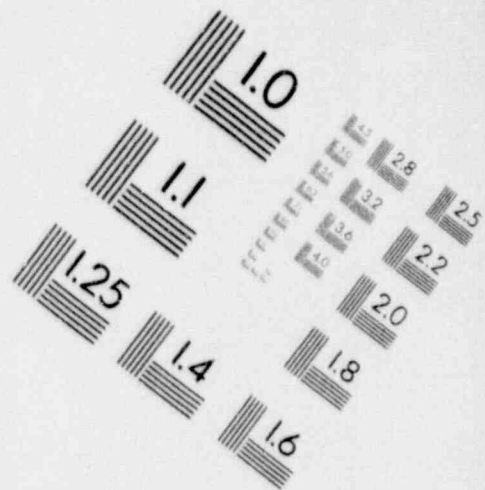
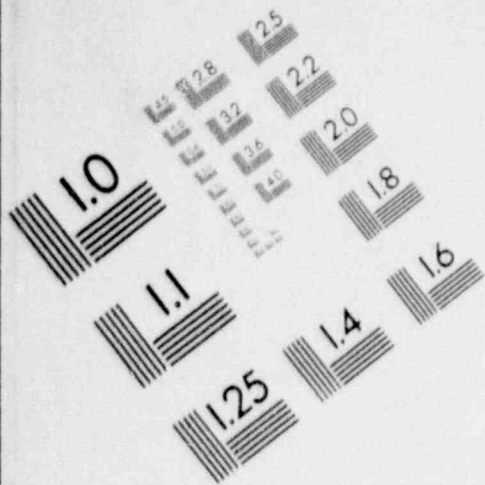
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## IMAGE EVALUATION TEST TARGET (MT-3)



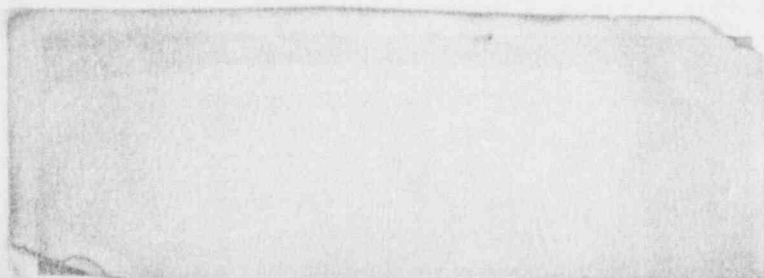
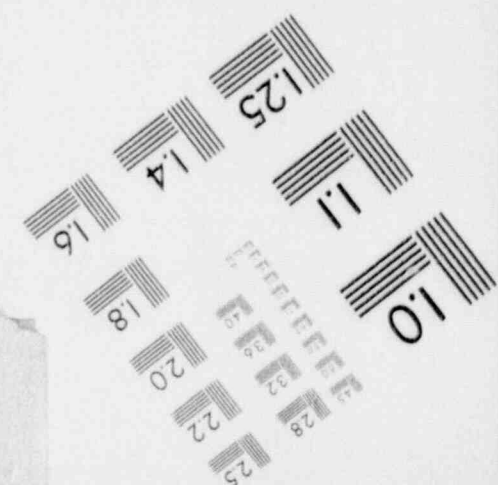
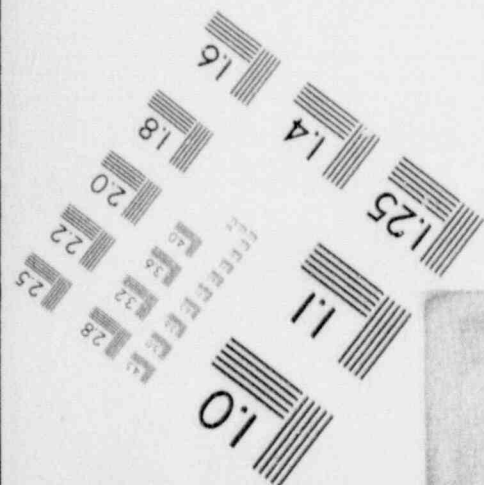
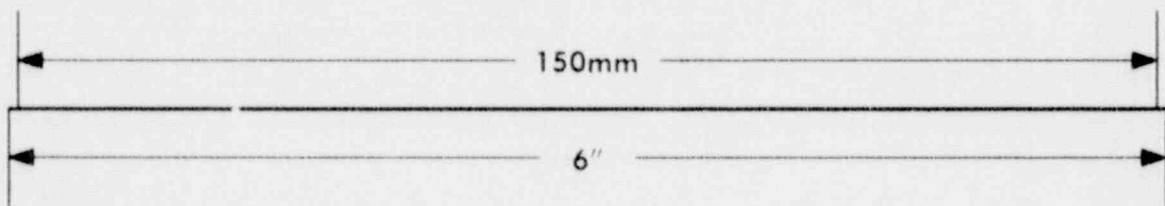
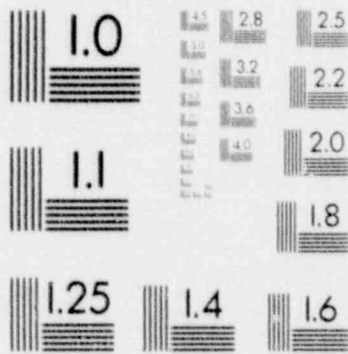
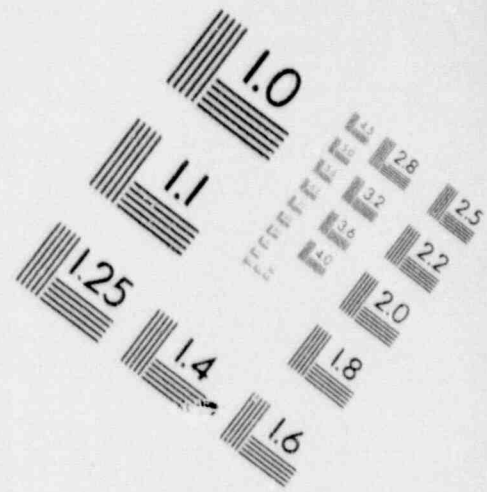
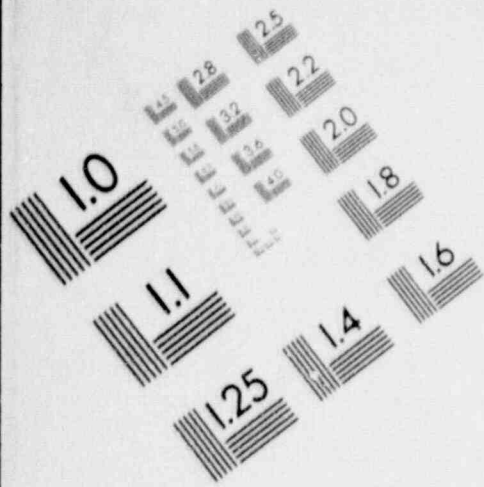
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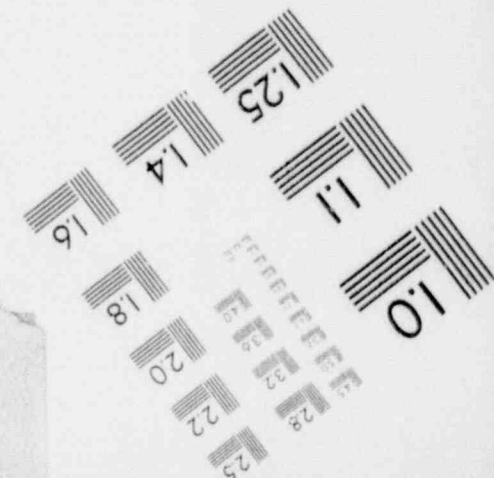
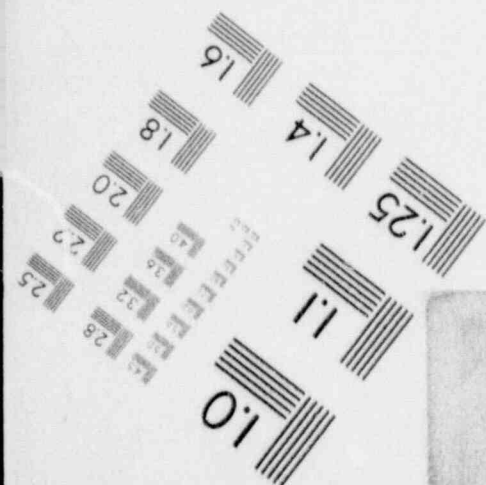
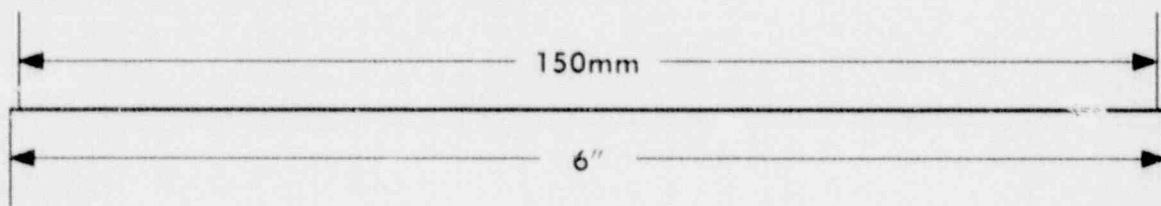
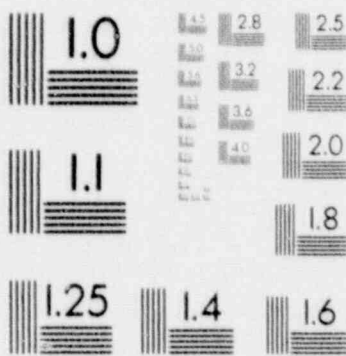
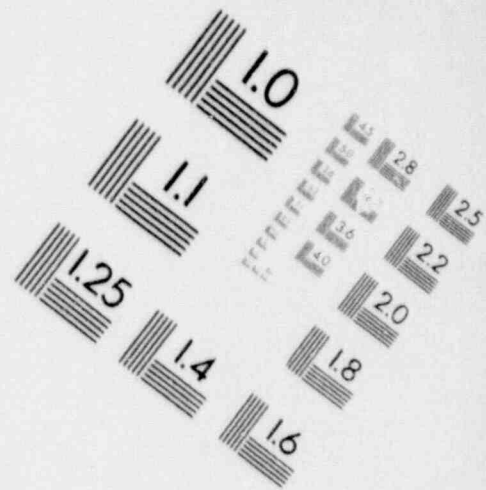
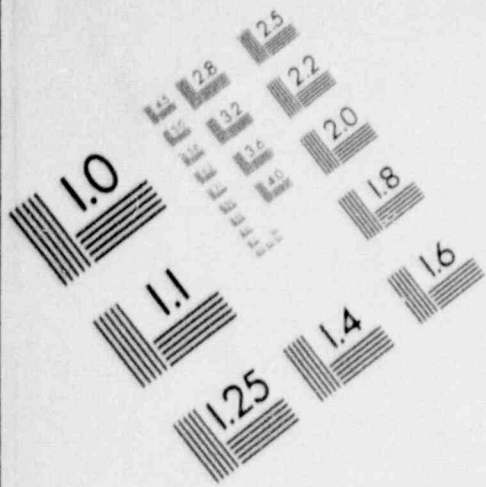
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## IMAGE EVALUATION TEST TARGET (MT-3)



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## IMAGE EVALUATION TEST TARGET (MT-3)



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 NRC-5, in accordance with the instructions contained in that form or on clear and legible records containing all the information required by Form NRC-5. The doses entered on the forms or records shall be for periods of time not exceeding one calendar quarter.

(b) Each licensee shall maintain records in the same units used in this part, showing the results of surveys required by § 20.201(b), monitoring required by §§ 20.205(b) and 20.205(c), and disposals made under §§ 20.302, 20.303, removed § 20.304, and Part 61 of this chapter.

(c)(1) Records of individual exposure to radiation and to radioactive material which must be maintained pursuant to the provisions of paragraph (a) of this section and records of bioassays, including results of whole body counting examinations, made pursuant to § 20.108, shall be preserved until the Commission authorizes disposition.

(2) Records of the results of surveys and monitoring which must be maintained pursuant to paragraph (b) of this section shall be preserved for two years after completion of the survey except that the following records shall be maintained until the Commission authorizes their disposition: (i) Records of the results of surveys to determine compliance with § 20.103(a); (ii) in the absence of personnel monitoring data, records of the results of surveys to determine external radiation dose; and (iii) records of the results of surveys used to evaluate the release of radioactive effluents to the environment.



(3) Records of disposal of licensed materials made pursuant to §§ 20.202, 20.203, removed § 20.204,<sup>1</sup> and Part 61 of this chapter are to be maintained until the Commission authorizes their disposition.

(4) Records which must be maintained pursuant to this part may be the original or a reproduced copy or microform if such reproduced copy or microform is duly authenticated by authorized personnel and the microform is capable of producing a clear and legible copy after storage for the period specified by Commission regulations.

(5) If there is a conflict between the Commission's regulations in this part, license condition, or technical specification, or other written Commission approval or authorization pertaining to the retention period for the same type of record, the retention period specified in the regulations in this part for such records shall apply unless the Commission pursuant to § 20.501, has granted a specific exemption from the record retention requirements specified in the regulations in this part.

#### § 20.402 Reports of theft or loss of licensed material.

(a)(1) Each licensee shall report to the Commission, by telephone, immediately after it determines that a loss or theft of licensed material has occurred in such quantities and under such circumstances that it appears to the licensee that a substantial hazard may result to persons in unrestricted areas.

(2) Reports must be made as follows:

(i) Licensees having an installed Emergency Notification System shall make the reports to the NRC Operations Center in accordance with § 20.72 of this chapter.

(ii) All other licensees shall make reports to the Administrator of the appropriate NRC Regional Office listed in Appendix D of this part.

(b) Each licensee who makes a report under paragraph (a) of this section shall, within 30 days after learning of the loss or theft, make a report in writing to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555, with a copy to the appropriate NRC Regional Office listed in Appendix D of this part. The report shall include the following information:

- (1) A description of the licensed material involved, including kind, quantity, chemical, and physical form;
- (2) A description of the circumstances under which the loss or theft occurred;
- (3) A statement of disposition or probable disposition of the licensed material involved;
- (4) Radiation exposures to individ-

uals, circumstances under which the exposures occurred, and the extent of possible hazard to persons in unrestricted areas;

(5) Actions which have been taken, or will be taken, to recover the material; and

(6) Procedures or measures which have been or will be adopted to prevent a recurrence of the loss or theft of licensed material.

(c) Subsequent to filing the written report the licensee shall also report any substantive additional information on the loss or theft which becomes available to the licensee, within 30 days after he learns of such information.

(d) Any report filed with the Commission pursuant to this section shall be so prepared that names of individuals who may have received exposure to radiation are stated in a separate part of the report.

(e) For holders of an operating license for a nuclear power plant, the events included in paragraph (b) of this section must be reported in accordance with the procedures described in § 20.73 (b), (c), (d), (e), and (g) of this chapter and must include the information required in paragraph (b) of this section. Events reported in accordance with § 20.73 of this chapter need not be reported by a duplicate report under paragraph (b) of this section.

#### § 20.403 Notifications of incidents.

(a) *Immediate notification.* Each licensee shall immediately report any events involving byproduct, source, or special nuclear material possessed by the licensee that 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 or 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 of this part; 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 \$200,000.

(b) *Twenty-four hour notification.*

Each licensee shall within 24 hours of discovery of the event, report any event involving licensed material possessed by the licensee that 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 of this part; or

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

(4) Damage to property in excess of \$2,000.

(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.

(d) Reports made by licensees in response to the requirements of this section must be made as follows:

(1) Licensees that have an installed Emergency Notification System shall make the reports required by paragraphs (a) and (b) of this section to the NRC Operations Center in accordance with § 20.72 of this chapter.

(2) All other licensees shall make the reports required by paragraphs (a) and (b) of this section by telephone to the NRC Operations Center<sup>1</sup> and by telegram, mailgram, or facsimile to the Administrator of the appropriate NRC Regional Office listed in Appendix D of this part.

§ 20.404 (Reserved)

#### § 20.405 Reports of overexposures and excessive levels and concentrations.

(a)(1) In addition to any notification required by § 20.403 of this part, each licensee shall make a report in writing concerning any one of the following types of incidents within 30 days of its occurrence:

(i) Each exposure of an individual to radiation in excess of the applicable limits in §§ 20.101 or 20.104(a) of this part, or the licensee;

(ii) Each exposure of an individual to radioactive material in excess of the applicable limits in §§ 20.103(a)(1), 20.103(a)(2), or 20.104(b) of this part, or in the licensee;

<sup>1</sup> Commercial telephone number of the NRC Operations Center is (302) 891-0850.

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(iii) Levels of radiation or concentrations of radioactive material in a restricted area in excess of any other applicable limit in the license;

(iv) Any incident for which notification is required by § 20.403 of this part; or

(v) Levels of radiation or concentrations of radioactive material (whether or 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 license.

(2) Each report required under paragraph (a)(1) of this section must describe the extent of exposure of individuals to radiation or to radioactive material, including:

(i) Estimates of each individual's exposure as required by paragraph (b) of this section;

(ii) Levels of radiation and concentrations of radioactive material involved;

(iii) The cause of the exposure, levels or concentrations; and

(iv) Corrective steps taken or planned to prevent a recurrence.

(b) Any report filed with the Commission pursuant to paragraph (a) of this section shall include for each individual exposed the name, social security number, and date of birth, and an estimate of the individual's exposure. The report shall be prepared so that this information is stated in a separate part of the report.

(c)(1) In addition to any notification required by § 20.403 of this part, each licensee shall make a report in writing of levels of radiation or releases of radioactive material in excess of limits specified by 40 CFR Part 160, "Environmental Radiation Protection Standards for Nuclear Power Operations," or in excess of license conditions related to compliance with 40 CFR Part 160.

(2) Each report submitted under paragraph (c)(1) of this section must describe:

(i) The extent of exposure of individuals to radiation or to radioactive material;

(ii) Levels of radiation and concentrations of radioactive material involved;

(iii) The cause of the exposure, levels, or concentrations; and

(iv) Corrective steps taken or planned to assure against a recurrence, including the schedule for achieving conformance with 40 CFR Part 160 and with associated license conditions.

(d) For holders of an operating license for a nuclear power plant, the incidents included in paragraphs (a) or (c) of this section must be reported in accordance

with the procedures described in paragraphs 20.73 (b), (c), (d), (e), and (g) of this chapter and must also include the information required by paragraphs (a) and (c) of this section. Incidents reported in accordance with § 20.73 of this chapter need not be reported by a duplicate report under paragraphs (a) or (c) of this section.

(e) All other licensees who make reports under paragraphs (a) or (c) of this section shall, within 30 days after learning of the overexposure or excessive level or concentration, make a report in writing to the U.S. Nuclear Regulatory Commission, Document Control Desk, Washington, D.C. 20555, with a copy to the appropriate NRC Regional Office listed in Appendix D of this part.

§ 20.406 [Reserved]

§ 20.407 Personnel monitoring reports.

Each person described in § 20.406 of this part shall, within the first quarter of each calendar year, submit to the Director, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555, the reports specified in paragraphs (a) and (b) of this section, covering the preceding calendar year.<sup>1</sup>

(a) A report of either (1) the total number of individuals for whom personnel monitoring was required under § 20.202(a) or § 34.33(a) of this chapter during the calendar year; or (2) the total number of individuals for whom personnel monitoring was provided during the calendar year. *Provided, however,* That such total includes at least the number of individuals required to be reported under paragraph (a)(1) of this section. The report shall indicate whether it is submitted in accordance with paragraph (a)(1) or (a)(2) of this section. If personnel monitoring was not required to be provided to any individual by the licensee under §§ 20.202(a) or 34.33(a) of this chapter during the calendar year, the licensee shall submit a negative report indicating that such personnel monitoring was not required.

(b) A statistical summary report of the personnel monitoring information recorded by the licensee for individuals for whom personnel monitoring was either required or provided, as described in paragraph (a) of this section, indicating the number of individuals whose total whole body exposure recorded during the previous calendar

<sup>1</sup> A licensee whose license expires or terminates prior to, or on the last day of the calendar year, shall submit reports at the expiration or termination of the license covering that part of the year during which the license was in effect.

year was in each of the following estimated exposure ranges:

Estimated whole body exposure range (mrem)	Number of individuals in each range
No measurable exposure	
Measurable exposure less than 0.1	
0.1 to 0.25	
0.25 to 0.5	
0.5 to 0.75	
0.75 to 1	
1 to 2	
2 to 3	
3 to 4	
4 to 5	
5 to 6	
6 to 7	
7 to 8	
8 to 9	
9 to 10	
10 to 11	
11 to 12	
12+	

<sup>1</sup> Individual values closely equal to the values separating exposure ranges shall be reported in the higher range.

The low exposure range data are required in order to obtain better information about the exposures actually recorded. This section does not require improved measurements.

§ 20.408 Reports of personnel monitoring on termination of employment or work.

(a) This section applies to each person licensed by the Commission to:

(1) Operate a nuclear reactor designed to produce electrical or heat energy pursuant to § 20.21(b) or § 20.22 of this chapter or a testing facility as defined in § 20.2 of this chapter.

(2) Possess or use byproduct material for purposes of radiography pursuant to Parts 30 and 34 of this chapter;

(3) Possess or use at any one time, for purposes of fuel processing, fabricating, or reprocessing, special nuclear material in a quantity exceeding 5,000 grams of contained uranium-235, uranium-233, or plutonium or any combination thereof pursuant to Part 70 of this chapter;

(4) Possess high-level radioactive waste at a geologic repository operations area pursuant to Part 60 of this chapter; or

(5) Possess spent fuel in an independent spent fuel storage installation (ISFSI) or possess spent fuel or high level radioactive waste in a monitored retrievable storage installation (MRS) pursuant to Part 72 of this chapter; or

(6) Possess or use at any one time, for processing or manufacturing for distribution pursuant to Parts 30, 32, or 33 of this Chapter, byproduct material in quantities exceeding any one of the following quantities:

462641

Radionuclide	Quantity in curies
Cesium-137	1
Cobalt-60	1
Gold-198	100
Iodine-131	1
Indium-113	10
Krypton-85	1,000
Promethium-147	10
Technetium-99m	1,000

The Commission may require, as a license condition, or by rule, regulation or order pursuant to § 20.502, reports from licensees who are licensed to use radionuclides not on this list, in quantities sufficient to cause comparable radiation levels.

§ 20.405 Notifications and reports to individuals.

(a) Requirements for notifications and reports to individuals of exposure to radiation or radioactive material are specified in § 19.13 of this chapter.

(b) When a licensee is required pursuant to §§ 20.405 or 20.408 to report to the Commission any exposure of an individual to radiation or radioactive material, the licensee shall also notify the individual. Such notice shall be transmitted at a time not later than the transmission to the Commission, and shall comply with the provisions of § 19.13(a) of this chapter.

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.

§ 20.502 Additional requirements.

The Commission may, by rule, regulation, or order, impose upon any licensee such requirements, in addition to those 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 Atomic Energy Act of 1954, as amended, or Title II of the Energy Reorganization Act of 1974, or any regulation or order issued thereunder. A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of section 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act, or section 206 of the Energy Reorganization Act of 1974, or any rule, regulation, or order issued thereunder, or any term, condition, or limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. 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.

(7) Receive radioactive waste from other persons for disposal under Part 61 of this chapter.

(b) When an individual terminates employment with a licensee described in paragraph (a) of this section, or an individual assigned to work in such a licensee's facility, but not employed by the licensee, completes the work assignment in the licensee's facility, the licensee shall furnish to the Director, Office of Nuclear Regulatory Research, U.S. Nuclear Regulatory Commission, Washington, DC 20555, a report of the individual's exposures to radiation and radioactive material, incurred during the period of employment or work assignment in the licensee's facility, containing information recorded by the licensee pursuant to §§ 20.401(a) and 20.108. Such report shall be furnished within 30 days after the exposure of the individual has been determined by the licensee or 90 days after the date of termination of employment or work assignment, whichever is earlier.

