29-19769-04
Corres.

ISOMEDIX INC.

September 5, 1985

U.S. Nuclear Regulatory Commission
Region III
Attn: Mr. James Lynch
799 Roosevelt Road
Glen Ellyn, IL 60137

Dear Mr. Lynch:

Enclosed is a copy of our Radiation Survey Report performed on August 16, 1985, as required by the U.S. Nuclear Regulatory Commission for Materials License.

Very truly yours,

ISOMEDIX (OHIO) INC.

Ronald D. Llewellyn Sr.

Ronald D. Llewellyn, Sr.
General Manager

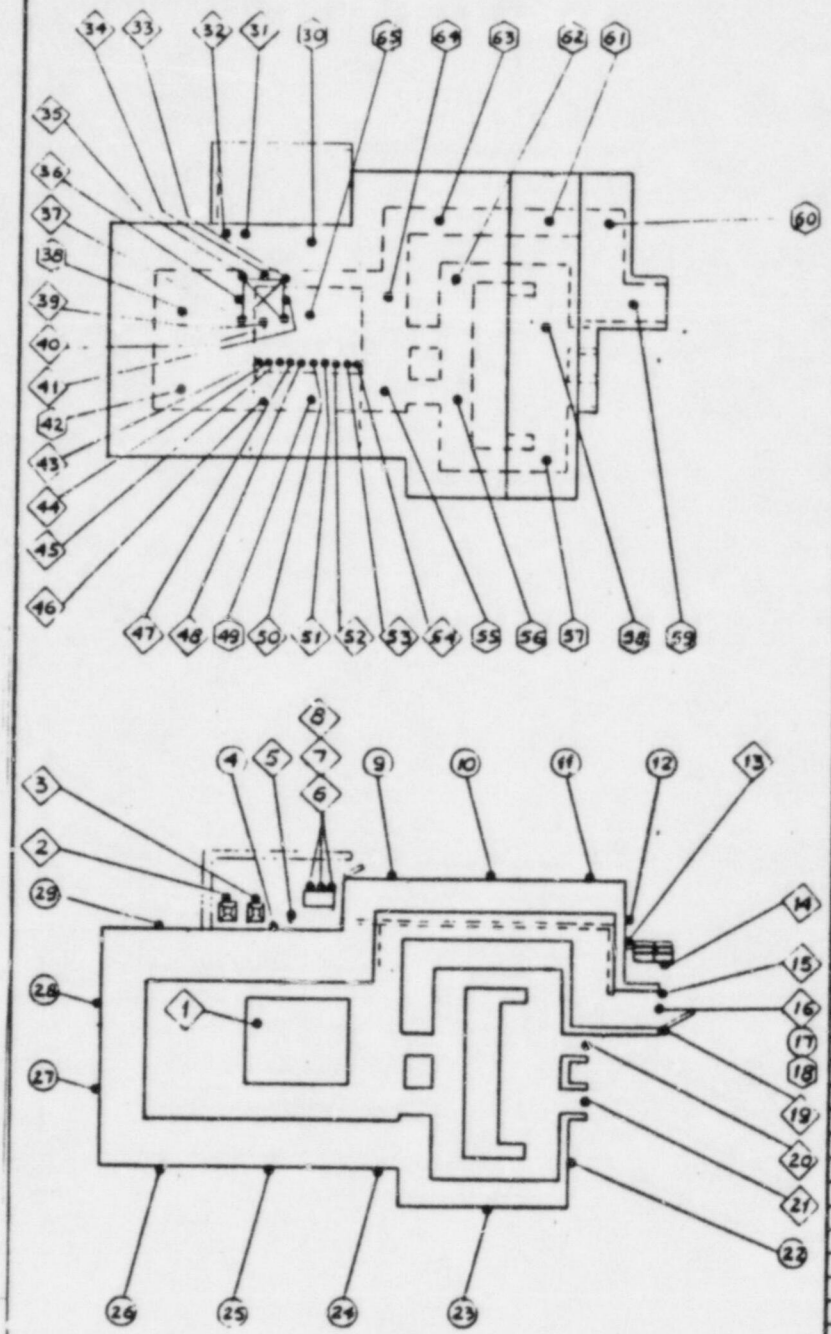
RDL:bkb

Enclosure

4405 MARKETING PLACE
P.O. BOX 356
GROVEPORT, OHIO 43125

D.9

SEP 9 1985



○ AT 1m ABOVE FLOOR
⬡ AT FLOOR OR ON ROOF
◇ ON NAMED FEATURE (SURVEYOR TO ADD AS NECESSARY)