[Note removed 49 F.R. 19623]

PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

APPENDIX A.—PROTECTION FACTORS FOR RESPIRATORS\*

Description <sup>1</sup>	Model <sup>2</sup>	Protection factor <sup>3</sup>		Tester and certified equipment—testing methods for determining filter and head/neck leaky and head adaptation tests for permeability
		Particulate only	Particulate, gases and vapors <sup>4</sup>	
1. Air-purifying respirator <sup>5</sup>				
Pressure, full-face <sup>6</sup>	OP	1000	100	See CFR Part 11, Subpart K.
Pressure, half-mask	OP			
Pressure, half-mask, full or head	OP			
2. Atmosphere-sustaining respirator				
1. Air-line respirator				
Pressure, full-face	OP	1000	100	See CFR Part 11, Subpart J.
Pressure, half-mask	OP			
Pressure, full	OP			
Pressure, half	OP			
Pressure, full	OP			
2. Self-contained breathing apparatus (SCBA)				
Pressure, full-face	OP	1000	100	See CFR Part 11, Subpart H.
Pressure, half-mask	OP			
Pressure, full	OP			
3. Combination respirator: Any combination of air-purifying and atmosphere-sustaining respirators.				See CFR Part 11, § 11.4200.

\* For use in the selection of respiratory protection devices to be used only where the contaminants have been identified and the concentrations or possible concentrations are known.  
 † Only for clean areas and where wearing respirators with the use of lighting facilities against the skin, hands and suit are essential.  
 ‡ The head systems are defined as follows: OP = open-face; P = pressure; HP = negative pressure; S.A. = negative pressure during exhalation; PD = pressure demand; S.A. = always positive pressure; HP = positive pressure; PD = demand; respirator (always closed) (P = positive pressure; HP = negative pressure; S.A. = always positive pressure).  
 § The protection factor is a measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of airborne radioactive material outside the respiratory protective equipment to the concentration of the same material inside the respiratory protective equipment, when the respirator is worn under conditions of use. It is applied to the protection factor determination to estimate the concentrations inside the respirator according to the following formula:  
 Concentration inside = Ambient external concentration / Protection factor

1. The protection factor only:  
 (a) For forced induction wearing proper head protection used and maintained under operation in a well-ventilated respiratory protective program.  
 (b) For air-purifying respirators and other high efficiency respirators which utilize 90-95% demand efficiency by normally generated 6.3 psi (static) pressure (SCP) test on use. In operation, all contaminants in oxygen and all carbon monoxide (CO) or carbon dioxide (CO<sub>2</sub>) must be removed.  
 (c) For atmosphere-sustaining respirators only which include self-contained breathing or feasible or shall be provided of the quality and quantity required in accordance with NIOSH/MSHA certification standards in 29 CFR Part 11, Subpart J, and shall not be used in the same conditions.  
 2. Filtering respirators (cartridges) are placed in operation or substitution based on filter media degradation and test of the media occurs by absorption through the skin to that an overall protection factor of less than 1.4 for particulate and atmosphere-sustaining respirators are used to protect against carbon monoxide if the protection factor for a device is 5, the effective protection factor for such use is about 1.4. For devices with protection factors of 14 the effective factor for such use is about 1.7, and for devices with protection factors of 100 or more the effective factor for such use is about 1.9. Air-purifying respirators are not suitable for protection against carbon monoxide. See also footnote 1 concerning hydrogen sulfide.  
 3. Cartridges and canisters shall not be used beyond expiration dates.  
 4. Under-use tests only. This type of equipment is not satisfactory for use where it might be possible to be in contact or emergency use is essential for the ambient airborne concentration to reach concentrations which exceed those listed in Table 1, Column 1 of Appendix B of this part. This type of equipment is not suitable for protection against plutonium or other high-activity materials. The mask shall be tested for its air-tightness, prior to use, each time it is donned.  
 5. Equipment shall be certified in a manner that ensures that proper fit and seal are maintained. A protection factor of no more than 1000 may be used for tested and certified equipment of head or face or full-face type which has an air-tight seal and a minimum fit of 2 mm of air seal at any one location in overall efficiency and the protection it provides. For example, some head or face or full-face type respirators which have a minimum fit of 2 mm of air seal at any one location in overall efficiency and the protection it provides. For example, some head or face or full-face type respirators which have a minimum fit of 2 mm of air seal at any one location in overall efficiency and the protection it provides. For example, some head or face or full-face type respirators which have a minimum fit of 2 mm of air seal at any one location in overall efficiency and the protection it provides.  
 6. Approved protection factors shall be determined using 20-100001, taking into account the design of the suit and its permeability to the contaminants under conditions of use. There shall be a suitable means for removal of suit-contaminated clothing and decontamination equipment wherever suitable and available.  
 7. An overall condition are currently available for the equipment. Equipment shall be replaced by testing or on the basis of suitable use information.  
 8. The type of respirator may provide greater protection and be used as an emergency source of protection for protection against plutonium hazards. External radon hazards and other protection is provided against such as air purifier and be taken into account in these circumstances.  
 9. Cartridges and canisters shall be performed on each individual and no more than 0.5% leakage is allowed with this type of apparatus. Permissible outward leakage of gas from the or any positive pressure self-contained breathing apparatus is unacceptable because carbon dioxide is released substantially. Special training in the use of the type of apparatus shall be provided to the user and workers.  
 10. Protection factor for type and mode of operation as listed above.

Note 1.—Protection factors for respirators, as may be approved by the U.S. Bureau of Mines/National Institute for Occupational Safety and Health (NIOSH) according to applicable approvals for respirators for type and mode of use to protect against airborne radionuclides, may be used in the extent that they do not exceed the protection factors listed in this table. The protection factors listed in this table may not be appropriate to circumstances where chemical or other respiratory hazards exist in addition to radiological hazards. The selection and use of respirators for these circumstances should take into account applicable approvals of the U.S. Bureau of Mines/NIOSH.

Note 2.—Radionuclide concentrations for which the concentration values in Table 1, column 1, Appendix B of this part are based on internal dose due to inhalation may, in addition, present external exposure hazards of higher concentrations. Under these circumstances, limitations on company may have to be governed by external dose limits.

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APPENDIX B  
 Concentrations in Air and Water Above Natural Background  
 (See notes at end of appendix.)

Element (atomic number)	Isotope	Table I		Table II	
		Column 1	Column 2	Column 1	Column 2
		Air † (μCi/ml)	Water (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)
Actinium (89)	Ac 227	3 × 10 <sup>-12</sup>	6 × 10 <sup>-12</sup>	6 × 10 <sup>-14</sup>	2 × 10 <sup>-14</sup>
	Ac 228	3 × 10 <sup>-11</sup>	9 × 10 <sup>-12</sup>	9 × 10 <sup>-13</sup>	3 × 10 <sup>-14</sup>
Americium (95)	Am 241	6 × 10 <sup>-12</sup>	1 × 10 <sup>-11</sup>	2 × 10 <sup>-12</sup>	4 × 10 <sup>-14</sup>
	Am 242m	1 × 10 <sup>-12</sup>	6 × 10 <sup>-12</sup>	4 × 10 <sup>-12</sup>	2 × 10 <sup>-14</sup>
	Am 242	6 × 10 <sup>-12</sup>	1 × 10 <sup>-11</sup>	3 × 10 <sup>-12</sup>	6 × 10 <sup>-14</sup>
	Am 243	3 × 10 <sup>-12</sup>	3 × 10 <sup>-11</sup>	9 × 10 <sup>-12</sup>	9 × 10 <sup>-14</sup>
	Am 244	4 × 10 <sup>-12</sup>	4 × 10 <sup>-11</sup>	1 × 10 <sup>-11</sup>	1 × 10 <sup>-14</sup>
	Am 245	6 × 10 <sup>-12</sup>	1 × 10 <sup>-11</sup>	2 × 10 <sup>-12</sup>	4 × 10 <sup>-14</sup>
Antimony (51)	Sb 122	1 × 10 <sup>-7</sup>	6 × 10 <sup>-8</sup>	6 × 10 <sup>-9</sup>	3 × 10 <sup>-9</sup>
	Sb 124	2 × 10 <sup>-7</sup>	7 × 10 <sup>-8</sup>	5 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>
	Sb 125	2 × 10 <sup>-7</sup>	7 × 10 <sup>-8</sup>	7 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>
Argon (18)	Ar 37	Sub <sup>1</sup>	6 × 10 <sup>-2</sup>	1 × 10 <sup>-4</sup>	
	Ar 41	Sub	2 × 10 <sup>-2</sup>	4 × 10 <sup>-4</sup>	
Arsenic (33)	As 73	3 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	7 × 10 <sup>-8</sup>	5 × 10 <sup>-9</sup>
	As 74	4 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	1 × 10 <sup>-8</sup>	5 × 10 <sup>-9</sup>
	As 75	1 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-8</sup>	5 × 10 <sup>-9</sup>
	As 76	1 × 10 <sup>-7</sup>	6 × 10 <sup>-8</sup>	4 × 10 <sup>-8</sup>	2 × 10 <sup>-9</sup>
	As 77	2 × 10 <sup>-7</sup>	6 × 10 <sup>-8</sup>	2 × 10 <sup>-8</sup>	2 × 10 <sup>-9</sup>
Astatine (85)	At 211	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-8</sup>	6 × 10 <sup>-9</sup>
	At 212	7 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>	2 × 10 <sup>-8</sup>	2 × 10 <sup>-9</sup>
Barium (56)	Ba 131	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-8</sup>	7 × 10 <sup>-9</sup>
	Ba 140	1 × 10 <sup>-7</sup>	5 × 10 <sup>-8</sup>	4 × 10 <sup>-8</sup>	2 × 10 <sup>-9</sup>
Berkelium (97)	Bk 249	4 × 10 <sup>-12</sup>	7 × 10 <sup>-12</sup>	1 × 10 <sup>-11</sup>	2 × 10 <sup>-14</sup>
	Bk 250	1 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	4 × 10 <sup>-12</sup>	6 × 10 <sup>-14</sup>
	Bk 251	1 × 10 <sup>-12</sup>	6 × 10 <sup>-12</sup>	3 × 10 <sup>-12</sup>	2 × 10 <sup>-14</sup>
Beryllium (4)	Be 7	6 × 10 <sup>-9</sup>	5 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>
	Be 10	1 × 10 <sup>-8</sup>	5 × 10 <sup>-9</sup>	4 × 10 <sup>-9</sup>	3 × 10 <sup>-9</sup>
Bismuth (83)	Bi 206	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	6 × 10 <sup>-8</sup>	4 × 10 <sup>-8</sup>
	Bi 207	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	5 × 10 <sup>-8</sup>	4 × 10 <sup>-8</sup>
	Bi 208	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	6 × 10 <sup>-8</sup>	6 × 10 <sup>-8</sup>
	Bi 210	1 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	5 × 10 <sup>-8</sup>	6 × 10 <sup>-8</sup>
	Bi 212	6 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	2 × 10 <sup>-8</sup>	4 × 10 <sup>-8</sup>

PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

APPENDIX B  
 Concentrations in Air and Water Above Natural Background—Continued  
 (See notes at end of appendix.)

Element (atomic number)	Isotope	Table I		Table II		
		Column 1	Column 2	Column 1	Column 2	
		† (μCi/ml)	(μCi/ml)	(μCi/ml)	(μCi/ml)	
Bromine (35)	Br 82	S	1 × 10 <sup>-4</sup>	5 × 10 <sup>-3</sup>	4 × 10 <sup>-8</sup>	3 × 10 <sup>-4</sup>
		I	3 × 10 <sup>-7</sup>	1 × 10 <sup>-1</sup>	6 × 10 <sup>-9</sup>	4 × 10 <sup>-3</sup>
Cadmium (48)	Cd 109	S	3 × 10 <sup>-8</sup>	3 × 10 <sup>-7</sup>	3 × 10 <sup>-9</sup>	3 × 10 <sup>-4</sup>
		I	7 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-9</sup>	3 × 10 <sup>-4</sup>
		S	4 × 10 <sup>-8</sup>	7 × 10 <sup>-4</sup>	1 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>
Cadmium (48)	Cd 115m	S	4 × 10 <sup>-8</sup>	7 × 10 <sup>-4</sup>	1 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>
		I	4 × 10 <sup>-8</sup>	7 × 10 <sup>-4</sup>	1 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>
		S	3 × 10 <sup>-7</sup>	1 × 10 <sup>-1</sup>	3 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>
Cadmium (48)	Cd 113	S	3 × 10 <sup>-7</sup>	1 × 10 <sup>-1</sup>	6 × 10 <sup>-9</sup>	4 × 10 <sup>-3</sup>
		I	3 × 10 <sup>-7</sup>	1 × 10 <sup>-1</sup>	6 × 10 <sup>-9</sup>	4 × 10 <sup>-3</sup>
		S	3 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-9</sup>	9 × 10 <sup>-4</sup>
Calcium (20)	Ca 48	S	1 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	4 × 10 <sup>-9</sup>	3 × 10 <sup>-4</sup>
		I	2 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	6 × 10 <sup>-9</sup>	5 × 10 <sup>-4</sup>
Calcium (20)	Ca 47	S	3 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	6 × 10 <sup>-9</sup>	3 × 10 <sup>-4</sup>
		I	3 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	6 × 10 <sup>-9</sup>	3 × 10 <sup>-4</sup>
Californium (98)	Cf 249	S	2 × 10 <sup>-12</sup>	1 × 10 <sup>-4</sup>	5 × 10 <sup>-14</sup>	4 × 10 <sup>-6</sup>
		I	1 × 10 <sup>-10</sup>	7 × 10 <sup>-4</sup>	3 × 10 <sup>-12</sup>	2 × 10 <sup>-3</sup>
		S	3 × 10 <sup>-12</sup>	4 × 10 <sup>-4</sup>	3 × 10 <sup>-12</sup>	1 × 10 <sup>-3</sup>
		I	1 × 10 <sup>-10</sup>	7 × 10 <sup>-4</sup>	3 × 10 <sup>-12</sup>	3 × 10 <sup>-3</sup>
		S	2 × 10 <sup>-12</sup>	1 × 10 <sup>-4</sup>	6 × 10 <sup>-12</sup>	4 × 10 <sup>-3</sup>
		I	1 × 10 <sup>-10</sup>	3 × 10 <sup>-4</sup>	3 × 10 <sup>-12</sup>	3 × 10 <sup>-3</sup>
		S	6 × 10 <sup>-12</sup>	2 × 10 <sup>-4</sup>	2 × 10 <sup>-12</sup>	7 × 10 <sup>-3</sup>
		I	3 × 10 <sup>-11</sup>	2 × 10 <sup>-4</sup>	1 × 10 <sup>-12</sup>	7 × 10 <sup>-3</sup>
		S	3 × 10 <sup>-10</sup>	4 × 10 <sup>-3</sup>	3 × 10 <sup>-11</sup>	1 × 10 <sup>-4</sup>
		I	4 × 10 <sup>-10</sup>	4 × 10 <sup>-3</sup>	3 × 10 <sup>-11</sup>	1 × 10 <sup>-4</sup>
Carbon (6)	C 14	S	4 × 10 <sup>-8</sup>	3 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	3 × 10 <sup>-4</sup>
		Sub	3 × 10 <sup>-8</sup>		1 × 10 <sup>-8</sup>	
Cesium (55)	Cs 137	S	4 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	2 × 10 <sup>-8</sup>	9 × 10 <sup>-3</sup>
		I	3 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	5 × 10 <sup>-8</sup>	9 × 10 <sup>-3</sup>
		S	3 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	9 × 10 <sup>-8</sup>	4 × 10 <sup>-3</sup>
		I	2 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	7 × 10 <sup>-8</sup>	4 × 10 <sup>-3</sup>
Cesium (55)	Cs 134m	S	1 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-10</sup>	1 × 10 <sup>-3</sup>
		I	6 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-10</sup>	1 × 10 <sup>-3</sup>
Cesium (55)	Cs 131	S	1 × 10 <sup>-8</sup>	7 × 10 <sup>-3</sup>	4 × 10 <sup>-9</sup>	2 × 10 <sup>-3</sup>
		I	3 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-9</sup>	9 × 10 <sup>-4</sup>
		S	4 × 10 <sup>-8</sup>	2 × 10 <sup>-3</sup>	1 × 10 <sup>-9</sup>	6 × 10 <sup>-3</sup>
		I	6 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	2 × 10 <sup>-9</sup>	1 × 10 <sup>-3</sup>
		S	4 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-9</sup>	9 × 10 <sup>-4</sup>
		I	1 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>	4 × 10 <sup>-10</sup>	4 × 10 <sup>-3</sup>
		S	3 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	2 × 10 <sup>-9</sup>	1 × 10 <sup>-3</sup>
		I	9 × 10 <sup>-8</sup>	7 × 10 <sup>-3</sup>	3 × 10 <sup>-9</sup>	2 × 10 <sup>-3</sup>
		S	4 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-9</sup>	9 × 10 <sup>-4</sup>
		I	3 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	6 × 10 <sup>-9</sup>	6 × 10 <sup>-3</sup>
Chlorine (17)	Cl 36	S	6 × 10 <sup>-8</sup>	4 × 10 <sup>-3</sup>	2 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>
		I	1 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>	5 × 10 <sup>-10</sup>	4 × 10 <sup>-3</sup>
		S	4 × 10 <sup>-7</sup>	2 × 10 <sup>-3</sup>	1 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>
Chlorine (17)	Cl 38	S	2 × 10 <sup>-8</sup>	2 × 10 <sup>-3</sup>	5 × 10 <sup>-10</sup>	6 × 10 <sup>-3</sup>
		I	3 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>	9 × 10 <sup>-9</sup>	4 × 10 <sup>-3</sup>
Chromium (24)	Cr 51	S	2 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>	7 × 10 <sup>-9</sup>	4 × 10 <sup>-3</sup>
		I	1 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	6 × 10 <sup>-9</sup>	3 × 10 <sup>-3</sup>
		I	2 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-9</sup>	2 × 10 <sup>-3</sup>

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APPENDIX C  
 Concentrations in Air and Water Above Natural Background—Continued  
 (See notes at end of appendix)

Element (atomic number)	Isotope	Table I		Table II	
		Column 1	Column 2	Column 1	Column 2
		† (μCi/ml) Air	(μCi/ml) Water	(μCi/ml) Air	(μCi/ml) Water
Cobalt (27)	Co 57	3 × 10 <sup>-10</sup>	3 × 10 <sup>-12</sup>	1 × 10 <sup>-12</sup>	5 × 10 <sup>-14</sup>
	Co 58	3 × 10 <sup>-10</sup>	1 × 10 <sup>-12</sup>	6 × 10 <sup>-13</sup>	4 × 10 <sup>-14</sup>
	Co 58m	3 × 10 <sup>-10</sup>	8 × 10 <sup>-13</sup>	6 × 10 <sup>-13</sup>	3 × 10 <sup>-14</sup>
	Co 59	9 × 10 <sup>-10</sup>	6 × 10 <sup>-12</sup>	3 × 10 <sup>-12</sup>	3 × 10 <sup>-13</sup>
	Co 60	8 × 10 <sup>-10</sup>	4 × 10 <sup>-12</sup>	3 × 10 <sup>-12</sup>	1 × 10 <sup>-13</sup>
	Co 60	8 × 10 <sup>-10</sup>	3 × 10 <sup>-12</sup>	3 × 10 <sup>-12</sup>	9 × 10 <sup>-14</sup>
Copper (29)	Co 64	3 × 10 <sup>-10</sup>	1 × 10 <sup>-12</sup>	1 × 10 <sup>-12</sup>	5 × 10 <sup>-14</sup>
	Co 64	9 × 10 <sup>-10</sup>	1 × 10 <sup>-12</sup>	3 × 10 <sup>-12</sup>	3 × 10 <sup>-13</sup>
Cesium (55)	Cs 132	1 × 10 <sup>-10</sup>	6 × 10 <sup>-12</sup>	4 × 10 <sup>-12</sup>	2 × 10 <sup>-13</sup>
	Cs 134	1 × 10 <sup>-10</sup>	7 × 10 <sup>-12</sup>	6 × 10 <sup>-12</sup>	2 × 10 <sup>-13</sup>
	Cs 134m	6 × 10 <sup>-11</sup>	1 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	3 × 10 <sup>-13</sup>
	Cs 137	1 × 10 <sup>-10</sup>	7 × 10 <sup>-12</sup>	3 × 10 <sup>-12</sup>	3 × 10 <sup>-13</sup>
	Cs 137	6 × 10 <sup>-11</sup>	1 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	2 × 10 <sup>-13</sup>
	Cs 138	1 × 10 <sup>-10</sup>	6 × 10 <sup>-12</sup>	3 × 10 <sup>-12</sup>	3 × 10 <sup>-13</sup>
	Cs 138	9 × 10 <sup>-11</sup>	1 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	4 × 10 <sup>-13</sup>
	Cs 139	1 × 10 <sup>-10</sup>	8 × 10 <sup>-12</sup>	4 × 10 <sup>-12</sup>	3 × 10 <sup>-13</sup>
	Cs 140	1 × 10 <sup>-10</sup>	6 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	4 × 10 <sup>-13</sup>
	Cs 141	1 × 10 <sup>-10</sup>	1 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	2 × 10 <sup>-13</sup>
	Cs 142	1 × 10 <sup>-10</sup>	6 × 10 <sup>-12</sup>	4 × 10 <sup>-12</sup>	4 × 10 <sup>-13</sup>
	Cs 144	1 × 10 <sup>-10</sup>	1 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	1 × 10 <sup>-13</sup>
	Cs 144	1 × 10 <sup>-10</sup>	4 × 10 <sup>-12</sup>	4 × 10 <sup>-12</sup>	1 × 10 <sup>-13</sup>
	Cs 147	1 × 10 <sup>-10</sup>	6 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	3 × 10 <sup>-13</sup>
Dysprosium (66)	Dy 163	3 × 10 <sup>-10</sup>	1 × 10 <sup>-12</sup>	9 × 10 <sup>-13</sup>	4 × 10 <sup>-14</sup>
	Dy 166	2 × 10 <sup>-10</sup>	1 × 10 <sup>-12</sup>	7 × 10 <sup>-13</sup>	4 × 10 <sup>-14</sup>
Einsteinium (99)	Es 252	2 × 10 <sup>-7</sup>	1 × 10 <sup>-9</sup>	6 × 10 <sup>-9</sup>	4 × 10 <sup>-9</sup>
	Es 252	8 × 10 <sup>-10</sup>	7 × 10 <sup>-12</sup>	3 × 10 <sup>-11</sup>	2 × 10 <sup>-12</sup>
	Es 254m	6 × 10 <sup>-10</sup>	7 × 10 <sup>-12</sup>	3 × 10 <sup>-11</sup>	2 × 10 <sup>-12</sup>
	Es 254	3 × 10 <sup>-10</sup>	5 × 10 <sup>-12</sup>	2 × 10 <sup>-10</sup>	3 × 10 <sup>-12</sup>
	Es 254	6 × 10 <sup>-10</sup>	5 × 10 <sup>-12</sup>	2 × 10 <sup>-10</sup>	2 × 10 <sup>-12</sup>
	Es 255	2 × 10 <sup>-10</sup>	4 × 10 <sup>-12</sup>	6 × 10 <sup>-12</sup>	1 × 10 <sup>-12</sup>
Bromine (35)	Br 79	3 × 10 <sup>-10</sup>	4 × 10 <sup>-12</sup>	4 × 10 <sup>-12</sup>	1 × 10 <sup>-13</sup>
	Br 81	3 × 10 <sup>-10</sup>	4 × 10 <sup>-12</sup>	2 × 10 <sup>-11</sup>	3 × 10 <sup>-13</sup>
Strontium (38)	Sr 89	6 × 10 <sup>-10</sup>	3 × 10 <sup>-12</sup>	2 × 10 <sup>-12</sup>	9 × 10 <sup>-14</sup>
	Sr 90	4 × 10 <sup>-10</sup>	3 × 10 <sup>-12</sup>	1 × 10 <sup>-12</sup>	9 × 10 <sup>-14</sup>
Selenium (34)	Sr 132	7 × 10 <sup>-7</sup>	3 × 10 <sup>-9</sup>	3 × 10 <sup>-9</sup>	1 × 10 <sup>-9</sup>
	Sr 132 (T/2 = 9.2 hrs)	6 × 10 <sup>-7</sup>	3 × 10 <sup>-9</sup>	3 × 10 <sup>-9</sup>	1 × 10 <sup>-9</sup>
	Sr 132	3 × 10 <sup>-7</sup>	2 × 10 <sup>-9</sup>	1 × 10 <sup>-9</sup>	6 × 10 <sup>-10</sup>
	Sr 132 (T/2 = 13 yrs)	1 × 10 <sup>-6</sup>	2 × 10 <sup>-9</sup>	4 × 10 <sup>-10</sup>	8 × 10 <sup>-10</sup>
	Sr 134	2 × 10 <sup>-7</sup>	2 × 10 <sup>-9</sup>	6 × 10 <sup>-10</sup>	8 × 10 <sup>-10</sup>
	Sr 134	4 × 10 <sup>-7</sup>	6 × 10 <sup>-9</sup>	1 × 10 <sup>-10</sup>	3 × 10 <sup>-10</sup>
	Sr 135	7 × 10 <sup>-7</sup>	6 × 10 <sup>-9</sup>	3 × 10 <sup>-10</sup>	2 × 10 <sup>-10</sup>