ALL READINGS IN mrem/h
READINGS LESS THAN 0.03 mrem/h SHOWN THUS ✱

NO	READING	REMARKS
1	0.12.	POOL SURFACE **
2	✱	AIR FILTER
3	✱	AIR FILTER
4	✱	
5	✱	FLOOR TRENCH
6	✱	WATER DEIONIZER
7	✱	WATER DEIONIZER
8	✱	WATER DEIONIZER
9	✱	
10	✱	
11	✱	
12	0.2	
13	0.2	FLOOR TRENCH
14	✱	CONTROL CONSOLE
15	0.3	MAX. DOOR CRACK
16	0.25	TOP OF DOOR
17	0.45	DOOR CENTER
18		
19	0.1	MAX. DOOR CRACK
20	0.1	MAX. INLET
21	0.05	MAX. OUTLET
22	✱	
23	✱	
24	✱	
25	✱	
26	✱	
27	✱	
28	✱	
29	✱	
30	✱	
31	✱	VENTILATION FAN
32	✱	VENTILATION FAN
33	✱	ROOF PLUG CRACK
34	✱	ROOF PLUG CRACK
35	✱	ROOF PLUG CRACK
36	✱	ROOF PLUG CRACK
37	✱	ROOF PLUG CRACK
38		
39	✱	ROOF PLUG CRACK
40	✱	ROOF PLUG CRACK
41	✱	ROOF PLUG CRACK
42	✱	
43	✱	GUIDE CABLE
44	✱	EMERGENCY PLUG
45	✱	HOIST CABLE
46	0.05	AIR SUPPLY LINE
47	✱	EMERGENCY PLUG
48	✱	GUIDE CABLE
49	✱	
50	✱	GUIDE CABLE
51	✱	EMERGENCY PLUG
52	✱	HOIST CABLE
53	✱	EMERGENCY PLUG
54	✱	GUIDE CABLE
55	✱	
56	✱	
57	✱	
58	✱	
59	—	
60	✱	
61	✱	
62	✱	
63	✱	
64	✱	
65	✱	

** WITH SOURCE DOWN.

MAXIMUM RADIATION DESIGN LEAKAGE SO THAT NO ONE SHALL RECEIVE MORE THAN 10 mrem IN A 40 HOUR WORK WEEK WITH CURIES OF COBALT-60 INSTALLED.

OCCUPANCY HOURS/WEEK	DOSE RATE IN mrem/h IN AREA	
	MAXIMUM	AVERAGE
40	2.0	0.25

SURVEY PERFORMED BY E BEERS
DATE August

ATOMIC ENERGY OF CANADA LIMITED
OTTAWA COMMERCIAL PRODUCTS CANADA

SURVEY INSTRUMENT MODEL BERTHOLD RATO/F
SERIAL NO. 574259 CALIBRATION DATE 65-7-4
SOURCE CONTENT 9.4.794 CURIES, ON DATE August 1/65

RADIATION SURVEY REPORT
AFTER SOURCE INSTALLATION NO. ---
IN IR 125 ISOMEDIX
OHIO

SHEET OF

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REGULATORY RESEARCH

DRAFT REGULATORY GUIDE AND VALUE/IMPACT STATEMENT

October 1984
Division 10
Task FC 402-4

Contact: N. Bassin (301) 427-9027

SECOND PROPOSED REVISION 1 TO REGULATORY GUIDE 10.9
(Second draft, previously issued as Task OP 706-4)

GUIDE FOR THE PREPARATION OF APPLICATIONS FOR LICENSES FOR THE USE OF SELF-CONTAINED DRY SOURCE-STORAGE IRRADIATORS

This regulatory guide and the associated value/impact statement are being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. They have not received complete staff review and do not represent an official NRC staff position.