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APPENDIX B  
 Concentrations in Air and Water Above Natural Background—Continued  
 (See notes at end of appendix)

Element (atomic number)	Isotope	Table I		Table II	
		Column 1	Column 2	Column 1	Column 2
		† (μCi/ml) Air	(μCi/ml) Water	(μCi/ml) Air	(μCi/ml) Water
Polonium (84)	Po 210	6 × 10 <sup>-10</sup>	4 × 10 <sup>-10</sup>	2 × 10 <sup>-10</sup>	1 × 10 <sup>-10</sup>
	Po 214	7 × 10 <sup>-10</sup>	4 × 10 <sup>-10</sup>	2 × 10 <sup>-10</sup>	1 × 10 <sup>-10</sup>
	Po 218	2 × 10 <sup>-10</sup>	1 × 10 <sup>-10</sup>	6 × 10 <sup>-10</sup>	3 × 10 <sup>-10</sup>
Plutonium (94)	Pu 239	1 × 10 <sup>-10</sup>	1 × 10 <sup>-10</sup>	4 × 10 <sup>-10</sup>	3 × 10 <sup>-10</sup>
	Pu 240	2 × 10 <sup>-10</sup>	3 × 10 <sup>-10</sup>	1 × 10 <sup>-10</sup>	9 × 10 <sup>-11</sup>
Protactinium (91)	Pa 231	5 × 10 <sup>-10</sup>	2 × 10 <sup>-10</sup>	2 × 10 <sup>-10</sup>	6 × 10 <sup>-11</sup>
	Pa 233	3 × 10 <sup>-10</sup>	1 × 10 <sup>-10</sup>	9 × 10 <sup>-10</sup>	3 × 10 <sup>-10</sup>
Radium (88)	Ra 226	2 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	Ra 228	9 × 10 <sup>-8</sup>	6 × 10 <sup>-8</sup>	2 × 10 <sup>-8</sup>	2 × 10 <sup>-8</sup>
Rhenium (75)	Re 187	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	6 × 10 <sup>-8</sup>
	Re 188	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	8 × 10 <sup>-8</sup>
Radium (88)	Ra 226	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	8 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
	Ra 228	3 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
Radium (88)	Ra 226	1 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	Ra 228	6 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
Gold (79)	Au 196	1 × 10 <sup>-8</sup>	8 × 10 <sup>-8</sup>	4 × 10 <sup>-8</sup>	2 × 10 <sup>-8</sup>
	Au 198	6 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
	Au 199	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	8 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>
Hassium (108)	Hs 265	1 × 10 <sup>-9</sup>	8 × 10 <sup>-9</sup>	4 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>
	Hs 271	6 × 10 <sup>-9</sup>	4 × 10 <sup>-9</sup>	3 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>
Hassium (108)	Hs 277	4 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>	1 × 10 <sup>-9</sup>	7 × 10 <sup>-10</sup>
	Hs 283	7 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>	7 × 10 <sup>-10</sup>
Hassium (108)	Hs 289	2 × 10 <sup>-9</sup>	9 × 10 <sup>-9</sup>	7 × 10 <sup>-9</sup>	3 × 10 <sup>-9</sup>
	Hs 295	2 × 10 <sup>-9</sup>	9 × 10 <sup>-9</sup>	6 × 10 <sup>-9</sup>	2 × 10 <sup>-9</sup>
Hydrogen (1)	H3	5 × 10 <sup>-4</sup>	1 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>
	Sub	5 × 10 <sup>-4</sup>	1 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>
Iodine (53)	I 127	2 × 10 <sup>-3</sup>	4 × 10 <sup>-3</sup>	4 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>
	I 129	8 × 10 <sup>-4</sup>	4 × 10 <sup>-4</sup>	2 × 10 <sup>-4</sup>	1 × 10 <sup>-4</sup>
	I 131	7 × 10 <sup>-4</sup>	4 × 10 <sup>-4</sup>	2 × 10 <sup>-4</sup>	1 × 10 <sup>-4</sup>
	I 132	1 × 10 <sup>-3</sup>	5 × 10 <sup>-4</sup>	4 × 10 <sup>-4</sup>	2 × 10 <sup>-4</sup>
	I 133	2 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	7 × 10 <sup>-4</sup>	2 × 10 <sup>-3</sup>
Iodine (53)	I 134	2 × 10 <sup>-3</sup>	1 × 10 <sup>-3</sup>	4 × 10 <sup>-4</sup>	1 × 10 <sup>-4</sup>
	I 135	3 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	4 × 10 <sup>-4</sup>	1 × 10 <sup>-4</sup>
	I 136	5 × 10 <sup>-3</sup>	4 × 10 <sup>-3</sup>	6 × 10 <sup>-4</sup>	2 × 10 <sup>-4</sup>
	I 137	8 × 10 <sup>-3</sup>	5 × 10 <sup>-3</sup>	9 × 10 <sup>-4</sup>	3 × 10 <sup>-4</sup>
	I 138	3 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	1 × 10 <sup>-3</sup>	6 × 10 <sup>-4</sup>
	I 139	2 × 10 <sup>-3</sup>	1 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	9 × 10 <sup>-4</sup>
	I 140	7 × 10 <sup>-3</sup>	6 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	6 × 10 <sup>-4</sup>
	I 141	9 × 10 <sup>-3</sup>	6 × 10 <sup>-3</sup>	1 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>
	I 142	3 × 10 <sup>-3</sup>	2 × 10 <sup>-3</sup>	1 × 10 <sup>-3</sup>	6 × 10 <sup>-4</sup>
	I 143	9 × 10 <sup>-3</sup>	5 × 10 <sup>-3</sup>	3 × 10 <sup>-3</sup>	8 × 10 <sup>-4</sup>
I 144	2 × 10 <sup>-3</sup>	1 × 10 <sup>-3</sup>	7 × 10 <sup>-4</sup>	4 × 10 <sup>-4</sup>	



PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

APPENDIX B  
 Concentrations in Air and Water Above Natural Background—Continued  
 (See notes at end of appendix)

Element (atomic number)	Isotope		Table I		Table II	
			Column 1	Column 2	Column 1	Column 2
			† (μCi/ml) Air	(μCi/ml) Water	(μCi/ml) Air	(μCi/ml) Water
Iodine (53)	I 124	I	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>
	I 130	S	1 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
	I 131	I	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>
Bromine (77)	Br 100	S	1 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
		I	4 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	Br 102	S	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
		I	3 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	9 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
Iron (26)	Fe 55	S	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>
		I	2 × 10 <sup>-7</sup>	9 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	Fe 59	S	9 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	8 × 10 <sup>-7</sup>
Krypton (36)		I	1 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	Kr 81m	S	1 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	Kr 83	Sub	6 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
	Kr 85	Sub	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
Lanthanum (57)	La 138	S	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
		I	2 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	La 140	S	1 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
Lead (82)	Pb 203	S	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	9 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
		I	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
	Pb 210	S	1 × 10 <sup>-10</sup>	4 × 10 <sup>-7</sup>	4 × 10 <sup>-12</sup>	1 × 10 <sup>-7</sup>
		I	2 × 10 <sup>-10</sup>	5 × 10 <sup>-7</sup>	6 × 10 <sup>-12</sup>	2 × 10 <sup>-7</sup>
Lithium (7)	Li 6	S	2 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
		I	2 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
	Li 7	S	6 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
Manganese (25)	Mn 52	S	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
		I	3 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
	Mn 54	S	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
		I	4 × 10 <sup>-7</sup>	9 × 10 <sup>-7</sup>	5 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>
Mercury (80)	Hg 197m	S	4 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
		I	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
	Hg 197	S	6 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
		I	6 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
Molybdenum (42)	Mo 99	S	7 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
		I	1 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
	Mo 93	S	7 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>
Neodymium (60)	Nd 144	S	1 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>
		I	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	7 × 10 <sup>-7</sup>	4 × 10 <sup>-7</sup>
	Nd 147	S	8 × 10 <sup>-11</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-11</sup>	7 × 10 <sup>-7</sup>
		I	3 × 10 <sup>-10</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-11</sup>	6 × 10 <sup>-7</sup>
	Nd 148	S	4 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	1 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>
		I	2 × 10 <sup>-7</sup>	2 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>
	Nd 149	S	3 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>
		I	1 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	6 × 10 <sup>-7</sup>	3 × 10 <sup>-7</sup>

PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

APPENDIX B

Concentrations in Air and Water Above Natural Background—Continued

(See notes at end of appendix)

Element (atomic number)	Isotope	Table I		Table II		
		Column 1	Column 2	Column 1	Column 2	
		† (μCi/ml) Air	(μCi/ml) Water	(μCi/ml) Air	(μCi/ml) Water	
Neptunium (93)	Np 237	5	4 × 10 <sup>-12</sup>	9 × 10 <sup>-3</sup>	1 × 10 <sup>-14</sup>	3 × 10 <sup>-4</sup>
	Np 239	5	1 × 10 <sup>-10</sup>	9 × 10 <sup>-4</sup>	4 × 10 <sup>-11</sup>	3 × 10 <sup>-3</sup>
Nickel (28)	Ni 59	5	8 × 10 <sup>-7</sup>	4 × 10 <sup>-3</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-4</sup>
	Ni 63	5	7 × 10 <sup>-7</sup>	4 × 10 <sup>-3</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-4</sup>
	Ni 65	5	5 × 10 <sup>-7</sup>	6 × 10 <sup>-3</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-3</sup>
	Ni 66	5	8 × 10 <sup>-7</sup>	6 × 10 <sup>-3</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-3</sup>
Niobium (Columbium) (41)	Nb 93m	5	6 × 10 <sup>-8</sup>	6 × 10 <sup>-3</sup>	2 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>
	Nb 93	5	3 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-8</sup>	7 × 10 <sup>-4</sup>
	Nb 95	5	9 × 10 <sup>-7</sup>	4 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-4</sup>
	Nb 97	5	3 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	2 × 10 <sup>-8</sup>	1 × 10 <sup>-4</sup>
Osmium (76)	Os 185	5	1 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	4 × 10 <sup>-8</sup>	4 × 10 <sup>-4</sup>
	Os 191m	5	3 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	4 × 10 <sup>-4</sup>
	Os 191	5	2 × 10 <sup>-7</sup>	1 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	4 × 10 <sup>-4</sup>
	Os 192	5	9 × 10 <sup>-8</sup>	7 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>
	Os 193	5	2 × 10 <sup>-7</sup>	7 × 10 <sup>-3</sup>	6 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>
Palladium (46)	Pd 103	5	1 × 10 <sup>-6</sup>	1 × 10 <sup>-3</sup>	9 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>
	Pd 107	5	7 × 10 <sup>-7</sup>	6 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>
	Pd 109	5	6 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	9 × 10 <sup>-3</sup>
Phosphorus (15)	P 32	5	4 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-8</sup>	7 × 10 <sup>-3</sup>
	P 33	5	7 × 10 <sup>-8</sup>	5 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>
Platinum (78)	Pt 191	5	8 × 10 <sup>-7</sup>	4 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	2 × 10 <sup>-3</sup>
	Pt 195m	5	6 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>
	Pt 195	5	7 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>
	Pt 197	5	5 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>
Plutonium (94)	Pu 238	5	1 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	4 × 10 <sup>-8</sup>	9 × 10 <sup>-3</sup>
	Pu 239	5	3 × 10 <sup>-7</sup>	3 × 10 <sup>-3</sup>	1 × 10 <sup>-8</sup>	2 × 10 <sup>-3</sup>
	Pu 240	5	6 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>
	Pu 241	5	5 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	9 × 10 <sup>-3</sup>
	Pu 242	5	8 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>
	Pu 244	5	4 × 10 <sup>-8</sup>	3 × 10 <sup>-3</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-3</sup>

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APPENDIX B  
 Concentrations in Air and Water Above Natural Background--Continued  
 (See notes at end of appendix)

Element (atomic number)	Isotope	Table I		Table II	
		Column 1	Column 2	Column 1	Column 2
		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )
Plutonium (94)	Pu 242	$2 \times 10^{-12}$	$1 \times 10^{-4}$	$6 \times 10^{-14}$	$3 \times 10^{-4}$
	Pu 243	$4 \times 10^{-11}$	$9 \times 10^{-4}$	$1 \times 10^{-12}$	$3 \times 10^{-4}$
	Pu 244	$2 \times 10^{-10}$	$1 \times 10^{-3}$	$6 \times 10^{-10}$	$2 \times 10^{-4}$
Polonium (84)	Po 210	$2 \times 10^{-11}$	$3 \times 10^{-4}$	$1 \times 10^{-12}$	$1 \times 10^{-4}$
	Po 218	$2 \times 10^{-10}$	$2 \times 10^{-3}$	$3 \times 10^{-11}$	$7 \times 10^{-4}$
Potassium (19)	K 42	$2 \times 10^{-7}$	$9 \times 10^{-3}$	$7 \times 10^{-8}$	$3 \times 10^{-4}$
	K 43	$1 \times 10^{-7}$	$6 \times 10^{-4}$	$4 \times 10^{-8}$	$2 \times 10^{-4}$
Protactinium (91)	Pa 142	$2 \times 10^{-7}$	$9 \times 10^{-4}$	$7 \times 10^{-8}$	$3 \times 10^{-4}$
	Pa 143	$2 \times 10^{-7}$	$9 \times 10^{-4}$	$5 \times 10^{-8}$	$2 \times 10^{-4}$
Promethium (61)	Pm 147	$2 \times 10^{-7}$	$1 \times 10^{-3}$	$1 \times 10^{-8}$	$5 \times 10^{-4}$
	Pm 149	$6 \times 10^{-8}$	$6 \times 10^{-3}$	$2 \times 10^{-8}$	$2 \times 10^{-4}$
Protactinium (91)	Pm 231	$1 \times 10^{-7}$	$6 \times 10^{-3}$	$3 \times 10^{-8}$	$2 \times 10^{-4}$
	Pm 233	$2 \times 10^{-7}$	$1 \times 10^{-3}$	$6 \times 10^{-8}$	$4 \times 10^{-4}$
Radium (88)	Ra 226	$2 \times 10^{-8}$	$2 \times 10^{-3}$	$6 \times 10^{-11}$	$7 \times 10^{-4}$
	Ra 228	$2 \times 10^{-10}$	$1 \times 10^{-4}$	$6 \times 10^{-12}$	$4 \times 10^{-4}$
Radium (88)	Ra 228	$2 \times 10^{-9}$	$7 \times 10^{-3}$	$3 \times 10^{-10}$	$2 \times 10^{-4}$
	Ra 228	$7 \times 10^{-10}$	$2 \times 10^{-4}$	$2 \times 10^{-11}$	$2 \times 10^{-4}$
Radium (88)	Ra 226	$2 \times 10^{-11}$	$4 \times 10^{-7}$	$3 \times 10^{-12}$	$3 \times 10^{-4}$
	Ra 226	$5 \times 10^{-11}$	$9 \times 10^{-7}$	$2 \times 10^{-12}$	$3 \times 10^{-4}$
Radium (88)	Ra 226	$7 \times 10^{-11}$	$6 \times 10^{-7}$	$2 \times 10^{-12}$	$3 \times 10^{-4}$
	Ra 226	$4 \times 10^{-11}$	$7 \times 10^{-7}$	$1 \times 10^{-12}$	$3 \times 10^{-4}$
Radium (88)	Ra 226	$2 \times 10^{-7}$	$2 \times 10^{-3}$	$1 \times 10^{-8}$	$1 \times 10^{-4}$
	Ra 222	$3 \times 10^{-8}$	$1 \times 10^{-3}$	$3 \times 10^{-9}$	$3 \times 10^{-4}$
Rhenium (75)	Re 185	$2 \times 10^{-7}$	$2 \times 10^{-3}$	$9 \times 10^{-8}$	$6 \times 10^{-4}$
	Re 186	$2 \times 10^{-7}$	$2 \times 10^{-3}$	$3 \times 10^{-8}$	$3 \times 10^{-4}$
Rhenium (75)	Re 186	$6 \times 10^{-7}$	$3 \times 10^{-3}$	$2 \times 10^{-8}$	$9 \times 10^{-4}$
	Re 187	$2 \times 10^{-7}$	$1 \times 10^{-3}$	$6 \times 10^{-8}$	$5 \times 10^{-4}$
Rhenium (75)	Re 187	$9 \times 10^{-8}$	$7 \times 10^{-3}$	$3 \times 10^{-8}$	$2 \times 10^{-4}$
	Re 188	$3 \times 10^{-7}$	$4 \times 10^{-3}$	$2 \times 10^{-8}$	$2 \times 10^{-4}$
Rhenium (75)	Re 188	$4 \times 10^{-7}$	$2 \times 10^{-3}$	$1 \times 10^{-8}$	$6 \times 10^{-4}$
	Re 188	$2 \times 10^{-7}$	$9 \times 10^{-4}$	$6 \times 10^{-8}$	$3 \times 10^{-4}$
Rhodium (45)	Rh 106m	$6 \times 10^{-7}$	$4 \times 10^{-3}$	$3 \times 10^{-8}$	$1 \times 10^{-4}$
	Rh 106	$6 \times 10^{-7}$	$3 \times 10^{-3}$	$2 \times 10^{-8}$	$1 \times 10^{-4}$
Rhodium (45)	Rh 106	$6 \times 10^{-7}$	$4 \times 10^{-3}$	$3 \times 10^{-8}$	$1 \times 10^{-4}$
	Rh 106	$3 \times 10^{-7}$	$2 \times 10^{-3}$	$2 \times 10^{-8}$	$1 \times 10^{-4}$
Rubidium (37)	Rb 86	$2 \times 10^{-7}$	$2 \times 10^{-3}$	$1 \times 10^{-8}$	$7 \times 10^{-4}$
	Rb 87	$2 \times 10^{-7}$	$2 \times 10^{-3}$	$2 \times 10^{-8}$	$2 \times 10^{-4}$
Rubidium (37)	Rb 87	$7 \times 10^{-7}$	$7 \times 10^{-3}$	$2 \times 10^{-8}$	$2 \times 10^{-4}$
	Rb 87	$6 \times 10^{-7}$	$3 \times 10^{-3}$	$2 \times 10^{-8}$	$1 \times 10^{-4}$
Rubidium (37)	Rb 87	$7 \times 10^{-7}$	$8 \times 10^{-3}$	$2 \times 10^{-8}$	$2 \times 10^{-4}$
	Rb 87	$7 \times 10^{-7}$	$8 \times 10^{-3}$	$2 \times 10^{-8}$	$2 \times 10^{-4}$

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APPENDIX B  
 Concentrations in Air and Water Above Natural Background—Continued  
 (See notes at end of appendix)

Element (atomic number)	Isotope	Table I		Table II		
		Column 1	Column 2	Column 1	Column 2	
		Air † (μCi/ml)	Water (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)	
Ruthenium (44)	Ru 97	5	$2 \times 10^{-4}$	$1 \times 10^{-3}$	$6 \times 10^{-4}$	$4 \times 10^{-4}$
		1	$2 \times 10^{-4}$	$1 \times 10^{-3}$	$6 \times 10^{-4}$	$3 \times 10^{-4}$
	Ru 100	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-6}$	$2 \times 10^{-7}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-6}$	$2 \times 10^{-7}$
	Ru 106	5	$7 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-6}$	$1 \times 10^{-6}$
Samarium (62)	Ru 106	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-6}$	$1 \times 10^{-6}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-6}$	$1 \times 10^{-6}$
	Sm 147	5	$6 \times 10^{-9}$	$2 \times 10^{-8}$	$2 \times 10^{-10}$	$1 \times 10^{-9}$
		1	$7 \times 10^{-11}$	$2 \times 10^{-11}$	$2 \times 10^{-12}$	$6 \times 10^{-12}$
	Sm 151	5	$2 \times 10^{-10}$	$2 \times 10^{-10}$	$2 \times 10^{-11}$	$7 \times 10^{-12}$
Samarium (62)		1	$6 \times 10^{-10}$	$1 \times 10^{-10}$	$2 \times 10^{-11}$	$4 \times 10^{-11}$
	Sm 153	5	$1 \times 10^{-7}$	$1 \times 10^{-7}$	$2 \times 10^{-8}$	$4 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Sm 155	5	$4 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-6}$	$2 \times 10^{-6}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-6}$	$2 \times 10^{-6}$
Selenium (34)	Se 76	5	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$2 \times 10^{-8}$	$4 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$2 \times 10^{-8}$	$4 \times 10^{-8}$
	Se 78	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$1 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Se 80	5	$1 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
Silicon (14)		1	$1 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Si 31	5	$6 \times 10^{-9}$	$2 \times 10^{-9}$	$2 \times 10^{-10}$	$2 \times 10^{-10}$
		1	$1 \times 10^{-9}$	$2 \times 10^{-9}$	$2 \times 10^{-10}$	$2 \times 10^{-10}$
	Si 32	5	$6 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$1 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$1 \times 10^{-8}$
Silver (47)	Ag 108	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Ag 110m	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$1 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Ag 111	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
Sodium (11)		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Na 22	5	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Na 24	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$1 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
Strontium (38)	Sr 89m	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Sr 90	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Sr 91	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Sr 92	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Sr 94	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
Sulfur (16)	S 35	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	S 36	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
Tellurium (52)	Te 132	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
		1	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$
	Te 130	5	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-8}$	$2 \times 10^{-8}$

PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

APPENDIX B  
 Concentrations in Air and Water Above Natural Background—Continued  
 (See notes at end of appendix.)