Public comments are being solicited on both drafts, the guide (including any implementation schedule) and the value/impact statement. Comments on the value/impact statement should be accompanied by supporting data. Comments on both drafts should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch, by JAN 4 1985

Requests for single copies of draft guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future draft guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Technical Information and Document Control.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 PURPOSE OF GUIDE

The purpose of this regulatory guide is to provide assistance to applicants and licensees in preparing applications for new licenses, license amendments, and license renewals for the use of self-contained dry source-storage irradiators. These irradiators are constructed so that the sealed sources and the material being irradiated are contained in a shielded volume and there is no external radiation beam during the use of the irradiator. The radioisotopes most commonly used for these irradiators are cobalt-60 and cesium-137.

This regulatory guide is intended to provide you, the applicant and licensee, with information that will enable you to have an understanding of specific regulatory requirements and licensing policies as they apply to self-contained dry source-storage irradiators. The information in this regulatory guide is not a substitute for training in radiation safety.

After you are issued a license, you must conduct your program in accordance with (1) the statements, representations, and procedures contained in your application, (2) the terms and conditions of the license, and (3) Nuclear Regulatory Commission regulations. The information you provide in your application should be clear, specific, and accurate.

1.2 APPLICABLE REGULATIONS

NRC regulations applicable to irradiators are in 10 CFR Part 19, "Notices, Instructions and Reports to Workers; Inspections"; 10 CFR Part 20, "Standards for Protection Against Radiation"; 10 CFR Part 21, "Reporting of Defects and Noncompliance"; 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material"; 10 CFR Part 71, "Packaging and Transportation of Radioactive Material"; and 10 CFR Part 170, "Fees for Facilities and Materials Licenses and Other Regulatory Services Under the Atomic Energy Act of 1954, as Amended." It is your responsibility as an applicant and as a licensee to have copies of, to read, and to abide by each regulation. As a licensee, you are subject to all applicable provisions of the regulations that pertain to self-contained dry source-storage irradiators.

This guide identifies the information needed to complete NRC Form 313 for applications for a license for the use of self-contained dry source-storage irradiators. The information collection requirements in NRC Form 313 have been cleared under OMB Clearance No. 3150-0120.

1.3 AS LOW AS IS REASONABLY ACHIEVABLE (ALARA) PHILOSOPHY

Paragraph 20.1(c) of 10 CFR Part 20 states "...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." Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable," provides the NRC staff position on this important subject. License applicants should consider the ALARA philosophy as described in Regulatory Guide 8.10 in the development of plans for work with licensed radioactive materials.

2. FILING AN APPLICATION

You, as the applicant for a materials license, should complete NRC Form 313 (see Appendix A to this guide). You should complete Items 1 through 4, 12, and 13 on the form itself. For Items 5 through 11, you should submit the information on supplementary pages. Each separate sheet or document submitted with the application should be identified and keyed to the item number on the application to which it refers. All typed pages, sketches, and, if possible, drawings should be on 8-1/2 x 11 inch paper to facilitate handling and review. If larger drawings are necessary, they should be folded to 8-1/2 x 11 inches. You should complete all items in the application in sufficient detail for the NRC to determine that your equipment, facilities, training and experience, and radiation safety program are adequate to protect health and minimize danger to life or property.

You should file your application in duplicate. Retain one copy for yourself, because the license will require that you possess and use licensed

material in accordance with the statements and representations in your application and in any supplements to it.

Federal agencies should file applications with the U.S. Nuclear Regulatory Commission, Division of Fuel Cycle and Material Safety, Washington, DC 20555.

If you are located in an Agreement State, you should file an application with the NRC only if you wish to possess and use licensed material in States subject to its jurisdiction. All other persons should file applications with the Nuclear Regulatory Commission Regional Office for the State in which they are located.

If you are located in Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, or Vermont, send your applications to the U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, 631 Park Avenue, King of Prussia, PA 19406.

If you are located in Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, Virgin Islands, or West Virginia, send your applications to the U.S. Nuclear Regulatory Commission, Region II, Material Radiation Protection Section, 101 Marietta Street, Suite 2900, Atlanta, GA 30323.

If you are located in Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, or Wisconsin, send your applications to the U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 799 Roosevelt Road, Glen Ellyn, IL 60137.

If you are located in Arkansas, Colorado, Idaho, Kansas, Louisiana, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, or Wyoming, send your applications to the U.S. Nuclear Regulatory Commission, Region IV, Material Radiation Protection Section, 611 Ryan Plaza Drive, Suite 1000, Arlington, TX 76011.

If you are located in Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington, or U.S. territories and possessions in the Pacific, send your applications to the U.S. Nuclear Regulatory Commission, Region V, Material Radiation Protection Section, 1450 Maria Lane, Suite 210, Walnut Creek, CA 94596.

3. CONTENTS OF AN APPLICATION

The following comments apply to the indicated items of NRC Form 313.

Item 1 - LICENSE INFORMATION

For a new license, check subitem A. For an amendment to an existing license, check subitem B. For a renewal of an existing license, check subitem C.

Item 2 - NAME AND MAILING ADDRESS OF APPLICANT

You, the applicant, should be the corporation or other legal entity applying for the license. If you are an individual, you should be designated as the applicant only if you are acting in a private capacity and the use of the radioactive material is not connected with your employment with a corporation or other legal entity.

The address specified here should be your mailing address for correspondence. This may or may not be the same as the address at which the material will be used, as specified in Item 3.

Item 3 - LOCATIONS OF USE

You should specify each location of use by the street address, city, and State or other descriptive address (such as 5 miles east on Highway 10, Anytown, State) to allow us to easily locate your facility. A Post Office Box address is not acceptable.

Item 4 - PERSON TO BE CONTACTED ABOUT APPLICATION

You should name the individual who knows your proposed program and can answer questions about the application, and you should note his or her telephone number. If the contact changes, the NRC should be notified. Notification of a contact change is for information only and would not be considered an application for a license amendment.

Item 5 - MATERIAL TO BE POSSESSED

1. Identify the radioisotope that will be in each sealed source in the irradiator.

2. Identify the manufacturer and model number of each sealed source that will be in the irradiator.

3. Specify the total amount of radioactive material that you will possess at any one time.

4. Identify the manufacturer and model number of the irradiator.

The information specified above is available from the supplier of the irradiator.

Item 6 - PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED

Specify the purpose for which the irradiator will be used.

Item 7 - INDIVIDUALS RESPONSIBLE FOR RADIATION SAFETY PROGRAM: THEIR TRAINING AND EXPERIENCE

Paragraph 30.33(a)(3) of 10 CFR Part 30 specifies that you must be qualified by training and experience to use the material for the purpose requested in such a manner as to protect health and minimize danger to life or property before an application for a license is approved.

You should provide the following information about the individual or individuals who will be responsible for your radiation safety program.

1. The name of each individual.

2. Specific dates each individual's training was completed and where and by whom the training was conducted. As a minimum, the individuals specified in

1 above should have successfully completed a training course of approximately 3 days in the following topics:

- The principles and fundamentals of radiation protection and good safety practices related to the use of radioactive materials.
- Radioactivity measurements, use of radiation detection and measuring instruments, and monitoring techniques.
- Mathematics and calculations basic to the use and measurement of radioactivity.
- Biological effects of radiation.

3. Specific dates of each individual's actual experience in irradiator use, the type of irradiator used, and its location. As a minimum, each individual should also have at least 40 hours of actual experience in the use of the type of irradiator specified in the application (or a similar type of irradiator) and in operations associated with irradiator use.

Item 8 - TRAINING PROVIDED TO OTHER USERS

Individuals who will operate the irradiator under the supervision of a responsible individual (described in item 7) do not need to be designated by name. Simply provide the following information:

1. An outline of the training program, including the topics that will be covered and the time that will be spent on each topic.

The following are examples of topics to be included in the training program: (1) the principles and fundamentals of radiation safety and good safety practices related to the use of radioactive materials, (2) the use of radiation detection instruments, and (3) the design and operation of the irradiator. This training should be approximately 8 hours in length.

The training program should include an examination to test the understanding and knowledge of the individuals who have completed the training program. The

examination should contain about 25 questions so that all aspects of the training program are covered.