Element (atomic number)	Isotope	Table I		Table II		
		Column 1	Column 2	Column 1	Column 2	
		† (μCi/ml)	(pCi/ml)	(μCi/ml)	(pCi/ml)	
Technetium (43)	Tc 96m	5 × 10 <sup>-4</sup>	4 × 10 <sup>-1</sup>	3 × 10 <sup>-4</sup>	1 × 10 <sup>-1</sup>	
		3 × 10 <sup>-3</sup>	3 × 10 <sup>-1</sup>	1 × 10 <sup>-4</sup>	1 × 10 <sup>-1</sup>	
	Tc 96	6 × 10 <sup>-7</sup>	3 × 10 <sup>-2</sup>	2 × 10 <sup>-8</sup>	1 × 10 <sup>-1</sup>	
		2 × 10 <sup>-7</sup>	1 × 10 <sup>-2</sup>	6 × 10 <sup>-9</sup>	5 × 10 <sup>-2</sup>	
	Tc 97m	2 × 10 <sup>-6</sup>	1 × 10 <sup>-2</sup>	8 × 10 <sup>-8</sup>	4 × 10 <sup>-2</sup>	
		2 × 10 <sup>-7</sup>	2 × 10 <sup>-2</sup>	5 × 10 <sup>-8</sup>	2 × 10 <sup>-2</sup>	
	Tc 97	1 × 10 <sup>-7</sup>	5 × 10 <sup>-2</sup>	4 × 10 <sup>-8</sup>	2 × 10 <sup>-2</sup>	
		3 × 10 <sup>-7</sup>	3 × 10 <sup>-2</sup>	1 × 10 <sup>-8</sup>	6 × 10 <sup>-2</sup>	
	Tc 99m	4 × 10 <sup>-3</sup>	2 × 10 <sup>-1</sup>	1 × 10 <sup>-4</sup>	6 × 10 <sup>-2</sup>	
		1 × 10 <sup>-3</sup>	6 × 10 <sup>-2</sup>	5 × 10 <sup>-7</sup>	3 × 10 <sup>-2</sup>	
Tellurium (52)	Te 125m	2 × 10 <sup>-6</sup>	1 × 10 <sup>-2</sup>	7 × 10 <sup>-8</sup>	3 × 10 <sup>-2</sup>	
		6 × 10 <sup>-6</sup>	5 × 10 <sup>-2</sup>	2 × 10 <sup>-7</sup>	2 × 10 <sup>-2</sup>	
	Te 127m	4 × 10 <sup>-7</sup>	3 × 10 <sup>-2</sup>	1 × 10 <sup>-8</sup>	3 × 10 <sup>-2</sup>	
		1 × 10 <sup>-7</sup>	3 × 10 <sup>-2</sup>	4 × 10 <sup>-9</sup>	1 × 10 <sup>-2</sup>	
	Te 127	1 × 10 <sup>-7</sup>	2 × 10 <sup>-2</sup>	5 × 10 <sup>-9</sup>	6 × 10 <sup>-2</sup>	
		4 × 10 <sup>-8</sup>	2 × 10 <sup>-2</sup>	1 × 10 <sup>-9</sup>	6 × 10 <sup>-2</sup>	
	Te 129m	2 × 10 <sup>-6</sup>	6 × 10 <sup>-2</sup>	3 × 10 <sup>-8</sup>	3 × 10 <sup>-2</sup>	
		9 × 10 <sup>-7</sup>	5 × 10 <sup>-2</sup>	3 × 10 <sup>-8</sup>	3 × 10 <sup>-2</sup>	
	Te 129	3 × 10 <sup>-6</sup>	1 × 10 <sup>-2</sup>	2 × 10 <sup>-8</sup>	2 × 10 <sup>-2</sup>	
		5 × 10 <sup>-6</sup>	2 × 10 <sup>-2</sup>	1 × 10 <sup>-7</sup>	6 × 10 <sup>-2</sup>	
Terbium (65)	Tb 148	4 × 10 <sup>-7</sup>	2 × 10 <sup>-2</sup>	1 × 10 <sup>-8</sup>	6 × 10 <sup>-2</sup>	
		2 × 10 <sup>-7</sup>	1 × 10 <sup>-2</sup>	6 × 10 <sup>-9</sup>	4 × 10 <sup>-2</sup>	
	Tb 152	2 × 10 <sup>-7</sup>	9 × 10 <sup>-2</sup>	7 × 10 <sup>-9</sup>	3 × 10 <sup>-2</sup>	
		1 × 10 <sup>-7</sup>	6 × 10 <sup>-2</sup>	4 × 10 <sup>-9</sup>	3 × 10 <sup>-2</sup>	
	Tb 154	1 × 10 <sup>-7</sup>	1 × 10 <sup>-2</sup>	3 × 10 <sup>-9</sup>	4 × 10 <sup>-2</sup>	
		3 × 10 <sup>-8</sup>	1 × 10 <sup>-2</sup>	1 × 10 <sup>-9</sup>	4 × 10 <sup>-2</sup>	
	Thallium (81)	Tl 203	3 × 10 <sup>-6</sup>	1 × 10 <sup>-2</sup>	9 × 10 <sup>-8</sup>	4 × 10 <sup>-2</sup>
			1 × 10 <sup>-6</sup>	7 × 10 <sup>-2</sup>	4 × 10 <sup>-8</sup>	2 × 10 <sup>-2</sup>
		Tl 204	2 × 10 <sup>-6</sup>	9 × 10 <sup>-2</sup>	7 × 10 <sup>-8</sup>	3 × 10 <sup>-2</sup>
			9 × 10 <sup>-7</sup>	3 × 10 <sup>-2</sup>	3 × 10 <sup>-8</sup>	3 × 10 <sup>-2</sup>
Tl 205		5 × 10 <sup>-7</sup>	4 × 10 <sup>-2</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-2</sup>	
		2 × 10 <sup>-7</sup>	2 × 10 <sup>-2</sup>	6 × 10 <sup>-9</sup>	7 × 10 <sup>-2</sup>	
Thorium (90)	Th 227	6 × 10 <sup>-7</sup>	3 × 10 <sup>-2</sup>	3 × 10 <sup>-8</sup>	1 × 10 <sup>-2</sup>	
		3 × 10 <sup>-10</sup>	5 × 10 <sup>-6</sup>	9 × 10 <sup>-11</sup>	6 × 10 <sup>-2</sup>	
	Th 228	2 × 10 <sup>-10</sup>	5 × 10 <sup>-6</sup>	1 × 10 <sup>-11</sup>	2 × 10 <sup>-2</sup>	
		2 × 10 <sup>-10</sup>	5 × 10 <sup>-6</sup>	6 × 10 <sup>-10</sup>	2 × 10 <sup>-2</sup>	
	Th 228	5 × 10 <sup>-13</sup>	2 × 10 <sup>-6</sup>	3 × 10 <sup>-13</sup>	7 × 10 <sup>-2</sup>	
		5 × 10 <sup>-13</sup>	4 × 10 <sup>-6</sup>	2 × 10 <sup>-13</sup>	1 × 10 <sup>-2</sup>	
	Th 230	2 × 10 <sup>-13</sup>	5 × 10 <sup>-6</sup>	5 × 10 <sup>-13</sup>	2 × 10 <sup>-2</sup>	
		2 × 10 <sup>-13</sup>	5 × 10 <sup>-6</sup>	2 × 10 <sup>-13</sup>	3 × 10 <sup>-2</sup>	
	Th 231	1 × 10 <sup>-6</sup>	7 × 10 <sup>-2</sup>	5 × 10 <sup>-8</sup>	2 × 10 <sup>-2</sup>	
		1 × 10 <sup>-6</sup>	7 × 10 <sup>-2</sup>	4 × 10 <sup>-8</sup>	2 × 10 <sup>-2</sup>	
Th natural	Th 232	3 × 10 <sup>-11</sup>	5 × 10 <sup>-6</sup>	1 × 10 <sup>-11</sup>	2 × 10 <sup>-2</sup>	
		3 × 10 <sup>-11</sup>	1 × 10 <sup>-6</sup>	1 × 10 <sup>-11</sup>	4 × 10 <sup>-2</sup>	
	Th natural	6 × 10 <sup>-11</sup>	6 × 10 <sup>-6</sup>	2 × 10 <sup>-11</sup>	2 × 10 <sup>-2</sup>	
		6 × 10 <sup>-11</sup>	6 × 10 <sup>-6</sup>	2 × 10 <sup>-11</sup>	2 × 10 <sup>-2</sup>	

APPENDIX B  
 Concentrations in Air and Water Above Natural Background—Continued  
 (See notes at end of appendix)

Element (atomic number)	Isotope	Table I		Table II		
		Column 1	Column 2	Column 1	Column 2	
		Air ( $\mu\text{Ci/ml}$ )		Water ( $\mu\text{Ci/ml}$ )		
Thorium (90)	Th 234	S	$6 \times 10^{-4}$	$5 \times 10^{-4}$	$5 \times 10^{-4}$	$2 \times 10^{-4}$
		I	$3 \times 10^{-4}$	$2 \times 10^{-4}$	$1 \times 10^{-4}$	$5 \times 10^{-5}$
Thorium (90)	Th 230	S	$4 \times 10^{-4}$	$1 \times 10^{-4}$	$1 \times 10^{-4}$	$5 \times 10^{-5}$
		I	$3 \times 10^{-4}$	$1 \times 10^{-4}$	$1 \times 10^{-4}$	$5 \times 10^{-5}$
Thorium (90)	Th 232	S	$1 \times 10^{-7}$	$1 \times 10^{-7}$	$4 \times 10^{-8}$	$5 \times 10^{-8}$
		I	$5 \times 10^{-8}$	$1 \times 10^{-7}$	$6 \times 10^{-8}$	$5 \times 10^{-8}$
Thorium (90)	Th 231	S	$4 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$9 \times 10^{-8}$
		I	$5 \times 10^{-8}$	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$6 \times 10^{-8}$
Tungsten (Wolfram) (74)	W 186	S	$1 \times 10^{-7}$	$5 \times 10^{-8}$	$4 \times 10^{-8}$	$2 \times 10^{-8}$
		I	$8 \times 10^{-8}$	$3 \times 10^{-8}$	$3 \times 10^{-8}$	$3 \times 10^{-8}$
Tungsten (Wolfram) (74)	W 187	S	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$8 \times 10^{-8}$	$4 \times 10^{-8}$
		I	$1 \times 10^{-7}$	$1 \times 10^{-7}$	$4 \times 10^{-8}$	$3 \times 10^{-8}$
Uranium (92)	U 238	S	$3 \times 10^{-10}$	$2 \times 10^{-10}$	$2 \times 10^{-11}$	$1 \times 10^{-11}$
		I	$1 \times 10^{-10}$	$1 \times 10^{-10}$	$4 \times 10^{-11}$	$5 \times 10^{-12}$
Uranium (92)	U 235	S	$1 \times 10^{-10}$	$8 \times 10^{-11}$	$3 \times 10^{-11}$	$3 \times 10^{-12}$
		I	$3 \times 10^{-11}$	$8 \times 10^{-11}$	$9 \times 10^{-12}$	$3 \times 10^{-12}$
Uranium (92)	U 234	S	$5 \times 10^{-10}$	$9 \times 10^{-11}$	$3 \times 10^{-11}$	$3 \times 10^{-12}$
		I	$1 \times 10^{-10}$	$9 \times 10^{-11}$	$4 \times 10^{-11}$	$5 \times 10^{-12}$
Uranium (92)	U 234m	S <sup>4</sup>	$6 \times 10^{-10}$	$9 \times 10^{-11}$	$3 \times 10^{-11}$	$3 \times 10^{-12}$
		I	$1 \times 10^{-10}$	$9 \times 10^{-11}$	$4 \times 10^{-11}$	$3 \times 10^{-12}$
Uranium (92)	U 233	S <sup>4</sup>	$5 \times 10^{-10}$	$8 \times 10^{-11}$	$3 \times 10^{-11}$	$3 \times 10^{-12}$
		I	$1 \times 10^{-10}$	$8 \times 10^{-11}$	$3 \times 10^{-11}$	$3 \times 10^{-12}$
Uranium (92)	U 236	S	$6 \times 10^{-10}$	$1 \times 10^{-10}$	$2 \times 10^{-11}$	$2 \times 10^{-12}$
		I	$1 \times 10^{-10}$	$1 \times 10^{-10}$	$4 \times 10^{-11}$	$3 \times 10^{-12}$
Uranium (92)	U 238	S <sup>4</sup>	$7 \times 10^{-11}$	$1 \times 10^{-10}$	$3 \times 10^{-11}$	$4 \times 10^{-12}$
		I	$1 \times 10^{-10}$	$1 \times 10^{-10}$	$5 \times 10^{-11}$	$4 \times 10^{-12}$
Uranium (92)	U 240	S	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$8 \times 10^{-8}$	$3 \times 10^{-8}$
		I	$3 \times 10^{-7}$	$1 \times 10^{-7}$	$6 \times 10^{-8}$	$3 \times 10^{-8}$
Uranium (92)	U-natural	S <sup>4</sup>	$1 \times 10^{-10}$	$1 \times 10^{-10}$	$5 \times 10^{-11}$	$3 \times 10^{-12}$
		I	$1 \times 10^{-10}$	$1 \times 10^{-10}$	$3 \times 10^{-11}$	$3 \times 10^{-12}$
Vanadium (23)	V 51	S	$2 \times 10^{-7}$	$9 \times 10^{-8}$	$6 \times 10^{-8}$	$3 \times 10^{-8}$
		I	$6 \times 10^{-8}$	$8 \times 10^{-8}$	$3 \times 10^{-8}$	$3 \times 10^{-8}$
Xenon (54)	Xe 131m	Sub	$2 \times 10^{-7}$		$4 \times 10^{-7}$	
	Xe 133	Sub	$1 \times 10^{-7}$		$3 \times 10^{-7}$	
	Xe 135m	Sub	$1 \times 10^{-7}$		$3 \times 10^{-7}$	
	Xe 138	Sub	$4 \times 10^{-4}$		$1 \times 10^{-7}$	
Ytterbium (70)	Yb 175	S	$7 \times 10^{-7}$	$3 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$
		I	$6 \times 10^{-7}$	$3 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$
Yttrium (39)	Y 90	S	$1 \times 10^{-7}$	$6 \times 10^{-8}$	$4 \times 10^{-8}$	$2 \times 10^{-8}$
		I	$1 \times 10^{-7}$	$6 \times 10^{-8}$	$3 \times 10^{-8}$	$2 \times 10^{-8}$
	Y 91m	S	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$5 \times 10^{-7}$	$3 \times 10^{-7}$
		I	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$6 \times 10^{-7}$	$3 \times 10^{-7}$
	Y 91	S	$4 \times 10^{-8}$	$8 \times 10^{-8}$	$1 \times 10^{-7}$	$3 \times 10^{-7}$
		I	$3 \times 10^{-8}$	$8 \times 10^{-8}$	$1 \times 10^{-7}$	$3 \times 10^{-7}$
	Y 92	S	$4 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$6 \times 10^{-7}$
Y 93	S	$2 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$6 \times 10^{-7}$	
	I	$1 \times 10^{-7}$	$8 \times 10^{-8}$	$3 \times 10^{-7}$	$3 \times 10^{-7}$	

APPENDIX B

Concentrations in Air and Water Above Natural Background—Continued

Element (atomic number)	Isotope	Table I		Table II		
		Column 1	Column 2	Column 1	Column 2	
		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
Zinc (30)	Zn 65	$1 \times 10^{-7}$	$3 \times 10^{-7}$	$4 \times 10^{-7}$	$1 \times 10^{-6}$	
		$6 \times 10^{-7}$	$3 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-6}$	
	Zn 69m	$4 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$7 \times 10^{-7}$	
		$3 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$6 \times 10^{-7}$	
Zinc (30)	Zn 69	$7 \times 10^{-7}$	$3 \times 10^{-7}$	$2 \times 10^{-7}$	$2 \times 10^{-7}$	
		$9 \times 10^{-7}$	$3 \times 10^{-7}$	$3 \times 10^{-7}$	$2 \times 10^{-7}$	
	Zirconium (40)	Zr 93	$1 \times 10^{-7}$	$2 \times 10^{-7}$	$4 \times 10^{-7}$	$8 \times 10^{-7}$
		$3 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$8 \times 10^{-7}$	
	Zr 95	$1 \times 10^{-7}$	$2 \times 10^{-7}$	$4 \times 10^{-7}$	$6 \times 10^{-7}$	
		$3 \times 10^{-7}$	$2 \times 10^{-7}$	$1 \times 10^{-7}$	$6 \times 10^{-7}$	
	Zr 97	$1 \times 10^{-7}$	$3 \times 10^{-7}$	$4 \times 10^{-7}$	$2 \times 10^{-7}$	
		$9 \times 10^{-7}$	$3 \times 10^{-7}$	$3 \times 10^{-7}$	$2 \times 10^{-7}$	
	Sub	$1 \times 10^{-7}$		$3 \times 10^{-7}$		
Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life less than 2 hours.						
Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours.		$3 \times 10^{-10}$	$9 \times 10^{-10}$	$1 \times 10^{-10}$	$3 \times 10^{-10}$	
Any single radionuclide not listed above, which decays by alpha emission or spontaneous fission.		$6 \times 10^{-11}$	$4 \times 10^{-11}$	$2 \times 10^{-11}$	$2 \times 10^{-11}$	

<sup>1</sup>Equable (S) insoluble (I)  
<sup>2</sup>"Sub" means that values given are for submersion in a comprehensive mixture cloud of airborne material.

<sup>3</sup>These radon concentrations are appropriate for protection from radon-222 combined with its short-lived daughters. Alternatively, the value in Table I may be replaced by one-third (1/3) "working level" (A "working level" is defined as any combination of short-lived radon-222 daughters, polonium-218, lead-214, bismuth-214 and polonium-214, in one liter of air, without regard to the degree of equilibrium, that will result in the ultimate emission of  $1.3 \times 10^5$  MeV of alpha particle energy.) The Table II value may be replaced by one-thirtieth (1/30) of a "working level." The limit on radon-222 concentrations in restricted areas may be based on an annual average.

<sup>4</sup>For soluble mixtures of U-235, U-234 and U-238 in air chemical toxicity may be the limiting factor. If the percent by weight (enrichment) of U-235 is less than 5, the concentration value for a 40-hour workweek, Table I, is 0.3 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40-hour workweek shall not exceed  $9 \times 10^{-7}$  SA  $\mu\text{Ci-hr/m}^3$ , where SA is the specific activity of the uranium inhaled. The concentration value for Table II is 0.907 milligrams uranium per cubic meter of air. The specific activity for natural uranium is  $0.77 \times 10^{-4}$  curies per gram U. The specific activity for other mixtures of U-235, U-234 and U-238, if not known, shall be:  
 $\text{SA} = 8.5 \times 10^{-4} \text{ curies/gram U} \frac{U-235}{82.7}$   
 $\text{SA} = (0.4 + 0.28 S + 0.0054 S^2) 10^{-4}$   
 where S is the percentage by weight of U-235, expressed as percent.

\* Amended 37 FR 23319.  
 \*\* Amended 39 FR 23990; fontsize redesignated 40 FR 50704.  
 \*\*\* Amended 40 FR 50704.  
 † Amended 38 FR 29314.  
 ‡ Amended 39 FR 25463; redesignated 40 FR 50704.

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NOTE TO APPENDIX B

NOTE: In any case where there is a mixture in air or water of more than one radionuclide, the limiting values for purposes of this Appendix should be determined as follows:

1. If the identity and concentration of each radionuclide in the mixture are known, the limiting values should be derived as follows: Determine, for each radionuclide in the mixture, the ratio between the quantity present in the mixture and the limit otherwise established in Appendix B for the specific radionuclide when not in a mixture. The sum of such ratios for all the radionuclides in the mixture may not exceed "1" (i.e., "unity").

EXAMPLE: If radionuclides A, B, and C are present in concentrations C<sub>A</sub>, C<sub>B</sub>, and C<sub>C</sub>, and if the applicable MPC's are MPC<sub>A</sub>, MPC<sub>B</sub>, and MPC<sub>C</sub> (respectively), then the concentrations shall be limited so that the following relationship exists:

C<sub>A</sub>/MPC<sub>A</sub> + C<sub>B</sub>/MPC<sub>B</sub> + C<sub>C</sub>/MPC<sub>C</sub> ≤ 1

2. If either the identity or the concentration of any radionuclide in the mixture is unknown, the limiting value for purposes of Appendix B shall be:

- a. For purposes of Table I, Col. 1—5 x 10<sup>-9</sup>
b. For purposes of Table I, Col. 2—5 x 10<sup>-9</sup>
c. For purposes of Table II, Col. 1—5 x 10<sup>-9</sup>
d. For purposes of Table II, Col. 2—5 x 10<sup>-9</sup>

3. If any of the conditions specified below are met, the corresponding values specified below may be used in lieu of those specified in paragraph 2 above.

a. If the identity of each radionuclide in the mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the concentration limit for the mixture is the limit specified in Appendix "B" for the radionuclide in the mixture having the lowest concentration limit; or

b. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in Appendix "B" are not present in the mixture, the concentration limit for the mixture is the lowest concentration limit specified in Appendix "B" for any radionuclide which is not known to be absent from the mixture; or

Table with 4 columns: Element (atomic number) and isotope, Table I Column 1 (Air), Table I Column 2 (Water), Table II Column 1 (Air), Table II Column 2 (Water). Rows include conditions for various radionuclides like Sr 90, Cs 137, etc.

4. If a mixture of radionuclides consists of uranium and its daughters in ore dust prior to chemical separation of the uranium from the ore, the values specified below may be used for uranium and its daughters through radium-226, instead of those from paragraphs 1, 2, or 3 above.

- a. For purposes of Table I, Col. 1—1x10<sup>-9</sup> pCi/ml gross alpha activity; or 5 x 10<sup>-9</sup> pCi/ml natural uranium; or 75 micrograms per cubic meter of air natural uranium.
b. For purposes of Table II, Col. 1—5 x 10<sup>-9</sup> pCi/ml gross alpha activity; or 5 x 10<sup>-9</sup> pCi/ml natural uranium; or 5 micrograms per cubic meter of air natural uranium.

5. For purposes of this Note, a radionuclide may be considered as not present in a mixture if (a) the ratio of the concentration of that radionuclide in the mixture (C<sub>i</sub>) to the concentration limit for that radionuclide specified in Table II of Appendix B (MPC<sub>i</sub>) does not exceed the

(i.e. C<sub>i</sub>/MPC<sub>i</sub> ≤ 1/10) and (b) the sum of such ratios for all the radionuclides considered as not present in the mixture does not exceed 1/10.

C<sub>A</sub>/MPC<sub>A</sub> + C<sub>B</sub>/MPC<sub>B</sub> + ... ≤ 1/10



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APPENDIX C

Material	Microcuries
Americium-241	0.1
Antimony-123	100
Antimony-124	10
Antimony-125	10
Arsenic-73	100
Arsenic-74	10
Arsenic-76	10
Arsenic-77	100
Barium-131	10
Barium-134	10
Barium-140	10
Bismuth-210	1
Bromine-82	10
Cadmium-109	10
Cadmium-115m	10
Cadmium-115	100
Calcium-45	10
Calcium-47	10
Carbon-14	100
Cerium-141	100
Cerium-143	100
Cerium-144	1
Cesium-131	1,000
Cesium-134m	100
Cesium-134	1
Cesium-135	10
Cesium-136	10
Cesium-137	10
Chlorine-36	10
Chlorine-38	10
Chromium-51	1,000
Cobalt-58m	10
Cobalt-58	10
Cobalt-60	1
Copper-64	100
Dysprosium-165	10
Dysprosium-166	100
Erbium-169	100
Erbium-171	100
Europium-152 9.2 h	1
Europium-152 13 yr	1
Europium-154	10
Europium-155	10
Fluorine-18	1,000
Gadolinium-153	10
Gadolinium-156	100
Gallium-72	10
Germanium-71	100
Gold-198	100
Gold-199	100
Hafnium-181	10
Holmium-166	100
Hydrogen-3	1,000
Indium-113m	100
Indium-114m	10
Indium-115m	100
Indium-115	10
Iodine-125	1
Iodine-126	1
Iodine-129	0.1
Iodine-131	1
Iodine-132	10
Iodine-133	1
Iodine-134	10
Iodine-135	10
Iridium-192	10
Iridium-194	100
Iron-55	100
Iron-59	10
Krypton-85	100
Krypton-87	10
Lanthanum-140	10
Lutetium-177	100
Manganese-53	10
Manganese-54	10
Manganese-56	10
Mercury-197m	100
Mercury-197	100
Mercury-203	10
Molybdenum-99	100
Neodymium-147	100
Neodymium-149	100
Nickel-50	100
Nickel-63	10
Nickel-65	100
Niobium-93m	10
Niobium-95	10
Niobium-97	10
Osmium-185	10

Material	Microcuries
Osmium-191m	100
Osmium-191	100
Osmium-196	100
Palladium-103	100
Palladium-106	100
Phosphorus-32	10
Platinum-191	100
Platinum-195m	100
Platinum-195	100
Platinum-197m	100
Platinum-197	100
Plutonium-239	0.1
Potassium-40	0.1
Potassium-42	10
Praseodymium-143	100
Praseodymium-145	100
Promethium-167	10
Promethium-169	10
Radium-226	0.1
Rhenium-187	100
Rhenium-188	100
Rhenium-189	100
Rhodium-103m	100
Rhodium-105	100
Rubidium-86	10
Rubidium-87	10
Ruthenium-97	100
Ruthenium-100	10
Ruthenium-101	10
Ruthenium-106	1
Samarium-151	10
Samarium-153	100
Scandium-46	10
Scandium-47	100
Scandium-48	10
Selenium-75	10
Silicon-31	100
Silver-106	10
Silver-110m	1
Silver-111	100
Sodium-24	10
Strontium-85	10
Strontium-89	1
Strontium-90	0.1
Strontium-91	10
Strontium-92	10
Sulfur-35	100
Tantalum-182	10
Technetium-96	10
Technetium-97m	100
Technetium-97	100
Technetium-99m	100
Technetium-99	10
Tellurium-125m	10
Tellurium-127m	10
Tellurium-127	100
Tellurium-129m	10
Tellurium-130	100
Tellurium-131m	10
Tellurium-133	10
Terbium-160	10
Thallium-200	100
Thallium-201	100
Thallium-204	100
Thallium-208	10
Thallium-210	100
Thorium (natural)	10
Thorium-230	10
Thorium-232	10
Tin-113	10
Tin-125	10
Tungsten-181	10
Tungsten-186	10
Tungsten-187	100
Uranium (natural)	100
Uranium-235	0.1
Uranium-234	0.1
Uranium-238	0.1
Vanadium-48	10
Xenon-131m	1,000
Xenon-135	100
Xenon-136	100
Ytterbium-176	100
Yttrium-90	10
Yttrium-91	10
Yttrium-92	100
Yttrium-93	100
Zinc-65	10
Zinc-69m	100
Zinc-69	1,000
Zirconium-93	10
Zirconium-95	10
Zirconium-97	10

Any alpha emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition 0.1

Any radionuclide other than alpha emitting radionuclides, not listed above or mixtures of beta emitters of unknown composition... 1

Note.—For purposes of § 20.203, where there is involved a combination of isotopes in known amounts, the limit for the combination shall be derived as follows. Determine, for each isotope in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific isotope when not in combination. The sum of such ratios for all the isotopes in the combination may not exceed "1" (i.e., "unity").