2. Copies of the examination, the correct answers, the passing grade, and a discussion of the additional instruction for individuals who are found to be deficient.

3. A discussion of the on-the-job training that will be given to individuals. The training should consist of a minimum of 4 hours of on-the-job training in the actual operation and use of the irradiator. The on-the-job training should be conducted by a responsible individual specified in Item 7.

4. The name of the course instructor. If this person is not a responsible individual specified in Item 7, submit this person's qualifications. The minimal qualifications for a course instructor should be the same as those of an individual specified in Item 7.

5. A commitment that records documenting the training of each individual will be maintained.

Item 9 - FACILITIES AND EQUIPMENT

Paragraph 30.33(a)(2) of 10 CFR Part 30 states that an application will be approved if, among other things, the applicant's proposed equipment and facilities are adequate to protect health and to minimize danger to life or property. Therefore, you should provide information concerning your equipment and facilities.

Further, § 20.207 of 10 CFR Part 20 states that licensed materials in an unrestricted area must be secured from unauthorized removal from the place of storage and that licensed materials in an unrestricted area and not in storage must be under the constant surveillance and immediate control of the licensee. The room or area in which the irradiator is located cannot be a restricted area if individuals other than those specified in Items 7 or 8 can have access to it.

The irradiator should be located in a room that can be locked when a user is not present to prevent access by unauthorized persons. You need only repeat

this statement in your application in a manner that constitutes a positive commitment.

Item 10 - RADIATION SAFETY PROGRAM

You, as the licensee, are responsible for the conduct of the irradiator program and all actions of your employees.

10.1 Personnel Monitoring Equipment

Section 20.202 of 10 CFR Part 20 requires that personnel monitoring equipment be used by individuals entering restricted areas who receive, or are likely to receive, a dose in excess of 25% of the dose specified in paragraph 20.101(a) of 10 CFR Part 20. The specified doses per calendar quarter are 1-1/4 rems to the whole body, head and trunk, active blood-forming organs, or gonads; 18-3/4 rems to the hands and forearms or feet and ankles; and 7-1/2 rems to the skin of the whole body. Individuals under 18 years of age need to use personnel monitoring equipment if they receive, or are likely to receive, a dose in excess of 5% of the specified doses in paragraph 20.101(a).

All your personnel should wear either a film badge or thermoluminescent dosimeter (TLD) when they use the irradiator. State the type of personnel monitoring equipment you will use and the frequency at which the film badges or TLD will be changed. The frequency of change should be at least monthly for film badges and quarterly for TLDs.

10.2 Radiation Detection Instruments

Paragraph 20.201(b) of 10 CFR Part 20 specifies that you, as the licensee, must make such surveys as are necessary to evaluate the extent of radiation hazards that may be present and to comply with regulatory requirements. In order to perform appropriate surveys, you need to have operable, calibrated instrumentation.

State that you will have available for use at all times a calibrated, operable survey meter that can measure up to one roentgen per hour. You do not need to name the manufacturer or the model number of the survey meter. The reason for the required range of the survey meter is the need to detect

abnormal radiation levels that may indicate shielding failure, sealed source displacement, or sealed source failure with a resultant spread of contamination.

In order to perform appropriate surveys, instruments must be operable and calibrated with an appropriate radiation source. State that the instrument will (1) be calibrated so that the readings are ±20% of the actual values over the range of the instrument, (2) have a calibration chart or graph that shows the results of the calibration, the date of the last calibration, and the due date for the next calibration affixed to the survey meter, and (3) be calibrated at least annually and after servicing. Also state that calibration records will be kept for a minimum of two years after each calibration, and identify who will calibrate the instrument. If a person or firm outside your organization will perform the calibration, identify each person or firm by name and NRC or Agreement State license number. If the person or firm is not a licensee, provide a copy of the procedure used for instrument calibration for NRC review.

For detailed information on survey instrument calibration, refer to ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration."*

NOTE: A person or firm in a non-Agreement State who uses radium for instrument calibration would not be an NRC licensee because NRC does not have authority to license naturally occurring radioisotopes such as radium. If you use one of these calibration services, you must provide the NRC with a copy of the procedures used.

10.3 Leak-Testing

As a licensee, you must perform such tests as the NRC deems appropriate pursuant to § 30.53, "Tests," of 10 CFR Part 30. Tests to determine if there is any leakage from the sealed sources in the irradiator are necessary and must be performed at 6-month intervals. The measurement of the leak-test sample should be a quantitative measurement and must be sufficiently sensitive to detect 0.05 microcurie of radioactivity.

The options for leak-testing are:

*Copies may be obtained from the American National Standards Institute 1430 Broadway, New York, NY 10018.

1. Engage the services of a consultant or commercial facility to take samples, evaluate the samples, and report the results to you.

2. Use a commercial leak-test kit. You take the smear and send the smear to the kit supplier, which reports the results to you.

3. You perform the entire leak-test sequence, including taking the smears and measurement.

For Option 1, specify the name, address, and license number of the consultant or commercial organization.

For Option 2, specify the kit model number and the name, address, and license number of the kit supplier. State if the test samples will be taken by the individual specified in Item 7 who is responsible for the irradiator program. If another irradiator operator will take the test sample, instructions for taking the sample should be included in your operating and emergency procedures. Include in the instructions a requirement that any indication of possible source leakage should be reported to the individual responsible for the irradiator program for appropriate action.

For Option 3, specify how and by whom the test sample will be taken, the instrumentation that will be used for measurement, and the individual who will make the measurement and his or her qualifications. An instrument capable of making quantitative measurements should be used. Hand-held survey meters will not normally be considered adequate for measurements. Include a sample calculation for conversion of the measurement data to microcuries.

10.4 Operating and Emergency Procedures

You should provide your personnel with written operating and emergency procedures and you should state to the NRC that you will provide copies of the procedures to each person who uses the irradiator. It is not necessary to submit the detailed operating and emergency procedures to the NRC. However, you should list the topics covered in your procedures, and you should state that these procedures include instructions in the following topics.

1. Step-by-step procedures for operation of the irradiator. Information may be extracted from the irradiator manufacturer's manual.

2. Personnel monitoring equipment to be worn when operating the irradiator.

3. The door to the irradiator room is to be locked when the irradiator is unattended.

4. Leak-testing, if applicable.

5. Emergency situations, e.g., if a survey reveals abnormal radiation levels around the irradiator, personnel should leave the irradiator room, lock the door, and contact the individual responsible for the irradiator program. In addition, your procedures should require that a survey be made with a radiation survey meter outside the irradiator room to determine whether further restriction of the area is necessary to ensure that no one can enter the area if the radiation level exceeds 2 milliroentgens per hour.

Item 11 - WASTE MANAGEMENT

Section 20.301 of 10 CFR Part 20 specifies the general requirements for disposal of licensed material. Because of the nature of the licensed material contained in irradiators, your only option for disposal is to transfer the radioactive source to an authorized recipient as specified in paragraph 20.301(a) of 10 CFR Part 20. You should state that disposal will be by transfer of the radioactive material to a licensee specifically authorized to accept it.

Authorized recipients are the original supplier of the irradiator source, a commercial firm licensed by the NRC or an Agreement State to accept radioactive waste from other persons, or another specific licensee authorized to possess the licensed material. No one else is authorized to dispose of your licensed material.

Item 12 - LICENSE FEES

An application fee paid in full is required by paragraph 170.12(a) of 10 CFR Part 170 for most types of licenses, including applications for license

amendments and renewals. You should refer to § 170.31, "Schedule of Fees for Materials Licenses and Other Regulatory Services," of 10 CFR Part 170 to determine the amount of the fee that must accompany your application. Applications for which no fee is received may be returned to you. All application fees may be charged irrespective of the NRC's disposition of the application or your withdrawal of the application.

Item 13 - CERTIFICATION

You, as the legal entity, must have your application dated and signed by your representative who is authorized to sign official documents and to certify that the application contains information that is true and correct to the best of your knowledge and belief. Unsigned applications will be returned for proper signature. If you are an individual applicant acting in a private capacity, you are required to sign the form.