<sup>1</sup> Based on alpha disintegration rate of Th-232, Th-230 and their daughter products.  
<sup>2</sup> Based on alpha disintegration rate of U-238, U-234, and U-235.  
 \* Amended 36 FR 16898.  
 \*\* Amended 39 FR 33940.

## PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

## APPENDIX D.—UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICES

	Address	Telephone (24 hours)
Region I: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont	USNRC, 475 Rhode Ave. Bldg. King of Prussia, Pa. 19151	(215) 397-8000 (FTS) 241-8700
Region II: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, Virgin Islands, and West Virginia	USNRC, 101 Marietta Street, NW, Suite 2900, Atlanta, GA 30323	(404) 331-4503 (FTS) 243-4800
Region III: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin	USNRC, 799 Roosevelt Road, Glen Ellyn, IL 60137	(312) 780-6600 (FTS) 388-6800
Region IV: Arkansas, Colorado, Idaho, Kansas, Louisiana, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming	USNRC, 911 Ryan Pass Drive, Suite 1080, Arlington, TX 76011	(817) 680-6100 (FTS) 728-6100
Region IV: Field Office	USNRC, Region IV Uranium Recovery Field Office, 730 Brown Street, P.O. Box 24326, Denver, CO 80226	(303) 236-2805 (FTS) 776-2805
Region V: Alaska, Arizona, California, Hawaii, Nevada, Oregon, Pacific Trust Territories, and Washington	USNRC, 1480 Marin Lane, Suite 210, Walnut Creek, CA 94595	(415) 943-3700 (FTS) 488-3700

53 FR 7361

UNITED STATES NUCLEAR REGULATORY COMMISSION  
RULES and REGULATIONS

TITLE 10, CHAPTER 1, CODE OF FEDERAL REGULATIONS - ENERGY

30.1

30.4(g)

**PART  
30**

**RULES OF GENERAL APPLICABILITY TO DOMESTIC  
LICENSING OF BYPRODUCT MATERIAL ★ ★**

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- 30.61 Modification and revocation of licenses.
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**SCHEDULES**

- 30.70 Schedule A—exempt concentrations.
- 30.71 Schedule B.

Appendix A Criteria Relating to Use of Financial Tests and Parent Company Guarantees for Providing Reasonable Assurance of Funds for Decommissioning.

Authority: Secs. 81, 82, 161, 162, 163, 166, 66 Stat. 935, 946, 953, 954, 955, as amended, sec. 234, 68 Stat. 444, as amended (42 U.S.C. 2111, 2112, 2201, 2232, 2233, 2236, 2282); secs. 201, as amended, 202, 205, 66 Stat. 1242, as amended, 1244, 1246 (42 U.S.C. 5841, 5842, 5846).

Section 30.7 also issued under Pub. L. 95-601, sec. 10, 82 Stat. 2861 (42 U.S.C. 5851). Section 30.34(b) also issued under sec. 164, 66 Stat. 954, as amended (42 U.S.C. 2234). Section 30.61 also issued under sec. 187, 66 Stat. 956 (42 U.S.C. 2237).

For the purposes of sec. 223, 66 Stat. 956, as amended (42 U.S.C. 2273), §§ 30.3, 30.34(b) and (c), 30.41 (a) and (c), and 30.53 are issued under sec. 161b, 66 Stat. 946, as amended (42 U.S.C. 2201(b)); and §§ 30.6, 30.8, 30.36, 30.51, 30.52, 30.55, and 30.56 (b) and (c) are issued under sec. 161c, 66 Stat. 950, as amended (42 U.S.C. 2201(c)).

§ 30.1 Purpose and scope.

This part prescribes rules applicable to all persons in the United States governing domestic licensing of byproduct material under the Atomic Energy Act of 1954, as amended (68 Stat. 919), and under Title II of the Energy Reorganization Act of 1974 (88 Stat. 1242), and exemptions from the domestic licensing requirements permitted by section 81 of the Act.

§ 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.

§ 30.3 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, or use 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 through 35 and 39 of this chapter:

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

(a-1) "Department" and "Department of Energy" means the Department of Energy established by the Department of Energy Organization Act (Pub. L. 96-91, 91 Stat. 566, 42 U.S.C. 7101 et seq.) to the extent that the Department, or its duly authorized representatives, exercises functions formerly vested in the U.S. Atomic Energy Commission, its Chairman, members, officers and components and transferred to the U.S. Energy Research and Development Administration and to the Administrator thereof pursuant to sections 104 (b), (c) and (d) of the Energy Reorganization Act of 1974 (Pub. L. 93-438, 88 Stat. 1233 at 1237, 42 U.S.C. 5814) and retransferred to the Secretary of Energy pursuant to section 301(a) of the Department of Energy Organization Act (Pub. L. 95-91, 91 Stat. 565 at 577-578, 42 U.S.C. 7151).

(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 through 35 and 39 to the extent such terms are not specifically defined in this part;

(c) "Agreement State" means any state with which the Atomic Energy Commission or the Nuclear Regulatory 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 Nuclear Regulatory 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

PART 30 • RULES OF GENERAL APPLICABILITY TO DOMESTIC LICENSING

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) "Medical use" means the intentional internal or external administration of byproduct material, or the radiation therefrom, to human beings in the practice of medicine in accordance with a license issued by a State or Territory of the United States, the District of Columbia, or the Commonwealth of Puerto Rico.

(i) "License", except where otherwise specified means a license for byproduct material issued pursuant to the regulations in this part and Parts 31 through 35 and 39 of this chapter;

(j)(1) "Microcurie" means that amount of radioactive material which disintegrates at the rate of 37 thousand atoms per second;

(2) "Millicurie" means that amount of radioactive material which disintegrates at the rate of 37 million 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 or the Department, except that the Department shall be considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to section 202 of the Energy Reorganization Act of 1974 (88 Stat. 1244), 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;

The Department facilities and activities identified in section 202 are:

(1) Demonstration Liquid Metal Fast Breeder reactors when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for the purpose of demonstrating the suitability for commercial application of such a reactor.

(2) Other demonstration nuclear reactors, except those in existence on January 19, 1975, when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for the purpose of demonstrating the suitability for commercial application of such a reactor.

(3) Facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from licensed activities.

(4) Retrievable Surface Storage Facilities and other facilities authorized for the ex-

(l) "Physician" means a medical doctor or doctor of osteopathy licensed by a State or Territory of the United States, the District of Columbia, or the Commonwealth of Puerto Rico to prescribe 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 radiation 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 through 35 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;

press purpose of subsequent long-term storage of high-level radioactive waste generated by the Department, which are not used for, or are part of, research and development activities.

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

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

(w) "Commencement of construction" means any clearing of land, excavation, or other substantial action that would adversely affect the natural environment of a site but does not include changes desirable for the temporary use of the land for public recreational uses, necessary borings to determine site characteristics or other preconstruction monitoring to establish background information related to the suitability of a site or to the protection of environmental values.

(x) [removed] 52 FR 8225

(y) "Dentist" means an individual licensed by a State or Territory of the United States, the District of Columbia, or the Commonwealth of Puerto Rico to practice dentistry.

(z) "Podiatrist" means an individual licensed by a State or Territory of the United States, the District of Columbia, or the Commonwealth of Puerto Rico to practice podiatry.

(aa) "Decommission" means to remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of license.

§ 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 through 35 and 39 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.

(a) Unless otherwise specified or covered under the regional licensing program as provided in paragraph (b) of this section, any communication or report concerning the regulations in Parts 30 through 35 and 39 of this chapter and any application filed under these regulations may be submitted to the Commission as follows:

(1) By mail addressed to: Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20545.

(2) By delivery in person to the Commission's offices to the Director, Office of Nuclear Material Safety and Safeguards at:

(i) 2120 L Street, N.W., Washington, D.C.; or

(ii) 11555 Rockville Pike, One White Flint North, Rockville, Maryland.

(b) The Commission has delegated to the five Regional Administrators licensing authority for selected parts of its decentralized licensing program for nuclear materials as described in paragraph (b)(1) of this section. Any communication, report, or application covered under this licensing program must be submitted as specified in paragraph (b)(2) of this section.

(1) The delegated licensing program includes authority to issue, renew, amend, cancel, modify, suspend, or revoke licenses for nuclear materials issued pursuant to 10 CFR Parts 30 through 35, 39, 40, and 70 to all persons for academic, medical, and industrial uses, with the following exceptions:

(i) Activities in the fuel cycle and special nuclear material in quantities sufficient to constitute a critical mass in any room or area. This exception does not apply to license modifications relating to termination of special nuclear material licenses that authorize possession of larger quantities when the case is referred for action from NRC's Headquarters to the Regional Administrators.

(ii) Health and safety design review of sealed sources and devices and approval, for licensing purposes, of sealed sources and devices.

(iii) Processing of source material for extracting of metallic compounds (including Zirconium, Hafnium, Tantalum, Titanium, Niobium, etc.).

(iv) Distribution of products containing radioactive material to persons exempt pursuant to 10 CFR 32.11 through 32.25.

(v) New uses or techniques for use of byproducts, source, or special nuclear material.

(2) Submissions—(i) Region I. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following

Region I non-Agreement States and the District of Columbia: Connecticut, Delaware, Maine, Massachusetts, New Jersey, Pennsylvania, and Vermont. All inquiries, communications, and applications for a new license or an amendment or renewal of an existing license specified in paragraph (b)(1) of this section must be sent to: U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, 475 Aldendale Road, King of Prussia, Pennsylvania 19406.

(ii) Region II. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region II non-Agreement States and territories: Virginia, West Virginia, Puerto Rico, and the Virgin Islands. All inquiries, communications, and applications for a new license or an amendment or renewal of an existing license specified in paragraph (b)(1) of this section must be sent to: U.S. Nuclear Regulatory Commission, Region II, Material Radiation Protection Section, 101 Marietta Street, NW, Suite 2900, Atlanta, Georgia 30323.

(iii) Region III. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region III non-Agreement States: Indiana, Michigan, Minnesota, Minnesota, Missouri, Ohio, and Wisconsin. All inquiries, communications, and applications for a new license or an amendment or renewal of an existing license specified in paragraph (b)(1) of this section must be sent to: U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 798 Roosevelt Road, Glen Ellyn, Illinois 60137.

(iv) Region IV. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region IV non-Agreement States: Montana, Oklahoma, South Dakota, and Wyoming. All inquiries, communications, and applications for a new license or an amendment or renewal of an existing license specified in paragraph (b)(1) of this section must be sent to: U.S. Nuclear Regulatory Commission, Region IV, Material Radiation Protection Section, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011.

(v) Region V. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region V

non-Agreement States and a territory: Alaska, Hawaii, and Guam. All inquiries, communications, and applications for a new license or an amendment or renewal of an existing license specified in paragraph (b)(1) of this section must be sent to: U.S. Nuclear Regulatory Commission, Region V, Material Radiation Protection Section, 1480 Maricopa Lane, Suite 210, Walnut Creek, California 94597.

§ 30.7 Employee protection.

(a) Discrimination by a Commission licensee, an applicant for a Commission license, or a contractor or subcontractor of a Commission licensee or applicant against an employee for engaging in certain protected activities is prohibited. Discrimination includes discharge and other actions that relate to compensation, terms, conditions, and privileges of employment. The protected activities are established in section 210 of the Energy Reorganization Act of 1974, as amended, and in general are related to the administration or enforcement of a requirement imposed under the Atomic Energy Act or the Energy Reorganization Act.

(1) The protected activities include but are not limited to—

(i) Providing the Commission information about possible violations of requirements imposed under either of the above statutes;

(ii) Requesting the Commission to institute action against his or her employer for the administration or enforcement of these requirements; or

(iii) Testifying in any Commission proceeding.

(2) These activities are protected even if no formal proceeding is actually initiated as a result of the employee assistance or participation.

(3) This section has no application to any employee alleging discrimination prohibited by this section who, acting without direction from his or her employer (or the employer's agent), deliberately causes a violation of any requirement of the Energy Reorganization Act of 1974, as amended, or the Atomic Energy Act of 1954, as amended.

(b) Any employee who believes that he or she has been discharged or otherwise discriminated against by any person for engaging in the protected activities specified in paragraph (a)(1) of this section may seek a remedy for the discharge or discrimination through an administrative proceeding in the Department of Labor. The administrative proceeding must be initiated within 90 days after an alleged violation occurs by filing a complaint alleging the violation with the Department of Labor, Employment Standards Administration, Wage and Hour Division. The Department of Labor

may order reinstatement, back pay, and compensatory damages.

(c) A violation of paragraph (a) of this section by a Commission licensee, an applicant for a Commission license, or a contractor or subcontractor of a Commission licensee or applicant may be grounds for—

(1) Denial, revocation, or suspension of the license.

(2) Imposition of a civil penalty on the licensee or applicant.

(3) Other enforcement action.

(d) Actions taken by an employer, or others, which adversely affect an employee may be predicated upon nondiscriminatory grounds. The prohibition applies when the adverse action occurs because the employee has engaged in protected activities. An employee's engagement in protected activities does not automatically render him or her immune from discharge or discipline for legitimate reasons or from adverse action dictated by nonprohibited considerations.

(e) Each licensee and each applicant shall post Form NRC-3, "Notice to Employees," on its premises. Posting must be at locations sufficient to permit employees protected by this section to observe a copy on the way to or from their place of work. Premises must be posted not later than 30 days after an application is docketed and remain posted while the application is pending before the Commission, during the term of the license, and for 30 days following license termination.

**Note.**—Copies of Form NRC-3 may be obtained by writing to the Regional Administrator of the appropriate U.S. Nuclear Regulatory Commission Regional Office listed in Appendix D, Part 30 of this chapter.

(f) The general licenses provided in Parts 31 and 35 of this chapter are exempt from paragraph (e) of this section.

#### § 30.8 Information collection requirements: OMB approval

(a) The Nuclear Regulatory Commission has submitted the information collection requirements contained in this part to the Office of Management and Budget (OMB) for approval as required by the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). OMB has approved the information collection requirements contained in this part under control number 3150-0017.

(b) The approved information collection requirements contained in this part appear in §§ 30.15, 30.18, 30.20, 30.22, 30.34, 30.36, 30.37, 30.38, 30.51, 30.55, and 30.56.

(c) This part contains information collection requirements in addition to

those approved under the control number specified in paragraph (a) of this section. These information collection requirements and the control numbers under which they are approved are as follows:

(1) In §§ 30.22, 30.37, and 30.38, Form NRC-312I is approved under control number 3150-0042.

(2) In §§ 30.22, 30.37, and 30.38, Form NRC-315T is approved under control number 3150-0031.

(3) In § 30.36, Form NRC-314 is approved under control number 3150-0028.

(4) In §§ 30.37 and 30.38, Form NRC-313M is approved under control number 3150-0041.

(5) In §§ 30.37 and 30.38, Form NRC-313R is approved under control number 3150-0023.

#### § 30.9 Completeness and accuracy of information

(a) Information provided to the Commission by an applicant for a license or by a licensee or information required by statute or by the Commission's regulations, orders, or license conditions to be maintained by the applicant or the licensee shall be complete and accurate in all material respects.

(b) Each applicant or licensee shall notify the Commission of information identified by the applicant or licensee as having for the regulated activity a significant implication for public health and safety or common defense and security. An applicant or licensee violates this paragraph only if the applicant or licensee fails to notify the Commission of information that the applicant or licensee has identified as having a significant implication for public health and safety or common defense and security. Notification shall be provided to the Administrator of the appropriate Regional Office within two working days of identifying the information. This requirement is not applicable to information which is already required to be provided to the Commission by other reporting or updating requirements.

47 FR 30452

52 FR 49362

49 FR 19625

EXEMPTIONS

§ 30.11 Specific exemptions.

(a) The Commission may, upon application of any interested person or upon its own initiative, grant such exemptions from the requirements of the regulations in this part and Parts 31-35 and 39 of this chapter as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest.

(b) [Deleted 45 FR 6562]

(c) The DOE is exempt from the requirements of this part to the extent that its activities are subject to the requirements of Part 60 of this chapter.

(d) Except as specifically provided in Part 61 of this chapter, any licensee is exempt from the requirements of this part to the extent that its activities are subject to the requirements of Part 61 of this chapter.

§ 30.12 Persons using byproduct material under certain Department of Energy and Nuclear Regulatory Commission contracts.

Except to the extent that Department facilities or activities of the types subject to licensing pursuant to section 202 of the Energy Reorganization Act of 1974 are involved, any prime contractor of the Department 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 Department manufactures, produces, transfers, receives, acquires, owns, possesses, or uses byproduct material for: (a) The performance of work for the Department at a United States Government-owned or controlled site, including the transportation of by-product material to or from such site and the performance of contract services during temporary interruptions of such transportation; (b) re-

search 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 and subject to the requirement for licensing of Department facilities and activities pursuant to section 202 of the Energy Reorganization Act of 1974, any prime contractor or subcontractor of the Department or 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, or uses 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.

§ 30.13 Carriers.

Common and contract carriers, freight forwarders, warehousemen, and the U.S. Postal Service are exempt from the regulations in this part and Parts 31-35 and 39 of this chapter and the requirements for a license set forth in section 81 of the Act to the extent that they transport or store byproduct material in the regular course of carriage for another or storage incident thereto.

§ 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 31-35 and 39 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 39 of this chapter 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, the Commission, or the Atomic Energy 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 this chapter.

§ 30.15 Certain items containing byproduct material.

(a) Except for persons who apply byproduct material to, or persons who incorporate byproduct material into, the following products, or persons who initially transfer for sale or distribution the following products containing byproduct material, 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 30-35 and 39 of this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires the following products:

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32 FR 13820

31 FR 9315

(1) Timepieces or hands or dials containing not more than the following specified quantities of byproduct material and not exceeding the following specified levels of radiation:

- (i) 25 millicuries of tritium per timepiece,
- (ii) 5 millicuries of tritium per hand,
- (iii) 15 millicuries of tritium per dial (bezels when used shall be considered as part of the dial),
- (iv) 100 microcuries of promethium-147 per watch or 200 microcuries of promethium-147 per any other timepiece,
- (v) 20 microcuries of promethium-147 per watch hand or 40 microcuries of promethium-147 per other timepiece hand,

(vi) 60 microcuries of promethium-147 per watch dial or 120 microcuries of promethium-147 per other timepiece dial (bezels when used shall be considered as part of the dial),

(vii) The levels of radiation from hands and dials containing promethium-147 will not exceed, when measured through 50 milligrams per square centimeter of absorber:

- (a) For wrist watches, 0.1 millirad per hour at 10 centimeters from any surface,
- (b) For pocket watches, 0.1 millirad per hour at 1 centimeter from any surface,
- (c) For any other timepiece, 0.2 millirad per hour at 10 centimeters from any surface.

(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.

(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) [Deleted 34 FR 6651.]

(8) Electron tubes: *Provided*, That each tube does not contain more than one of the following specified quantities of byproduct material:

- (i) 150 millicuries of tritium per microwave receiver protector tube or 10 millicuries of tritium per any other electron tube;
- (ii) 1 microcurie of cobalt-60;
- (iii) 5 microcuries of nickel-63;
- (iv) 30 microcuries of krypton-85;
- (v) 5 microcuries of cesium-137;
- (vi) 30 microcuries of promethium-147;

*And provided further*, That the levels of radiation from each electron tube containing byproduct material do not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber.<sup>3</sup>

(9) Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, one or more sources of byproduct material: *Provided*, That:

- (i) Each source contains no more than one exempt quantity set forth in § 30.71, Schedule B, and
- (ii) Each instrument contains no more than 10 exempt quantities. For purposes of this paragraph (a)(9), an instrument's source(s) may contain either one type or different types of radionuclides and an individual exempt quantity may be composed of fractional parts of one or more of the exempt quantities in § 30.71, Schedule B, provided that the sum of such fractions shall not exceed unity.

(iii) For purposes of this paragraph (a)(9), 0.05 microcurie of americium-241 is considered an exempt quantity under § 30.71, Schedule B.

<sup>3</sup>For purposes of this subparagraph "electron tubes" include spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pickup tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents.

(10) Spark gap irradiators containing not more than 1 microcurie of cobalt-60 per spark gap irradiator for use in electrically ignited fuel oil burners having a firing rate of at least 3 gallons per hour (11.4 liters per hour).

(b) Any person who desires to apply byproduct material to, or to incorporate byproduct material into, the products exempted in paragraph (a) of this section, or who desires to initially transfer for sale or distribution such products containing byproduct material, 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.

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 30-35.39 of this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires synthetic plastic resins containing scandium-46 which are designed for sand-consolidation in oil wells, and which have been manufactured or initially transferred 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 initial transfer for sale or distribution of any resins containing scandium-46.

§ 30.18 Exempt quantities.

(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 Parts 30-34.39 of this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires byproduct material in individual quantities each of which does not exceed the applicable quantity set forth in § 30.71, Schedule B.



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(b) Any person who possesses by-product material received or acquired prior to September 25, 1971, under the general license then provided in § 31.4 of this chapter is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in Parts 30-34 of this chapter to the extent that such person possesses, uses, transfers, or owns such byproduct material.

(c) This section does not authorize for purposes of commercial distribution the production, packaging, repackaging, or transfer of byproduct material, or the incorporation of byproduct material into products intended for commercial distribution.

(d) No person may, for purposes of commercial distribution, transfer by-product material in the individual quantities set forth in § 30.71 Schedule B, knowing or having reason to believe that such quantities of byproduct material will be transferred to persons exempt under this section or equivalent regulations of an Agreement State, except in accordance with a license issued under § 32.18 of this chapter, which license states that the byproduct material may be transferred by the licensee to persons exempt under this section or the equivalent regulations of an Agreement State.

§ 30.19 Self-luminous products containing tritium, krypton-85, or promethium-147.

(a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution self-luminous products containing tritium, krypton-85, or promethium-147, and except as provided in paragraph (c) 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 Parts 20 and 30-35, 39 of this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires tritium, krypton-85, or promethium-147 in self-luminous products manufactured, processed, produced, or initially transferred in accordance with a specific license issued pursuant to § 32.22 of this chapter, which license authorizes the initial transfer of the product for use under this action.

(b) Any person who desires to manufacture, process, or produce self-luminous products containing tritium, krypton-85, or promethium-147, or to transfer such products for use pursuant to paragraph (a) of this section, should apply for a

license pursuant to § 32.22 of this chapter, which license states that the product may be transferred by the licensee to persons exempt from the regulations pursuant to paragraph (a) of this section or equivalent regulations of an Agreement State.

(c) The exemption in paragraph (a) of this section does not apply to tritium, krypton-85, or promethium-147 used in products primarily for frivolous purposes or in toys or adornments.

§ 30.27 Gas and aerosol detectors containing byproduct material.

(a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution gas and aerosol detectors containing byproduct material, 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 30-35, 39 of this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires byproduct material in gas and aerosol detectors designed to protect life or property from fires and airborne hazards, and manufactured, processed, produced, or initially transferred in accordance with a specific license issued pursuant to § 32.26 of this chapter, which license authorizes the initial transfer of the product for use under this section.