4. AMENDMENTS TO A LICENSE

After you are issued a license, you must conduct your program in accordance with (1) the statements, representations, and procedures contained in your application, (2) the terms and conditions of the license, and (3) the Nuclear Regulatory Commission's regulations.

It is your obligation to keep your license current. You should anticipate the need for a license amendment insofar as possible. If any of the information provided in your application is to be modified or changed, submit an application for a license amendment. In the meantime, you must comply with the terms and conditions of your license until it is actually amended; our regulations do not allow you to implement changes on the basis of a submission requesting an amendment to your license.

An application for a license amendment may be filed either on the application form (NRC Form 313) or in a letter (in duplicate) and sent to the address specified in this guide in Section 2, "Filing An Application." Your application should identify your license by number and should clearly describe the exact nature of the changes, additions, or deletions. References to previously submitted information and documents should be clear and specific and should identify the pertinent information by date, page, and paragraph. For example,

if you wish to change the responsible individual, your application for a license amendment should specify the new individual's name, training, and experience. The qualifications of the new individual should be equivalent to those specified in Item 7 of this regulatory guide.

You must send the appropriate fee for license amendment with your application. The NRC will not accept an application for filing or processing before the proper fee is paid, in accordance with § 170.12 of 10 CFR Part 170.

5. RENEWAL OF A LICENSE

Licenses are issued for a period of up to 5 years. You must send an application for renewal to the address specified in this guide in Section 2, "Filing An Application." You may submit an entirely new application for renewal as if it were an application for a new license without referring to previously submitted information.

As an alternative, you may:

1. Review your current license to determine whether the information about the sealed sources and the irradiator accurately represents your current and anticipated program. Identify any additions, deletions, or other changes and then prepare information appropriate for the required additions or changes.

2. Review the documents you have submitted in the past to determine whether the information in them is up to date and accurately represents your facilities, equipment, personnel, radiation safety procedures, locations of use, and so on. The documents you consider to represent your current program should be identified by date. Any out-of-date or superseded documents should also be identified, and changes should be made in the documents as necessary to reflect your current program.

3. Review NRC regulations to ensure that any changes in the regulations are appropriately covered in your program description.

4. After you have completed your review, you should submit a letter to the NRC in duplicate, with the proper fee, requesting renewal of your license and providing the information specified in Items 1, 2, and 3, as necessary.

5. Include the name and telephone number of the person to be contacted about your renewal application and include your current mailing address if it is not indicated correctly on your license.

If you file your application for license renewal at least 30 days before the expiration date of your license and send it with the appropriate fee for license renewal, your license will automatically remain in effect until the NRC takes final action on your application. However, if you file an application less than 30 days before the expiration date and the NRC cannot process it before that date, you would be without a valid license when your license expires.

It is important that the appropriate fee accompany your application for license renewal. In accordance with § 170.12 of 10 CFR Part 170, the NRC will not accept an application for filing or processing before the proper fee is paid.

If you do not wish to renew your license, you must dispose of all licensed radioactive material you possess in a manner authorized by 10 CFR Part 20. Complete Form NRC-314, "Certificate of Disposition of Materials," and send it to the NRC before the expiration date of your license with a request that your license be terminated.

If you cannot dispose of all the licensed radioactive material in your possession before the expiration date, you must request a license renewal for storage only of the radioactive material. The renewal is necessary to avoid violating NRC's regulations, which do not allow you to possess licensable material without a valid license.

APPENDIX A

NRC FORM 313
(1-84)
10 CFR 30, 32, 33, 34, 35 and 40

APPLICATION FOR MATERIAL LICENSE

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB
3150-0120
Expires 5-31-87

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.

FEDERAL AGENCIES FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS, IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIAL SECTION B
631 PARK AVENUE
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
MATERIAL RADIATION PROTECTION SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
MATERIAL RADIATION PROTECTION SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

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.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- ☐ A. NEW LICENSE
- ☐ B. AMENDMENT TO LICENSE NUMBER _____
- ☐ C. RENEWAL OF LICENSE NUMBER _____

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip Code)*

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED.