(b) Any person who desires to manufacture, process, or produce gas and aerosol detectors containing byproduct material, or to initially transfer such products for use pursuant to paragraph (a) of this section, should apply for a license pursuant to § 32.26 of this chapter, which license states that the product may be initially transferred by the licensee to persons exempt from the regulations pursuant to paragraph (a) of this section or equivalent regulations of an Agreement State.

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 32-35, 39. General licenses are effective without the filing of applications with the Commission or the issuance of licensing documents to particular persons.

§ 30.32 Application for specific licenses.

(a) A person may file an application in duplicate on NRC Form 313, "Application for Material License," in accordance with the instructions in § 30.8 of this chapter. Information contained in previous applications, statements or reports filed with the Commission or the Atomic Energy Commission may be incorporated by reference, provided that the reference is 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 32-35 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 activities for which licenses are requested and complies with regulations of the Commission as to applications for such licenses.

(e) Each application for a byproduct material license, other than a license exempted from Part 170 of this chapter, shall be accompanied by the fee prescribed in § 170.31 of this chapter. No fee will be required to accompany an application for renewal or amendment of a license, except as provided in § 170.31 of this chapter.

(f) An application for a license to receive and possess byproduct material for the conduct of any activity which the Commission has determined pursuant to Subpart A of Part 51 of this chapter will significantly affect the quality of the environment shall be filed at least 9 months prior to commencement of construction of the plant or facility in which the activity will be conducted and shall be accompanied by any Environmental Report required pursuant to Subpart A of Part 51 of this chapter.

(g) An application for a specific license to use byproduct material in the form of a sealed source or in a device that contains the sealed source must either—

(1) Identify the source or device by manufacturer and model number as registered with the Commission under § 32.210 of this chapter or with an Agreement State; or

(2) Contain the information identified in § 32.210(c).

(h) As provided by § 30.35, certain applications for specific licenses filed under this part and Parts 32 through 35 of this chapter must contain a proposed decommissioning funding plan or a certification of financial assurance for decommissioning. In the case of renewal applications submitted before July 27, 1990, this submittal may follow the renewal application but must be submitted on or before July 27, 1990.

§ 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;

(4) The applicant satisfies any special requirements contained in Parts 32-35, 39 and

(5) In the case of an application for a license to receive and possess byproduct material for the conduct of any activity which the Commission determines will significantly affect the quality of the environment, the Director of Nuclear Material Safety and Safeguards or his designee, before commencement of construction of the plant or facility in which the activity will be conducted, on the basis of information filed and evaluations made pursuant to Subpart A of Part 51 of this chapter, has concluded, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. Commencement of construction prior to such conclusion shall be grounds for denial of a license to receive and possess byproduct material in such plant or facility. As used in this paragraph the term "commencement of construction" means any clearing of land, excavation, or other substantial action that would adversely affect the environment of a site. The term does not

mean site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring or testing to establish background information related to the suitability of the site or the protection of environmental values.

(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 NRC-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 31-35, 39 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 31-35, 39 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 31-35, 39 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 31-35, 39 of this chapter shall carry with it the right to receive, acquire, own, and possess, byproduct material. Preparation for shipment and transport of byproduct material shall be in accordance with the provisions of Part 71 of this chapter.

(d) Each license issued pursuant to the regulations in this part and Parts 31-35, 39 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 31-35, 39 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.

(f) [Reserved] 48 FR 22324

(g) Each licensee preparing technetium-99m radiopharmaceuticals from molybdenum-99/technetium-99m generators shall test the generator eluates for molybdenum-99 breakthrough in accordance with § 35.204 of this chapter. The licensee shall record the results of each test and retain each record for three years after the record is made.

(h)(1) Each licensee shall notify the appropriate NRC Regional Administrator, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapter of Title 11 (Bankruptcy) of the United States Code by or against:

- (i) The licensee;
(ii) An entity (as that term is defined in 11 U.S.C. 101(14)) controlling the licensee or listing the license or licensee as property of the estate; or
(iii) An affiliate (as that term is defined in 11 U.S.C. 101(2)) of the licensee.

(2) This notification must indicate:

- (i) The bankruptcy in which the petition for bankruptcy was filed; and
(ii) The date of the filing of the petition.

§ 30.35 Financial assurance and recordkeeping for decommissioning.

(a) Each applicant for a specific license authorizing the possession and use of unsealed byproduct material of half-life greater than 120 days and in quantities exceeding 10^6 times the applicable quantities set forth in Appendix C to 10 CFR Part 20 shall submit a decommissioning funding plan as described in paragraph (e) of this section. The decommissioning funding plan must also be submitted when a combination of isotopes is involved if R divided by 10^6 is greater than 1 (unity rule), where R is defined here as the sum of the ratios of the quantity of each

isotope to the applicable value in Appendix C.

(b) Each applicant for a specific license authorizing possession and use of byproduct material of half-life greater than 120 days and in quantities specified in paragraph (d) of this section shall either—

(1) Submit a decommissioning funding plan as described in paragraph (e) of this section; or

(2) Submit a certification that financial assurance for decommissioning has been provided in the amount prescribed by paragraph (d) of this section using one of the methods described in paragraph (f) of this section. For an applicant, this certification may state that the appropriate assurance will be obtained after the application has been approved and the license issued but prior to the receipt of licensed material. As part of the certification, a copy of the financial instrument obtained to satisfy the requirements of paragraph (f) of this section is to be submitted to NRC.

(c) (1) Each holder of a specific license issued on or after July 27, 1990, which is of a type described in paragraph (a) or (b) of this section, shall provide financial assurance for decommissioning in accordance with the criteria set forth in this section.

(2) Each holder of a specific license issued before July 27, 1990, and of a type described in paragraph (a) of this section shall submit, on or before July 27, 1990, a decommissioning funding plan or a certification of financial assurance for decommissioning in an amount at least equal to \$750,000 in accordance with the criteria set forth in this section. If the licensee submits the certification of financial assurance rather than a decommissioning funding plan at this time, the licensee shall include a decommissioning funding plan in any application for license renewal.

(3) Each holder of a specific license issued before July 27, 1990, and of a type described in paragraph (b) of this section shall submit, on or before July 27, 1990, a certification of financial assurance for decommissioning or a decommissioning funding plan in accordance with the criteria set forth in this section.

(d) Table of required amounts of financial assurance for decommissioning by quantity of material.

greater than 10<sup>4</sup> but less than or equal to 10<sup>5</sup> times the applicable quantities of Appendix C of Part 20 in unsealed form. (For a combination of isotopes, if R, as defined in § 30.35(a), divided by 10<sup>4</sup> is greater than 1 but R divided by 10<sup>5</sup> is less than or equal to 1.)..... \$750,000

greater than 10<sup>5</sup> but less than or equal to 10<sup>6</sup> times the applicable quantities of Appendix C of

Part 20 in unsealed form. (For a combination of isotopes, if R, as defined in § 30.35(a), divided by 10<sup>5</sup> is greater than 1 but R divided by 10<sup>6</sup> is less than or equal to 1.)..... \$150,000

greater than 10<sup>10</sup> times the applicable quantities of Appendix C of Part 20 in sealed sources or plated foils. (For a combination of isotopes, if R, as defined in § 30.35(a), divided by 10<sup>10</sup> is greater than 1.)..... \$75,000

(e) Each decommissioning funding plan must contain a cost estimate for decommissioning and a description of the method of assuring funds for decommissioning from paragraph (f) of this section, including means of adjusting cost estimates and associated funding levels periodically over the life of the facility.

(f) Financial assurance for decommissioning must be provided by one or more of the following methods:

(1) Prepayment. Prepayment is the deposit prior to the start of operation into an account segregated from licensee assets and outside the licensee's administrative control of cash or liquid assets such that the amount of funds would be sufficient to pay decommissioning costs. Prepayment may be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities.

(2) A surety method, insurance, or other guarantee method. These methods guarantee that decommissioning costs will be paid should the licensee default. A surety method may be in the form of a surety bond, letter of credit, or line of credit. A parent company guaranter of funds for decommissioning costs based on a financial test may be used if the guarantee and test are as contained in Appendix A to this part. A parent company guarantee may not be used in combination with other financial methods to satisfy the requirements of this section. Any surety method or insurance used to provide financial assurance for decommissioning must contain the following conditions:

(i) The surety method or insurance must be open-ended or, if written for a specified term, such as five years, must be renewed automatically unless 90 days or more prior to the renewal date, the issuer notifies the Commission, the beneficiary, and the licensee of its intention not to renew. The surety method or insurance must also provide that the full face amount be paid to the beneficiary automatically prior to the expiration without proof of forfeiture if the licensee fails to provide a replacement acceptable to the Commission within 30 days after receipt of notification of cancellation.

(ii) The surety method or insurance

must be payable to a trust established for decommissioning costs. The trustee and trust must be acceptable to the Commission. An acceptable trustee includes an appropriate State or Federal government agency or an entity which has the authority to act as a trustee and whose trust operations are regulated and examined by a Federal or State agency.

(iii) The surety method or insurance must remain in effect until the Commission has terminated the license.

(3) An external sinking fund in which deposits are made at least annually, coupled with a surety method or insurance, the value of which may decrease by the amount being accumulated in the sinking fund. An external sinking fund is a fund established and maintained by setting aside funds periodically in an account segregated from licensee assets and outside the licensee's administrative control in which the total amount of funds would be sufficient to pay decommissioning costs at the time termination of operation is expected. An external sinking fund may be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities. The surety or insurance provisions must be as stated in paragraph (f)(2) of this section.

(4) In the case of Federal, State, or local government licensees, a statement of intent containing a cost estimate for decommissioning or an amount based on the Table in paragraph (d) of this section, and indicating that funds for decommissioning will be obtained when necessary.

(g) Each person licensed under this part or Parts 32 through 35 of this chapter shall keep records of information important to the safe and effective decommissioning of the facility in an identified location until the license is terminated by the Commission. If records of relevant information are kept for other purposes, reference to these records and their locations may be used. Information the Commission considers important to decommissioning consists of—

(1) Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations.

(2) As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or

53 FR 24018

53 FR 24018

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stored, and of locations of possible inaccessible contamination such as buried pipes which may be subject to contamination. If required drawings are referenced, each relevant document need not be indexed individually. If drawings are not available, the licensee shall substitute appropriate records of available information concerning these areas and locations.

(3) Records of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and records of the funding method used for assuring funds if either a funding plan or certification is used.

#### § 30.36 Expiration and termination of licenses

(a) Except as provided in § 30.37(b) and paragraph (e) of this section, each specific license expires at the end of the day, in the month and year stated in the license.

(b) Each licensee shall notify the Commission promptly, in writing under § 30.6, and request termination of the license when the licensee decides to terminate all activities involving materials authorized under the license. This notification and request for termination of the license must include the reports and information specified in paragraphs (c)(1)(iv) and (v) of this section and a plan for completion of decommissioning if required by paragraph (c)(2) of this section or by license condition.

(c)(1) If a licensee does not submit an application for license renewal under § 30.37, the licensee shall on or before the expiration date specified in the license—

(i) Terminate use of byproduct material;

(ii) Remove radioactive contamination to the extent practicable except for those procedures covered by paragraph (c)(2)(i) of this section;

(iii) Properly dispose of byproduct material;

(iv) Submit a completed form NRC-314, which certifies information concerning the disposition of materials; and

(v) Conduct a radiation survey of the premises where the licensed activities were carried out and submit a report of the results of this survey, unless the licensee demonstrates that the premises are suitable for release for unrestricted use in some other manner. The licensee shall, as appropriate—

(A) Report levels of radiation in units of microrads per hour of beta and gamma radiation at one centimeter and gamma radiation at one meter from surfaces, and report levels of radioactivity, including alpha, in units of disintegrations per minute (or microcuries) per 100 square centimeters removable and fixed for surfaces.

microcuries per milliliter for water, and picocuries per gram for solids such as soils or concrete; and

(B) Specify the survey instrument(s) used and certify that each instrument is properly calibrated and tested.

(2)(i) In addition to the information required under paragraphs (c)(1)(iv) and (v) of this section, the licensee shall submit a plan for completion of decommissioning if the procedures necessary to carry out decommissioning have not been previously approved by the NRC and could increase potential health and safety impacts to workers or to the public such as in any of the following cases:

(A) Procedures would involve techniques not applied routinely during cleanup or maintenance operations; or

(B) Workers would be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation; or

(C) Procedures could result in significantly greater airborne concentrations of radioactive materials than are present during operation; or

(D) Procedures could result in significantly greater releases of radioactive material to the environment than those associated with operation.

(ii) Procedures with potential health and safety impacts may not be carried out prior to approval of the decommissioning plan.

(iii) The proposed decommissioning plan, if required by paragraph (c)(2)(i) of this section or by license condition, must include—

(A) Description of planned decommissioning activities;

(B) Description of methods used to assure protection of workers and the environment against radiation hazards during decommissioning;

(C) A description of the planned final radiation survey; and

(D) An updated detailed cost estimate for decommissioning, comparison of that estimate with present funds set aside for decommissioning, and plan for assuring the availability of adequate funds for completion of decommissioning.

(iv) The proposed decommissioning plan will be approved by the Commission if the information therein demonstrates that the decommissioning will be completed as soon as is reasonable and that the health and safety of workers and the public will be adequately protected.

(3) Upon approval of the decommissioning plan by the Commission, the licensee shall complete decommissioning in accordance with the approved plan. As a final step in decommissioning, the licensee shall again submit the information required in paragraph (c)(1)(v) of this section and shall certify the disposition of accumulated wastes from decommissioning.

(d) If the information submitted under paragraphs (c)(1)(v) or (c)(3) of this section does not adequately demonstrate that the premises are suitable for release for unrestricted use, the Commission will inform the licensee of the appropriate further actions required for termination of license.

(e) Each specific license continues in effect, beyond the expiration date if necessary, with respect to possession of residual byproduct material present as contamination until the Commission notifies the licensee in writing that the license is terminated. During this time, the licensee shall—

(1) Limit actions involving byproduct material to those related to decommissioning; and

(2) Continue to control entry to restricted areas until they are suitable for release for unrestricted use and the Commission notifies the licensee in writing that the license is terminated.

(f) Specific licenses will be terminated by written notice to the licensee when the Commission determines that—

(1) Byproduct material has been properly disposed;

(2) Reasonable effort has been made to eliminate residual radioactive contamination, if present; and

(3)(i) A radiation survey has been performed which demonstrates that the premises are suitable for release for unrestricted use; or

(ii) Other information submitted by the licensee is sufficient to demonstrate that the premises are suitable for release for unrestricted use.

#### § 30.37 Applications for renewal of licenses.

(a) Application for renewal of a specific license shall be filed on Form NRC-313 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.

#### § 30.31 Applications for amendment of licenses.

Applications for amendment of a license shall be filed on Form NRC-313 in accordance with § 30.32 and shall specify the respects in which the licensee desires its license to be amended and the grounds for the 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 32-35.39 of this chapter.

53 FR 24018

53 FR 24018

53 FR 24018

49 FR 19627

30 FR 8765

30 FR 19625

52 FR 822

§ 30.41 Transfer of byproduct material.

(a) No licensee shall transfer byproduct material except as authorized pursuant to this section.

(b) Except as otherwise provided in his license and subject to the provisions of paragraphs (c) and (d) of this section, any licensee may transfer byproduct material:

- (1) To the Administration;
- (2) To the agency in any Agreement State which regulates radioactive material pursuant to an agreement under section 274 of the Act;

(3) To any person exempt from the licensing requirements of the Act and regulations in this part, to the extent permitted under such exemption;

(4) To any person in an Agreement State, subject to the jurisdiction of that State, who has been exempted from the licensing requirements and regulations of that State, to the extent permitted under such exemption;

(5) To any person authorized to receive such byproduct material under terms of a specific license or a general license or their equivalents issued by the Atomic Energy Commission, the Commission, or an Agreement State; or

(6) To a person abroad pursuant to an export license issued under Part 110 of this chapter;

(7) As otherwise authorized by the Commission in writing.

(c) Before transferring byproduct material to a specific licensee of the Commission or an Agreement State or to a general licensee who is required to register with the Commission or with an Agreement State prior to receipt of the byproduct material, the licensee transferring the material shall verify that the transferee's license authorizes the receipt of the type, form, and quantity of byproduct material to be transferred.

(d) The following methods for the verification required by paragraph (c) of this section are acceptable:

(1) The transferor may have in his possession, and read, a current copy of the transferee's specific license or registration certificate;

(2) The transferor may have in his possession a written certification by the transferee that he is authorized by license or registration certificate to receive the type, form, and quantity of byproduct material to be transferred, specifying the license or registration certificate number, issuing agency and expiration date;

(3) For emergency shipments the transferor may accept oral certification by the transferee that he is authorized by license or registration certificate to receive the type, form, and quantity of byproduct material to be transferred, specifying the license or registration certificate number, issuing agency and expiration date: *Provided*, That the oral certification is confirmed in writing within 10 days;

(4) The transferor may obtain other sources of information compiled by a reporting service from official records of the Commission or the licensing agency of an Agreement State as to the identity of licensees and the scope and expiration dates of licenses and registration; or

(5) When none of the methods of verification described in paragraphs (d)(1) to (4) of this section are readily available or when a transferor desires to verify that information received by one of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the Commission or the licensing agency of an Agreement State that the transferee is licensed to receive the byproduct material.

RECORDS, INSPECTIONS, TESTS, AND REPORTS

§ 30.51 Records.

(a) Each person who receives byproduct material pursuant to a license issued pursuant to the regulations in this part and Parts 31 through 35 of this chapter shall keep records showing the receipt, transfer, and disposal of the byproduct material as follows:

(1) The licensee shall retain each record of receipt of byproduct material as long as the material is possessed and for three years following transfer or disposal of the material.

(2) The licensee who transferred the material shall retain each record of transfer for three years after each transfer unless a specific requirement in another part of the regulations in this chapter dictates otherwise.

(3) The licensee who disposed of the material shall retain each record of disposal of byproduct material until the Commission terminates each license that authorizes disposal of the material.

(b) The licensee shall retain each record that is required by the regulations in this part and Parts 31 through 35 of this chapter or by license condition for the period specified by the appropriate regulation or license condition. If a retention period is not otherwise specified by regulation or license condition, the record must be retained until the Commission terminates each license that authorizes

the activity that is subject to the recordkeeping requirement.

(c)(1) Records which must be maintained pursuant to this part and Parts 31 through 35 of this chapter may be the original or a reproduced copy or microform if such reproduced copy or microform is duly authenticated by authorized personnel and the microform is capable of producing a clear and legible copy after storage for the period specified by Commission regulations. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures. The licensee shall maintain adequate safeguards against tampering with and loss of records.

(2) If there is a conflict between the Commission's regulations in this part and Parts 31-35, license condition, or other written Commission approval or authorization pertaining to the retention period for the same type of record, the retention period specified in the regulations in this part and Parts 31-35, for such records shall apply unless the Commission, pursuant to § 30.11, has granted a specific exemption from the record retention requirements specified in the regulations in this part or Parts 31-35.

§ 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 31-35 and 39 of this chapter, 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.

§ 30.55 Tritium reports.

- (a) [Reserved] 46 FR 55085
- (b) [reserved] 49 FR 24708

(c) Except as specified in paragraph (d) of this section, each licensee who is authorized to possess tritium shall report promptly to the appropriate NRC Regional Office listed in Appendix D of Part 30 of this chapter by telephone and telegraph, mailgram, or facsimile any incident in which an attempt has been made or is believed to have been made to commit a theft or unlawful diversion of more than 10 curies of such material at any one time or more than 100 curies of such material in any one calendar year. The initial report shall be followed within a period of fifteen (15) days by a written report submitted to the appropriate NRC Regional Office which sets forth the details of the incident and its consequences. Copies of such written report shall be sent to the Director, Office of Nuclear Material Safety and Safeguards U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

Subsequent to the submission of the written report required by this paragraph, the licensee shall promptly inform the Office of Nuclear Material Safety and Safeguards by means of a written report of any substantive additional information, which becomes available to the licensee, concerning an attempted or apparent theft or unlawful diversion of tritium.

(d) The reports described in this section are not required for tritium possessed pursuant to a general license provided in Part 31 of this chapter or for tritium contained in spent fuel.

(e) [reserved] 49 FR 84708

§ 30.55 (Removed) 52 FR 6225

**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 through 35 of this chapter 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 cause the withholding or recall of byproduct material.**

The Commission may cause 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 Atomic Energy Act of 1954, as amended, or Title II of the Energy Reorganization Act of 1974, or any regulation or order issued thereunder. A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of section 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act, or section 206 of the Energy Reorganization Act of 1974, or any rule, regulation, or order issued thereunder, or any term, condition, or limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. 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.

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SCHEDULES

§ 30.70 Schedule A—Exempt concentrations.

Element (atomic number)	Isotope	Column I Gas concentration μCi/ ml <sup>1</sup>	Column II Liquid and solid concentration μCi/ ml <sup>2</sup>
Antimony (51) ----	Sb 122	-----	3X10 <sup>-4</sup>
	Sb 124	-----	2X10 <sup>-4</sup>
	Sb 125	-----	1X10 <sup>-3</sup>
Argon (18) ----	A 37	1X10 <sup>-3</sup>	-----
	A 41	4X10 <sup>-7</sup>	-----
Arsenic (33)-----	As 73	-----	5X10 <sup>-3</sup>
	As 74	-----	5X10 <sup>-4</sup>
	As 76	-----	2X10 <sup>-4</sup>
	As 77	-----	8X10 <sup>-4</sup>
Barium (56)-----	Ba 131	-----	2X10 <sup>-3</sup>
	Ba 140	-----	3X10 <sup>-4</sup>
Beryllium (4) ----	Be 7	-----	2X10 <sup>-2</sup>
Bismuth (83) ----	Bi 206	-----	4X10 <sup>-4</sup>
Bromine (35) ----	Br 82	4X10 <sup>-7</sup>	3X10 <sup>-3</sup>
Cadmium (48) ----	Cd 109	-----	2X10 <sup>-3</sup>
	Cd 115m	-----	3X10 <sup>-4</sup>
	Cd 115	-----	3X10 <sup>-4</sup>
Calcium (20) ----	Ca 45	-----	9X10 <sup>-5</sup>
	Ca 47	-----	5X10 <sup>-4</sup>
Carbon (6) ----	C 14	1X10 <sup>-6</sup>	8X10 <sup>-2</sup>
Cerium (58)-----	Ce 141	-----	9X10 <sup>-4</sup>
	Ce 143	-----	4X10 <sup>-4</sup>
	Ce 144	-----	1X10 <sup>-4</sup>
	Ce 144	-----	1X10 <sup>-4</sup>
Cesium (55)-----	Cs 131	-----	2X10 <sup>-2</sup>
	Cs 134m	-----	6X10 <sup>-2</sup>
Cs 134	-----	6X10 <sup>-2</sup>	
Chlorine (17) ----	Cl 38	9X10 <sup>-7</sup>	9X10 <sup>-3</sup>
Chromium (24) ----	Cr 51	-----	2X10 <sup>-2</sup>
Cobalt (27) ----	Co 57	-----	5X10 <sup>-3</sup>
	Co 58	-----	1X10 <sup>-3</sup>
	Co 60	-----	5X10 <sup>-4</sup>
Copper (29)-----	Cu 64	-----	3X10 <sup>-3</sup>
	Cu 64	-----	3X10 <sup>-3</sup>
Dysprosium (66) --	Dy 165	-----	4X10 <sup>-3</sup>
	Dy 166	-----	4X10 <sup>-4</sup>
Erbium (68)-----	Er 169	-----	9X10 <sup>-4</sup>
	Er 171	-----	1X10 <sup>-3</sup>
Europium (63) ----	Eu 152	-----	6X10 <sup>-4</sup>
	(T/2=9.2 Hrs)	-----	-----
Fluorine (9)-----	F 18	2X10 <sup>-6</sup>	2X10 <sup>-3</sup>
	F 18	-----	8X10 <sup>-3</sup>
Gadolinium (64) --	Gd 153	-----	2X10 <sup>-3</sup>
	Gd 159	-----	8X10 <sup>-4</sup>
Gallium (31) ----	Ga 72	-----	4X10 <sup>-4</sup>
Germanium (32) --	Ge 71	-----	2X10 <sup>-2</sup>
Gold (79) -----	Au 196	-----	2X10 <sup>-3</sup>
	Au 198	-----	5X10 <sup>-4</sup>
	Au 199	-----	2X10 <sup>-3</sup>

Element (atomic number)	Isotope	Column I Gas concentration μCi/ ml <sup>1</sup>	Column II Liquid and solid concentration μCi/ ml <sup>2</sup>
Hafnium (72) ----	Hf 181	-----	7X10 <sup>-4</sup>
Hydrogen (1) ----	H 3	5X10 <sup>-6</sup>	3X10 <sup>-2</sup>
	H 3	-----	3X10 <sup>-2</sup>
Indium (49)-----	In 113m	-----	1X10 <sup>-2</sup>
	In 114m	-----	2X10 <sup>-4</sup>
Iodine (53) ----	I 126	3X10 <sup>-9</sup>	2X10 <sup>-5</sup>
	I 131	3X10 <sup>-9</sup>	2X10 <sup>-5</sup>
	I 132	8X10 <sup>-8</sup>	6X10 <sup>-4</sup>
	I 133	1X10 <sup>-8</sup>	7X10 <sup>-5</sup>
	I 134	2X10 <sup>-7</sup>	1X10 <sup>-3</sup>
Iridium (77)-----	Ir 190	-----	2X10 <sup>-3</sup>
	Ir 192	-----	4X10 <sup>-4</sup>
	Ir 194	-----	3X10 <sup>-4</sup>
Iron (26) -----	Fe 55	-----	8X10 <sup>-3</sup>
	Fe 59	-----	6X10 <sup>-4</sup>
Krypton (36) ----	Kr 85m	1X10 <sup>-6</sup>	-----
	Kr 85	3X10 <sup>-6</sup>	-----
Lanthanum (57) --	La 140	-----	2X10 <sup>-4</sup>
	La 140	-----	2X10 <sup>-4</sup>
Lead (82) -----	Pb 203	-----	4X10 <sup>-3</sup>
Lutetium (71) ----	Lu 177	-----	1X10 <sup>-3</sup>
	Lu 177	-----	1X10 <sup>-3</sup>
Manganese (25)---	Mn 52	-----	3X10 <sup>-4</sup>
	Mn 54	-----	1X10 <sup>-3</sup>
	Mn 56	-----	1X10 <sup>-3</sup>
	Mn 56	-----	1X10 <sup>-3</sup>
Mercury (80) ----	Hg 197m	-----	2X10 <sup>-3</sup>
	Hg 197	-----	3X10 <sup>-3</sup>
	Hg 203	-----	2X10 <sup>-4</sup>
Molybdenum (42) -	Mo 99	-----	2X10 <sup>-3</sup>
Neodymium (60) --	Nd 147	-----	6X10 <sup>-4</sup>
	Nd 149	-----	3X10 <sup>-3</sup>
Nickel (28) ----	Ni 65	-----	1X10 <sup>-3</sup>
Niobium (Colum- bium) (41)-----	Nb 95	-----	1X10 <sup>-3</sup>
	Nb 97	-----	9X10 <sup>-3</sup>
Osmium (76) ----	Os 185	-----	7X10 <sup>-4</sup>
	Os 191m	-----	3X10 <sup>-2</sup>
	Os 191	-----	2X10 <sup>-3</sup>
	Os 193	-----	6X10 <sup>-4</sup>
Palladium (46) ----	Pd 103	-----	3X10 <sup>-3</sup>
	Pd 109	-----	9X10 <sup>-4</sup>
Phosphorus (15) --	P 32	-----	2X10 <sup>-4</sup>
Platinum (78) ----	Pt 191	-----	1X10 <sup>-3</sup>
	Pt 193m	-----	1X10 <sup>-2</sup>
	Pt 197m	-----	1X10 <sup>-2</sup>
	Pt 197	-----	1X10 <sup>-3</sup>
Potassium (19) ----	K 42	-----	3X10 <sup>-3</sup>
	K 42	-----	3X10 <sup>-3</sup>
Praseodymium (59)-----	Pr 142	-----	3X10 <sup>-4</sup>
	Pr 143	-----	5X10 <sup>-4</sup>
Promethium (61) --	Pm 147	-----	2X10 <sup>-3</sup>
	Pm 149	-----	4X10 <sup>-4</sup>
Rhenium (75)-----	Re 183	-----	6X10 <sup>-3</sup>
	Re 186	-----	9X10 <sup>-4</sup>
	Re 188	-----	6X10 <sup>-4</sup>

<sup>1</sup> Values are given only for those materials normally used as gases.

<sup>2</sup> μCi/gm for solids.

Element (atomic number)	Isotope	Column I Gas concentration μCi/ ml <sup>1</sup>	Column II Liquid and solid concentration μCi/ ml <sup>2</sup>
Rhodium (45) ---	Rh 103m	---	1X10 <sup>-1</sup>
	Rh 105	---	1X10 <sup>-3</sup>
Rubidium (37) ---	Rb 86	---	7X10 <sup>-4</sup>
Ruthenium (44) ---	Ru 97	---	4X10 <sup>-3</sup>
	Ru 103	---	8X10 <sup>-4</sup>
	Ru 105	---	1X10 <sup>-3</sup>
	Ru 106	---	1X10 <sup>-4</sup>
Samarium (62) ---	Sm 153	---	8X10 <sup>-4</sup>
Scandium (21) ---	Sc 46	---	4X10 <sup>-4</sup>
	Sc 47	---	9X10 <sup>-4</sup>
	Sc 48	---	3X10 <sup>-4</sup>
Selenium (34) ---	Se 75	---	3X10 <sup>-3</sup>
Silicon (14) ---	Si 31	---	9X10 <sup>-3</sup>
Silver (47) ---	Ag 105	---	1X10 <sup>-3</sup>
	Ag 110m	---	3X10 <sup>-4</sup>
	Ag 111	---	4X10 <sup>-4</sup>
Sodium (11) ---	Na 24	---	2X10 <sup>-7</sup>
Strontium (38) ---	Sr 85	---	1X10 <sup>-3</sup>
	Sr 89	---	1X10 <sup>-4</sup>
	Sr 91	---	7X10 <sup>-4</sup>
	Sr 92	---	7X10 <sup>-4</sup>
Sulfur (16) ---	S 35	9X10 <sup>-6</sup>	6X10 <sup>-4</sup>
Tantalum (73) ---	Ta 182	---	4X10 <sup>-4</sup>
Technetium (43) ---	Tc 96m	---	1X10 <sup>-1</sup>
	Tc 96	---	1X10 <sup>-3</sup>
Tellurium (52) ---	Te 125m	---	2X10 <sup>-3</sup>
	Te 127m	---	6X10 <sup>-4</sup>
	Te 127	---	3X10 <sup>-3</sup>
	Te 129m	---	3X10 <sup>-4</sup>
	Te 131m	---	6X10 <sup>-4</sup>
	Te 132	---	3X10 <sup>-4</sup>
Terbium (65) ---	Tb 160	---	4X10 <sup>-4</sup>
Thallium (81) ---	Tl 200	---	4X10 <sup>-3</sup>
	Tl 201	---	3X10 <sup>-3</sup>
	Tl 202	---	1X10 <sup>-3</sup>
	Tl 204	---	1X10 <sup>-3</sup>
Thulium (69) ---	Tm 170	---	5X10 <sup>-4</sup>
	Tm 171	---	5X10 <sup>-3</sup>
Tin (50) ---	Sn 113	---	9X10 <sup>-4</sup>
	Sn 125	---	2X10 <sup>-4</sup>
Tungsten (Wolfram) (74) ---	W 181	---	4X10 <sup>-3</sup>
	W 187	---	7X10 <sup>-4</sup>
Vanadium (23) ---	V 48	---	3X10 <sup>-4</sup>
Xenon (54) ---	Xe 131m	4X10 <sup>-6</sup>	---
	Xe 133	3X10 <sup>-6</sup>	---
	Xe 135	1X10 <sup>-6</sup>	---
Ytterbium (70) ---	Yb 175	---	1X10 <sup>-3</sup>
Yttrium (39) ---	Y 90	---	2X10 <sup>-4</sup>
	Y 91m	---	3X10 <sup>-2</sup>
	Y 91	---	3X10 <sup>-4</sup>
	Y 92	---	6X10 <sup>-4</sup>
	Y 93	---	3X10 <sup>-4</sup>

<sup>1</sup> Values are given only for those materials normally used as gases.  
<sup>2</sup> μCi/gm for solids.

Element (atomic number)	Isotope	Column I Gas concentration μCi/ ml <sup>1</sup>	Column II Liquid and solid concentration μCi/ ml <sup>2</sup>
Zinc (30) ---	Zn 65	---	1X10 <sup>-3</sup>
	Zn 69m	---	7X10 <sup>-4</sup>
	Zn 69	---	2X10 <sup>-2</sup>
Zirconium (40) ---	Zr 95	---	6X10 <sup>-4</sup>
	Zr 97	---	2X10 <sup>-4</sup>
Beta and/or gamma emitting byproduct material not listed above with half-life less than 3 years.	-----	1X10 <sup>-10</sup>	1X10 <sup>-6</sup>

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:

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

§ 30.71 Schedule B.

Byproduct material	Microcuries
Antimony 122 (Sb 122) .....	100
Antimony 124 (Sb 124) .....	10
Antimony 125 (Sb 125) .....	10
Arsenic 73 (As 73) .....	100
Arsenic 74 (As 74) .....	10
Arsenic 76 (As 76) .....	10
Arsenic 77 (As 77) .....	100
Barium 131 (Ba 131) .....	10
Barium 133 (Ba 133) .....	10
Barium 140 (Ba 140) .....	10
Bismuth 210 (Bi 210) .....	1
Bromine 82 (Br 82) .....	10
Cadmium 109 (Cd 109) .....	10
Cadmium 115m (Cd 115m) .....	10
Cadmium 115 (Cd 115) .....	100
Calcium 45 (Ca 45) .....	10
Calcium 47 (Ca 47) .....	10
Carbon 14 (C 14) .....	100
Cerium 141 (Ce 141) .....	100
Cerium 143 (Ce 143) .....	100
Cerium 144 (Ce 144) .....	1
Cesium 131 (Cs 131) .....	1,000



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Byproduct material	Microcuries	Byproduct material	Microcuries	Byproduct material	Microcuries
Cesium 134m (Cs 134m)	100	Neodymium 149 (Nd 149)	100	Tellurium 127 (Te 127)	100
Cesium 134 (Cs 134)	1	Nickel 59 (Ni 59)	100	Tellurium 129m (Te 129m)	10
Cesium 135 (Cs 135)	10	Nickel 63 (Ni 63)	10	Tellurium 129 (Te 129)	100
Cesium 136 (Cs 136)	10	Nickel 65 (Ni 65)	100	Tellurium 131m (Te 131m)	10
Cesium 137 (Cs 137)	10	Niobium 93m (Nb 93m)	10	Tellurium 132 (Te 132)	10
Chlorine 36 (Cl 36)	10	Niobium 95 (Nb 95)	10	Terbium 160 (Tb 160)	10
Chlorine 38 (Cl 38)	10	Niobium 97 (Nb 97)	10	Thallium 200 (Tl 200)	100
Chromium 51 (Cr 51)	1,000	Osmium 185 (Os 185)	10	Thallium 201 (Tl 201)	100
Cobalt 58m (Co 58m)	10	Osmium 191m (Os 191m)	100	Thallium 202 (Tl 202)	100
Cobalt 58 (Co 58)	10	Osmium 191 (Os 191)	100	Thallium 204 (Tl 204)	10
Cobalt 60 (Co 60)	1	Osmium 193 (Os 193)	100	Thulium 170 (Tm 170)	10
Copper 64 (Cu 64)	100	Palladium 103 (Pd 103)	100	Thulium 171 (Tm 171)	10
Dysprosium 165 (Dy 165)	10	Palladium 109 (Pd 109)	100	Tin 113 (Sn 113)	10
Dysprosium 166 (Dy 166)	100	Phosphorous 32 (P 32)	10	Tin 125 (Sn 125)	10
Erbium 169 (Er 169)	100	Platinum 191 (Pt 191)	100	Tungsten 181 (W 181)	10
Erbium 171 (Er 171)	100	Platinum 193m (Pt 193m)	100	Tungsten 185 (W 185)	10
Europium 152 9.2h (Eu 152 9.2h)	100	Platinum 193 (Pt 193)	100	Tungsten 187 (W 187)	100
Europium 152 13 yr (Eu 152 13 yr)	1	Platinum 197m (Pt 197m)	100	Vanadium 48 (V 48)	10
Europium 154 (Eu 154)	1	Platinum 197 (Pt 197)	100	Xenon 131m (Xe 131m)	1,000
Europium 155 (Eu 155)	10	Polonium 210 (Po 210)	0.1	Xenon 133 (Xe 133)	100
Fluorine 18 (F 18)	1,000	Potassium 42 (K 42)	10	Xenon 135 (Xe 135)	100
Gadolinium 153 (Gd 153)	10	Praseodymium 142 (Pr 142)	100	Ytterbium 175 (Yb 175)	100
Gadolinium 159 (Gd 159)	100	Praseodymium 143 (Pr 143)	100	Yttrium 90 (Y 90)	10
Gallium 72 (Ga 72)	10	Promethium 147 (Pm 147)	10	Yttrium 91 (Y 91)	10
Germanium 71 (Ge 71)	100	Promethium 149 (Pm 149)	10	Yttrium 92 (Y 92)	100
Gold 198 (Au 198)	100	Rhenium 186 (Re 186)	100	Yttrium 93 (Y 93)	100
Gold 199 (Au 199)	100	Rhenium 188 (Re 188)	100	Zinc 65 (Zn 65)	10
Hafnium 181 (Hf 181)	10	Rhodium 103m (Rh 103m)	100	Zinc 69m (Zn 69m)	100
Holmium 166 (Ho 166)	100	Rhodium 105 (Rh 105)	100	Zinc 69 (Zn 69)	1,000
Hydrogen 3 (H 3)	1,000	Rubidium 86 (Rb 86)	10	Zirconium 93 (Zr 93)	10
Indium 113m (In 113m)	100	Rubidium 87 (Rb 87)	10	Zirconium 95 (Zr 95)	10
Indium 114m (In 114m)	10	Ruthenium 97 (Ru 97)	100	Zirconium 97 (Zr 97)	10
Indium 115m (In 115m)	100	Ruthenium 103 (Ru 103)	10	Any byproduct material not listed above other than alpha emitting byproduct material	0.1
Indium 115 (In 115)	10	Ruthenium 105 (Ru 105)	10		
Iodine 125 (I 125)	1	Ruthenium 106 (Ru 106)	1		
Iodine 126 (I 126)	1	Samarium 151 (Sm 151)	10		
Iodine 129 (I 129)	0.1	Samarium 153 (Sm 153)	100		
Iodine 131 (I 131)	1	Scandium 46 (Sc 46)	10		
Iodine 132 (I 132)	10	Scandium 47 (Sc 47)	100		
Iodine 133 (I 133)	1	Scandium 48 (Sc 48)	10		
Iodine 134 (I 134)	10	Selenium 75 (Se 75)	10		
Iodine 135 (I 135)	10	Silicon 31 (Si 31)	100		
Iridium 192 (Ir 192)	10	Silver 105 (Ag 105)	10		
Iridium 194 (Ir 194)	100	Silver 110m (Ag 110m)	1		
Iron 55 (Fe 55)	100	Silver 111 (Ag 111)	100		
Iron 59 (Fe 59)	10	Sodium 24 (Na 24)	10		
Krypton 85 (Kr 85)	100	Strontium 85 (Sr 85)	10		
Krypton 87 (Kr 87)	10	Strontium 87 (Sr 87)	1		
Lanthanum 140 (La 140)	10	Strontium 90 (Sr 90)	0.1		
Lutetium 177 (Lu 177)	100	Strontium 91 (Sr 91)	10		
Manganese 52 (Mn 52)	10	Strontium 92 (Sr 92)	10		
Manganese 54 (Mn 54)	10	Sulfur 35 (S 35)	100		
Manganese 56 (Mn 56)	10	Tantalum 182 (Ta 182)	10		
Mercury 197m (Hg 197m)	100	Technetium 96 (Tc 96)	10		
Mercury 197 (Hg 197)	100	Technetium 97m (Tc 97m)	100		
Mercury 203 (Hg 203)	10	Technetium 97 (Tc 97)	100		
Molybdenum 99 (Mo 99)	100	Technetium 99m (Tc 99m)	100		
Neodymium 147 (Nd 147)	100	Technetium 99 (Tc 99)	10		
		Tellurium 125m (Te 125m)	10		
		Tellurium 127m (Te 127m)	10		

[Note removed 49 FR 19623]

**Appendix A—Criteria Relating to Use of Financial Tests and Parent Company Guarantees for Providing Reasonable Assurance of Funds for Decommissioning**

**I. Introduction**

An applicant or licensee may provide reasonable assurance of the availability of funds for decommissioning based on obtaining a parent company guarantee that funds will be available for decommissioning costs and on a demonstration that the parent company passes a financial test. This appendix establishes criteria for passing the financial test and for obtaining the parent company guarantee.

**II. Financial Test**

A. To pass the financial test, the parent company must meet the criteria of either paragraph A.1 or A.2 of this section:

1. The parent company must have:  
 (i) Two of the following three ratios: A ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.3; and a ratio of current assets to current liabilities greater than 1.5; and

(ii) Net working capital and tangible net worth each at least six times the current decommissioning cost estimates (or prescribed amount if a certification is used); and

(iii) Tangible net worth of at least \$10 million; and

(iv) Assets located in the United States amounting to at least 80 percent of total assets or at least six times the current decommissioning cost estimates (or prescribed amount if a certification is used).

2. The parent company must have:

(i) A current rating for its most recent bond issuance of AAA, AA, A, or BBB as issued by Standard and Poor's or Aaa, Aa, A, or Baa as issued by Moody's; and

(ii) Tangible net worth at least six times the current decommissioning cost estimate (or prescribed amount if a certification is used); and

(iii) Tangible net worth of at least \$10 million; and

(iv) Assets located in the United States amounting to at least 80 percent of total assets or at least six times the current decommissioning cost estimates (or prescribed amount if certification is used).

B. The parent company's independent certified public accountant must have compared the data used by the parent company in the financial test, which is derived from the independently audited, year end financial statements for the latest fiscal year, with the amounts in such financial statement. In connection with that procedure the licensee shall inform NRC within 80 days of any matters coming to the auditor's attention which cause the auditor to believe that the data specified in the financial test should be adjusted and that the company no longer passes the test.

C. 1. After the initial financial test, the parent company must repeat the passage of the test within 80 days after the close of each succeeding fiscal year.

2. If the parent company no longer meets the requirements of paragraph A of this section, the licensee must send notice to the Commission of intent to establish alternate financial assurance as specified in the Commission's regulations. The notice must be sent by certified mail within 80 days after the end of the fiscal year for which the year end financial data show that the parent company no longer meets the financial test requirements. The licensee must provide alternate financial assurance within 120 days after the end of such fiscal year.

**III. Parent Company Guarantee**

The terms of a parent company guarantee which an applicant or licensee obtains must provide that:

A. The parent company guarantee will remain in force unless the guarantor sends notice of cancellation by certified mail to the licensee and the Commission. Cancellation may not occur, however, during the 120 days beginning on the date of receipt of the notice of cancellation by both the licensee and the Commission, as evidenced by the return receipts.

B. If the licensee fails to provide alternate financial assurance as specified in the Commission's regulations within 80 days after receipt by the licensee and Commission of a notice of cancellation of the parent company guarantee from the guarantor, the guarantor will provide such alternative financial assurance in the name of the licensee.

C. The parent company guarantee and financial test provisions must remain in effect until the Commission has terminated the license.

D. If a trust is established for decommissioning costs, the trustee and trust must be acceptable to the Commission. An acceptable trustee includes an appropriate State or Federal Government agency or an entity which has the authority to act as a trustee and whose trust operations are regulated and examined by a Federal or State agency.

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150.1

150.3(i)

**PART  
150**

**EXEMPTIONS AND CONTINUED REGULATORY AUTHORITY  
IN AGREEMENT STATES AND IN OFFSHORE WATERS  
UNDER SECTION 274**

**GENERAL PROVISIONS**

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- 150.20 Violations.
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- 150.32 Funds for reclamation or maintenance of byproduct material.

Authority: Sec. 101, 68 Stat. 948, as amended, sec. 274, 73 Stat. 676, as amended (42 U.S.C. 2201, 2202); sec. 201, as amended, 68 Stat. 1242, as amended (42 U.S.C. 5941). Sections 150.3, 150.15, 150.15a, 150.31, 150.32 also issued under sec. 116(2), 61, 68 Stat. 923, 926, as amended, sec. 63, 64, 62 Stat. 3073, 3039 (42 U.S.C. 2014a(2), 2111, 2113, 2114). Section 150.14 also issued under sec. 53, 68 Stat. 930, as amended (42 U.S.C. 2073). Section 150.15 also issued under sec. 126, 141, Pub. L. 87-425, 66 Stat. 2232, 2241 (42 U.S.C. 1015a, 10161). Section 150.17a also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2132). Section 150.30 also issued under sec. 234, 63 Stat. 644 (42 U.S.C. 2202). For the purposes of sec. 223, 68 Stat. 926, as amended (42 U.S.C. 2273); §§ 150.20(b)(2)-(4) and 150.21 are issued under sec. 101b, 68 Stat. 948, as amended (42 U.S.C. 2201(b)); § 150.14 is issued under sec. 101i, 68 Stat. 949, as amended (42 U.S.C. 2201(i)); and §§ 150.16-150.19 and 150.30(b)(1) are issued under sec. 101c, 68 Stat. 950, as amended (42 U.S.C. 2201(c)).

**GENERAL PROVISIONS**

**§ 150.1 Purpose.**  
The regulations in this part provide certain exemptions to persons in Agreement States from the licensing requirements contained in Chapters 6, 7, and 8 of the Act and from the regulations of the Commission imposing requirements upon persons who receive, possess, use or transfer byproduct material, source, or special nuclear material in quantities not sufficient to form a critical mass; and to define activities in Agreement States and in offshore waters over which the regulatory authority of the Commission continues. The provisions of the Act, and regulations of the Commission apply to all persons in Agreement States and in offshore waters engaging in activities over which the regulatory authority of the Commission continues.

**§ 150.2 Scope.**  
The regulations in this part apply to all States that have entered into agreements with the Commission or the Atomic Energy Commission pursuant to subsection 274b of the Act.

**§ 150.3 Definitions.**  
As used in this part:  
(a) "Act" means the Atomic Energy Act of 1954 (68 Stat. 919) including any amendments thereto;

(b) "Agreement State" means any State with which the Commission or the Atomic Energy Commission has entered into an effective agreement under subsection 274b of the Act. "Nonagreement State" means any other State.

(c) "Byproduct material" means: (1) 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; or (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from solution extraction processes. Underground ore bodies depleted by such solution extraction operations do not constitute "byproduct material" within the definition.

(d) "Commission" means the Nuclear Regulatory Commission or its duly authorized representatives;

(e) "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.

(f) "Offshore waters" means that area of land and water, beyond Agreement States' Submerged Lands Act jurisdiction, on or above the U.S. Outer Continental Shelf.

(g) "Person" means: (1) Any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, and State or any political subdivision of any political entity within a State, and any legal successor, representative, agent, or agency of the foregoing other than Government agencies;

(h) "Production facility" means: (1) Any equipment or device determined by rule of the Commission to be capable of the production of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device as determined by the Commission;

(i) "Source material" means: (1) Uranium, thorium, or any other material which is determined by the Commission pursuant to the provisions of section 61 of the Act to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time;

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(j) "Special nuclear material" means (1) 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 (2) any material artificially enriched by any of the foregoing but does not include source material;

(k) "State" means any State, Territory, or possession of the United States, Puerto Rico, and the District of Columbia;

(l) "Utilization facility" means (1) any equipment or device, except an atomic weapon, determined by rule of the Commission to be capable of making use of special nuclear material in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public, or peculiarly adapted for making use of atomic energy in such quantity as to be of significance to the common defense and security, or in such manner as to affect the health and safety of the public; or (2) any important component part especially designed for such equipment or device as determined by the Commission

§ 150.4 Communications.

Except where otherwise specified in this part, all communications and reports concerning the regulations in this part should be addressed to the Executive Director for Operations, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Communications and reports may be delivered in person at the Commission's offices at 2120 L Street NW, Washington, DC, or at 11566 Rockville Pike, Rockville, Maryland.

§ 150.5 Interpretations.

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

CONTINUED COMMISSION REGULATORY AUTHORITY IN OFFSHORE WATERS

§ 150.7 Persons in offshore waters not exempt.

Persons in offshore waters are not exempt from the Commission's licensing and regulatory requirements with respect to byproduct, source, and special nuclear materials.

§ 150.8 Information collection requirements: OMB approval.

(a) The Nuclear Regulatory Commission has submitted the information collection requirements contained in this part to the Office of Management and Budget (OMB) for approval as required by the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). OMB has approved the information collection requirements contained in this part under control number 3150-0082.

(b) The approved information collection requirements contained in this part appear in §§ 150.16, 150.17, 150.17a, 150.18, 150.20, and 150.21.

(c) This part contains information collection requirements in addition to those approved under the control number specified in paragraph (a) of this section. These information collection requirements and the control numbers under which they are approved are as follows:

(1) In §§ 150.16 and 150.17, Form NRC-741 is approved under control number 3150-0088.

(2) In § 150.20, Form NRC-341 is approved under control number 3150-0018.

EXEMPTIONS IN AGREEMENT STATES

§ 150.10 Persons exempt.

Except as provided in §§ 150.15, 150.16, 150.17, 150.17a, 150.18 and 150.19, any person in an Agreement State who manufactures, produces, receives, possesses, uses, or transfers byproduct material, source material, or special nuclear material in quantities not sufficient to form a critical mass is exempt from the requirements for a license contained in Chapters 6, 7, and 8 of the Act, regulations of the Commission imposing licensing requirements upon persons who manufacture, produce, receive, possess, use, or transfer such materials, and from regulations of the Commission applicable to licensees. The exemptions in this

section do not apply to agencies of the Federal government as defined in § 150.3.

§ 150.11 Critical mass.

(a) For the purposes of this part, special nuclear material in quantities not sufficient to form a critical mass means uranium enriched in the isotope U-235 in quantities not exceeding 350 grams of contained U-235; uranium-233 in quantities not exceeding 200 grams; plutonium in quantities not exceeding 200 grams; or any combination of them in accordance with the following formula: For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified above for the same kind of special nuclear material. The sum of such ratios for all kinds of special nuclear materials in combination shall not exceed the limitation and are within the formula, as follows:

$$\frac{175 \text{ (grams contained U-235)}}{350} + \frac{50 \text{ (grams U-233)}}{200} + \frac{50 \text{ (grams Pu)}}{200} = 1$$

(b) To determine whether the exemption granted in § 150.10 applies to the receipt, possession or use of special nuclear material at any particular plant or other authorized location of use, a person shall include in the quantity computed according to paragraph (a) of this section the total quantity of special nuclear material which he is authorized to receive, possess or use at the plant or other location of use at any one time.

CONTINUED COMMISSION REGULATORY AUTHORITY IN AGREEMENT STATES

§ 150.14 Commission Regulatory Authority for Physical Protection.

Persons in Agreement States possessing, using or transporting special nuclear material of low strategic significance in quantities greater than 15 grams of plutonium or uranium-233 or uranium-235 (enriched to 20 percent or more in the U-235 isotope) or any combination greater than 15 grams when computed by the equation grams = grams uranium-235 + grams plutonium + grams uranium-233 shall meet the physical protection requirements of § 73.67 of 10 CFR Part 73.

§150.15 Persons not exempt.

(a) Persons in Agreement States are not exempt from the Commission's licensing and regulatory requirements with respect to the following activities:

(1) The construction and operation of any production or utilization facility. As used in this subparagraph (1), "operation" of a facility includes, but is not limited to (i) the storage and handling of radioactive wastes at the facility site by the person licensed to operate the facility, and (ii) the discharge of radioactive effluents from the facility site.

(2) The export from or import into the United States of byproduct, source, or special nuclear material, or of any production or utilization facility.

(3) The disposal into the ocean or sea of byproduct, source, or special nuclear waste materials, as defined in regulations or orders of the Commission. For purposes of this part, ocean or sea means any part of the territorial waters of the United States and any part of the international waters.

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(4) The transfer, storage or disposal of radioactive waste material resulting from the separation in a production facility of special nuclear material from irradiated nuclear reactor fuel. This subparagraph (4) does not apply to the transfer, storage, or disposal of contaminated equipment.

(5) The disposal of such other byproduct, source, or special nuclear material as the Commission determines by regulation or order should, because of the hazards or potential hazards thereof, not be so disposed of without a license from the Commission.

(6) The transfer of possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing source material or byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from licensing and regulatory requirements of the Commission under Parts 30 and 40 of this chapter.

(7) The storage of:

- (i) Spent fuel in an independent spent fuel storage installation (ISFSI) or
- (ii) Spent fuel and high level radioactive waste in a monitored retrievable storage installation (MRS) licensed pursuant to Part 72 of this chapter.

(b) Notwithstanding any exemptions provided in this part, the Commission may from time to time by rule, regulation, or order, require that the manufacturer, processor or producer of any equipment, device, commodity, or other product containing source, byproduct, or special nuclear material shall not transfer possession or control of such product except pursuant to a license or an exemption from licensing issued by the Commission.

§ 150.15c Continued Commission authority pertaining to byproduct material.

(a) Prior to the termination of any Agreement State license for byproduct material as defined in § 150.3(c)(2) of this Part, or for any activity that results in the production of such material, the Commission shall have made a determination that all applicable standards and requirements pertaining to such material have been met.

(b) After November 8, 1981, the Commission reserves the authority to establish minimum standards regarding reclamation, long term surveillance (i.e., continued site observation, monitoring and, where necessary, maintenance), and ownership of byproduct material as defined in § 150.3(c)(2) of this Part and of land used as a disposal site for such material. Such reserved authority includes:

(1) Authority to establish such terms and conditions as the Commission determines necessary to assure that, prior to termination of any license for byproduct material as defined in § 150.3(c)(2) of this Part, or for any activity that results in the production of such material, the licensee shall comply with decontamination, decommissioning, and reclamation standards prescribed by the Commission; and with ownership requirements for such materials and its disposal site:

(2) The authority to require that prior to termination of any license for byproduct material as defined in § 150.3(c)(2) of this Part, or for any activity that results in the production of such material, that title to such byproduct material and its disposal site be transferred to the United States or the State in which such material and land is located, at the option of the State (provided such option is exercised prior to termination of the license):

(3) The authority to permit use of the surface or subsurface estates, or both, of the land transferred to the United States or a State pursuant to paragraph (b)(2) of this section in a manner consistent with the provisions of the Uranium Mill Tailings Radiation Control Act of 1978, provided that the Commission determines that such use would not endanger the public health, safety, welfare, or the environment;

(4) The authority to require, in the case of a license for any activity that produces such byproduct material (which license was in effect on November 8, 1981) transfer of land and material pursuant to paragraph (b)(2), of this section, taking into consideration the status of such material and land and interests therein, and the ability of the licensee to transfer title and custody thereof to the United States or a State.

(5) The authority to require the Secretary of the Department of Energy, other Federal agency, or State, whichever has custody of such property and materials, to undertake such monitoring, maintenance and emergency measures as are necessary to protect the public health and safety and other actions that the Commission deems necessary to comply with the standards promulgated pursuant to the Uranium Mill Tailings Radiation Control Act of 1978; and

(6) The authority to enter into arrangements as may be appropriate to assure Federal long term surveillance (i.e., continued site observation, monitoring, and where necessary, maintenance) of such disposal sites on land held in trust by the United States for any Indian tribe or land owned by an Indian tribe and subject to a restriction against alienation imposed by the United States.

#### CONTINUED COMMISSION AUTHORITY IN AGREEMENT STATES

§ 150.16 Submission to Commission of nuclear material transfer reports.

(a) Each person who transfers and each person who receives special nuclear material pursuant to an Agreement State license shall complete and distribute Nuclear Material Transaction Reports on Form NRC-741, in accordance with printed instructions for completing the form, whenever he transfers or receives a quantity of special nuclear material of 1 gram or more of contained uranium-235, uranium-233, or plutonium.

Each person who transfers such material shall submit a copy of Form NRC-741 to the U.S.

Department of Energy, P.O. Box E, Oak Ridge, Tennessee 37830, and three (3) copies to the receiver of the material promptly after the transfer takes place. Each person who receives special nuclear material shall submit a copy of Form NRC-741 to the U.S.

Department of Energy  
istration and the the shipper of the material within ten (10) days after the special nuclear material is received.

(b)(1) Each person who, pursuant to an Agreement State License, possesses 1 gram or more of contained uranium-235, uranium-233, or plutonium shall report immediately to the Regional Administrator of the appropriate NRC Regional Office listed in Appendix A of Part 73 of this chapter, by telephone, any theft or other unlawful diversion of special nuclear material which the licensee is licensed to possess or any incident in which an attempt has been made, or is believed to have been made, to commit a theft or unlawful diversion of special nuclear material.

(2) The licensee shall follow the initial report within a period of 15 days with a written report submitted to the appropriate NRC Regional Office, shown in Appendix A of Part 73 of this chapter, which sets forth the details of

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the incident. The licensee shall send copies of this report to the Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

(3) Subsequent to the submission of the written report required by this paragraph, each licensee shall promptly inform the Regional Administrator of the appropriate NRC Regional Office by means of a written report of any substantive additional information which becomes available to the licensee concerning an attempted or apparent theft or unlawful diversion of special nuclear material.

**§ 150.17 Submission to the Commission of source material transfer reports.**

(a) Except as specified in paragraph (d) of this section and § 150.17a, each person who, pursuant to an Agreement State specific license, transfers or receives or adjusts the inventory in any manner by 1 kilogram or more of uranium or thorium of foreign origin or who imports 1 kilogram or more of uranium or thorium of any origin shall complete and distribute a Nuclear Material Transaction Report on DOE/NRC Form 741 in accordance with the printed instructions for completing the form (NUREG/BR-0006). Copies of forms and instructions may be obtained by writing to U.S. Nuclear Regulatory Commission, Division of Safeguards and Transportation,

Washington, DC 20555. Each person who transfers the material shall submit a completed copy of DOE/NRC Form 741 to the address specified in the printed instructions and three (3) copies to the receiver of the material no later than the close of business the next working day. Each person who receives the material shall submit a completed copy of DOE/NRC Form 741 to the address specified in the printed instructions and to the shipper of the material within ten (10) days after the material is received.

(b) Except as specified in paragraph (d) of this section and § 150.17a, each person authorized to possess at any one time and location, under an Agreement State license, more than 1,000 kilograms of uranium or thorium, or any combination of uranium or thorium, shall submit to the Commission within 30 days after September 30 of each year, a statement of the licensee's foreign origin source material inventory. This statement must be submitted to the address specified in the printed instructions (NUREG/BR-0007) and must include the Reporting Identification Symbol (RIS) assigned by the Commission to the licensee. Copies of the reporting instructions may be obtained by writing to U.S. Nuclear Regulatory Commission, Division of Safeguards and Transportation, Washington, DC 20555.

(c) Except as specified in paragraph

(d) of this section, each person who is authorized to possess uranium or thorium pursuant to a specific license from an Agreement State shall report promptly to the appropriate NRC Regional Office shown in Appendix D of Part 20 of this chapter by telephone and telegraph, mail, or facsimile any incident in which an attempt has been made or is believed to have been made to commit a theft or unlawful diversion of more than 15 pounds of such material at any one time or more than 150 pounds of such material in any one calendar year. The initial report shall be followed within a period of fifteen (15) days by a written report submitted to the appropriate NRC Regional Office which sets forth the details of the incident and its consequences. Copies of such written report shall be sent to the U.S. Nuclear Regulatory Commission, Division of Safeguards and Transportation

Washington, D.C. 20555. Subsequent to the submission of the written report required by this paragraph, each person subject to the provisions of this paragraph, shall promptly inform the appropriate NRC Regional Office by means of a written report of any substantive additional information, which becomes available to such person, concerning an attempted or apparent theft or unlawful diversion of source material.

(d) The reports described in paragraphs (a), (b), and (c) of this section are not required for:

(1) Processed ores containing less than five (5) percent of uranium or thorium, or any combination of uranium and thorium, by dry weight;

(2) Thorium contained in magnesium-thorium and tungsten-thorium alloys, if the thorium content in the alloys does not exceed 4 percent by weight;

(3) Chemical catalysts containing uranium depleted in the U-235 isotope to 0.4 percent or less, if the uranium content of the catalyst does not exceed 15 percent by weight; or

(4) Any source material contained in non-nuclear end use devices or components, including but not limited to permanently installed shielding, teletherapy, radiography, X-ray, accelerator devices, or munitions.

**§ 150.17a Compliance with requirements of US/IAEA safeguards agreement.**

(a) For purposes of this section, the terms "effective kilogram", "ore processing", "installation", and "United States eligible list" have the meaning set forth in § 75.4 of this chapter.

(b) Each person who, pursuant to an Agreement State License, is authorized to possess source material in amounts greater than one effective kilogram (except in ore processing) is subject to the provisions of Part 75 of this chapter and shall comply with its applicable provisions. However, with respect to such persons, the Commission will issue orders under section 274m. of the Act instead of making license amendments; and, to the extent Part 75 refers to license amendments and license conditions, such references shall be deemed, for purposes of this paragraph, to refer to orders under section 274m. of the Act.

(c) An applicant for an Agreement State License authorizing possession of source material in amounts greater than one effective kilogram (except in ore processing) shall notify the Commission at least 9 months prior to the date when the applicant desires to receive the source material.

(d) In response to a written request by the Commission, an applicant for an Agreement State License authorizing possession of source material in amounts greater than one effective kilogram (except in ore processing) shall file with the Commission the installation information described in § 75.11 of this chapter. The applicant shall also permit verification of such installation information by the International Atomic Energy Agency and take such other action as may be necessary to implement the US/IAEA Safeguards Agreement, in the manner set forth in § 75.8 and §§ 75.11 through 75.14 of this chapter.

§ 150.19 Submission to Commission of tritium reports.

(a) (Reserved)

(b) [reserved]

(c) Except as specified in paragraph (d) of this section, each person who, pursuant to an Agreement State license, is authorized to possess tritium shall report promptly to the appropriate NRC Regional Office as shown in Appendix D of Part 20 of this chapter by telephone and telegraph, mailgram, or facsimile any incident in which an attempt has been made or is believed to have been made to commit a theft or unlawful diversion of more than 10 curies of such material at any one time or 100 curies of such material in any one calendar year. The initial report shall be followed within a period of fifteen (15) days by a written report submitted to the appropriate NRC Regional Office which sets forth the details of the incident and its consequences. Copies of such written report shall be sent to the Director, Office of Nuclear Material Safety and Safeguards

U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Subsequent to the submission of the written report required by this paragraph, each person subject to the provisions of this paragraph shall promptly inform the appropriate NRC Regional Office by means of a written report of any substantive additional information, which becomes available to such person, concerning an attempted or apparent theft or unlawful diversion of tritium.

(d) The reports described in this section are not required for tritium possessed pursuant to a general license issued pursuant to regulations of an Agreement State equivalent to Part 31 of this chapter or for tritium in spent fuel.

#### RECIPROCITY

§ 150.20 Recognition of Agreement State licenses.

(a) Subject to the provisions of paragraph (b) of this section, any person holding a specific license from an Agreement State where the licensee maintains an office for directing the licensed activity, and at which radiation safety records are normally maintained, is hereby granted a general license to conduct the same activity in non-Agreement States and a general license to conduct the same activity in offshore waters: *Provided*, That the specific license does not limit the activity authorized by either general license to specified installations or locations.

(b) Notwithstanding any provision to the contrary in any specific license issued by an Agreement State to a person engaging in activities in a non-Agreement State or in offshore waters under the general licenses provided in this section, the general licenses provided in this section are subject to the provisions of §§ 30.7 (a) through (e), 30.9, 30.14(j) and §§ 30.34, 30.41, and 30.51 to 30.63, inclusive, of Part 30 of this chapter; § 40.7 (a) through (e), § 40.9, and §§ 40.41, 40.51, 40.61, 40.63 inclusive, 40.71 and 40.81 of Part 40 of this chapter; and § 70.7 (a) through (e), § 70.9, and §§ 70.32, 70.42, 70.51 to 70.56, inclusive, 70.60 to 70.62, inclusive, and 70.7 of Part 70 of this chapter; and to the provisions of Parts 19, 20, and 71 and Subpart B of Part 34 of this chapter. In addition, any person engaging in activities in non-Agreement States or in offshore waters under the general licenses provided in this section:

(1) Except as specified in paragraph (c) of this section, shall, at least 3 days before engaging in such activity, file 4 copies of Form-241 (revised), "Report of Proposed Activities in Non-Agreement States," and 4 copies of its Agreement State specific license with the Regional Administrator of the U.S. Nuclear Regulatory Commission Regional Office listed in Appendix D of Part 20 of this chapter for the Region in which the Agreement State that issued the license is located. That Regional Administrator may authorize the licensee to begin the activity upon notification by telephone of the licensee's intent to conduct the proposed

activity under the general license: *Provided, however*, That 4 copies of Form-241 (revised) and 4 copies of the Agreement State license shall be filed within 3 days after the telephonic notification. The Regional Administrator of the U.S. Nuclear Regulatory Commission Regional Office may waive the requirement for filing additional Forms-241 (revised) during the remainder of the calendar year following the receipt of the initial Form-241 (revised) from a person engaging in activities under the general license provided in this section:

(2) Shall not, in any non-Agreement State or in offshore waters, transfer or dispose of radioactive material possessed or used under the general licenses provided in this section, except by transfer to a person (i) specifically licensed by the Commission to receive such material, or (ii) exempt from the requirements for a license for such material under § 30.14 of this chapter;

(3) Shall not, under the general license concerning activities in Non-Agreement States, possess or use radioactive materials, or engage in the activities authorized in paragraph (a) of this section, for more than 180 days in any calendar year, except that, the general license in paragraph (a) of this section concerning activities in offshore waters authorizes that person to possess or use radioactive materials, or engage in the activities authorized, for an unlimited period of time;

(4) Shall comply with all terms and conditions of the specific license issued by an Agreement State except such terms or conditions as are contrary to the requirements of this section.



(c) A person engaging in activities in offshore waters under the general license provided for that purpose in paragraph (a) of this section need not file a Form NRC-241 (revised) with the Commission under paragraph (b)(1) of this section. *Provided*, That:

(1) At least 3 days before engaging in each such activity the person notifies the Agreement State that issued the specific license about the activity, including in the notification (i) a description of the activity, (ii) the location, (iii) the dates scheduled, (iv) a list of the sealed sources, or devices containing sealed sources, which will be possessed, used, installed, serviced, or tested, and (v) a description of the type and quantity of radioactive material contained in each sealed source or device; and (2) The Agreement State that issued the specific license is listed in paragraph (d) of this section as having entered into an agreement to perform inspections and other functions for the Commission.

(d) The following Agreement State has entered into an agreement to perform inspections and other functions for the Commission: Louisiana.

limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. 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.

**§ 150.31 Requirements for Agreement State regulation of byproduct material.**

(a) Prior to November 8, 1981, in the licensing and regulation of byproduct material, as defined in § 150.3(c)(2) of this Part, or of any activity which results in the production of such byproduct material, an Agreement State shall require compliance with the requirements in Appendix A of 10 CFR 40 of this Chapter to the maximum extent practicable.

(b) After November 8, 1981, in the licensing and regulation of byproduct material, as defined in § 150.3(c)(2) of this Part, or of any activity which results in the production of such byproduct material, an Agreement State shall require:

(1) Compliance with requirements in Appendix A of 10 CFR 40 of this Chapter established by the Commission pertaining to ownership of such byproduct material and disposal sites for such material; and

(2) Compliance with standards which shall be adopted by the Agreement State for the protection of the public health, safety, and the environment from hazards associated with such material which are equivalent, to the extent practicable, or more stringent than, standards in Appendix A of 10 CFR 40 of this Chapter adopted and enforced by the Commission for the same purposes, including requirements and standards subsequently promulgated by the Commission and the Administrator of the Environmental Protection Agency pursuant to the Uranium Mill Tailings Radiation Control Act of 1978; and

(3) Compliance with procedures which:

(i) In the case of licenses, under State law include:

(A) An opportunity, after public notice, for written comments and a public hearing, with a transcript;

(B) An opportunity for cross examination; and

(C) A written determination by the appropriate State official which is based upon findings included in such determination and upon the evidence presented during the public comment period and which is subject to judicial review;

(ii) In the case of rulemaking, provide an opportunity for public participation through written comments or a public hearing and provide for judicial review of the rule;

(iii) Require for each licensing action which has a significant impact on the human environment a written analysis by the appropriate State agency (which shall be available to the public before the commencement of any such proceedings) of the impact of such licensing action, including any activities conducted pursuant thereto, on the environment. Such analysis shall include:

(A) An assessment of the radiological and nonradiological impacts to the public health of the activities to be conducted pursuant to such licenses.

(B) An assessment of any impact on any waterway and groundwater resulting from such activities;

(C) Consideration of alternatives, including alternative sites and engineering methods, to the activities to be conducted pursuant to such license; and

(D) Consideration of the long term impacts, including decommissioning, decontamination, and reclamation impacts associated with activities to be conducted pursuant to such license, including the management of any byproduct material, as defined in § 150.3(c)(2) of this Part; and

(iv) Prohibit any major construction activity with respect to such material prior to complying with the provisions of paragraph (c)(3) of this section. As used in this paragraph the term "major construction activity" means any clearing of land, excavation, or other substantial action that would adversely affect the environment of a site. The term does not mean site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring or testing to establish background information related to the suitability of the site or the protection of environmental values.

(c) No Agreement State shall be required under paragraph (b) to conduct proceedings concerning any license or regulation which would duplicate proceedings conducted by the Commission.

**§ 150.21 Transportation of special nuclear material by aircraft.**

Except as specifically approved by the Commission no shipment of special nuclear material in excess of 20 grams or 20 curies whichever is less of plutonium or uranium-233 shall be made by a licensee of an Agreement State in passenger aircraft.

**ENFORCEMENT**

**§ 150.30 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. A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of section 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act or any rule, regulation, or order issued thereunder, or any term, condition, or

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(d) In adopting requirements pursuant to paragraph (b)(2) of this section, the State may adopt alternatives (including, where appropriate, site-specific alternatives) to the requirements adopted and enforced by the Commission for the same purpose if, after notice and opportunity for public hearing, the Commission determines that the alternatives will achieve a level of stabilization and containment of the sites concerned, and a level of protection for public health, safety and the environment from radiological and nonradiological hazards associated with the sites, which is equivalent to, to the extent practicable, or more stringent than the level which would be achieved by standards and requirements adopted and enforced by the Commission for the same purpose and any final standards promulgated by the Administrator of the Environmental Protection Agency in accordance with section 275. Alternative State requirements may take into account local or regional conditions, including geology, topography, hydrology and meteorology.

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**§ 150.32 Funds for reclamation or maintenance of byproduct material.**

(a) The total amount of funds an Agreement State collects, pursuant to a license for byproduct material as defined in § 150.3(c)(3) of this Part or for any activity that results in the production of such material, for reclamation or long term maintenance and monitoring of such material, shall after November 8, 1981, be transferred to the United States if title and custody of such material and its disposal site is transferred to the United States upon termination of such license. Such funds include, but are not limited to, sums collected for long term surveillance (i.e., continued site observation, monitoring and, where necessary, maintenance). Such funds do not however, include monies held as surety where no default has occurred and the reclamation or other bonded activity has been performed.

(b) If an Agreement State requires such payments for reclamation or long term surveillance (i.e., continued site observation, monitoring and, where necessary, maintenance), the payments must, after November 8, 1981, be sufficient to ensure compliance with those standards established by the Commission pertaining to bonds, sureties, and financial arrangements to ensure adequate reclamation and long term management of such byproduct material and its disposal site.

[Note removed 49 FR 19623]