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION | TELEPHONE NUMBER

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY | AMOUNT ENCLOSED $

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

14. VOLUNTARY ECONOMIC DATA

a. ANNUAL RECEIPTS
- ☐ <$250K
- ☐ $250K–500K
- ☐ $500K–750K
- ☐ $750K–1M
- ☐ $1M–3.5M
- ☐ $3.5M–7M
- ☐ $7M–10M
- ☐ >$10M

b. NUMBER OF EMPLOYEES *(Total for entire facility excluding outside contractors)*

c. NUMBER OF BEDS

d. WOULD YOU BE WILLING TO FURNISH COST INFORMATION *(Dollar and/or staff hours)* ON THE ECONOMIC IMPACT OF CURRENT NRC REGULATIONS OR ANY FUTURE PROPOSED NRC REGULATIONS THAT MAY AFFECT YOU? *(NRC regulations permit it to protect confidential commercial or financial–proprietary–information furnished to the agency in confidence)*
☐ YES ☐ NO

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
AMOUNT RECEIVED	CHECK NUMBER			DATE

PRIVACY ACT STATEMENT ON THE REVERSE

TEAR LINE

TEAR LINE

PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the Nuclear Regulatory Commission on NRC Form 313. This information is maintained in a system of records designated as NRC-3 and described at 40 Federal Register 45334 (October 1, 1975).

1. **AUTHORITY:** Sections 81 and 161(b) of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2111 and 2201(b)).

2. **PRINCIPAL PURPOSE(S):** The information is evaluated by the NRC staff pursuant to the criteria set forth in 10 CFR Parts 30, 32, 33, 34, 35 and 40 to determine whether the application meets the requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations, for the issuance of a radioactive material license or amendment thereof.

3. **ROUTINE USES:** The information may be (a) provided to State health departments for their information and use; and (b) provided to Federal, State, and local health officials and other persons in the event of incident or exposure, for their information, investigation, and protection of the public health and safety. The information may also be disclosed to appropriate Federal, State, and local agencies in the event that the information indicates a violation or potential violation of law and in the course of an administrative or judicial proceeding. In addition, this information may be transferred to an appropriate Federal, State, or local agency to the extent relevant and necessary for an NRC decision or to an appropriate Federal agency to the extent relevant and necessary for that agency's decision about you.

4. **WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION:** Disclosure of the requested information is voluntary. If the requested information is not furnished, however, the application for radioactive material license, or amendment thereof, will not be processed. A request that information be held from public inspection must be in accordance with the provisions of 10 CFR 2.790. Withholding from public inspection shall not affect the right, if any, of persons properly and directly concerned need to inspect the document.

5. **SYSTEM MANAGER(S) AND ADDRESS:** U.S. Nuclear Regulatory Commission
Director, Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
Washington, D.C. 20555

DRAFT VALUE/IMPACT STATEMENT

1. BACKGROUND

The NRC issues licenses for the possession and use of byproduct material in self-contained dry source-storage irradiators. In April 1980, the NRC issued Regulatory Guide 10.9 to provide guidance for the preparation of applications for licenses for the use of gamma irradiators, which reflected the use of Form NRC-313I. In July 1984, the NRC issued a new application form, NRC Form 313, which superseded Form NRC-313I. It was decided that a new regulatory guide dealing exclusively with self-contained dry source-storage irradiators, in conformance with NRC Form 313, should be issued.

2. PROPOSED ACTION

2.1 Description

An applicant for a license to use byproduct material in self-contained dry source-storage irradiators is required to develop a program that complies with NRC regulations and to describe this program in the license application. The proposed action is to revise Regulatory Guide 10.9 to conform to the new NRC Form 313 and to provide guidance in establishing a program for the use of self-contained dry source-storage irradiators.

2.2 Need

The change from Form NRC-313I to NRC Form 313 necessitates changes in the guidance provided for the license application to conform to the NRC Form 313.

2.3 Value/Impact

2.3.1 NRC

The review and approval of applications for the use of byproduct material in self-contained dry source-storage irradiators would be facilitated by the instructions and guidance to be provided in the revised regulatory guide. The

proposed action would clearly list the regulations to be followed and the information required for licensing and implementing an acceptable program for the use of an irradiator. Staff review time would be shortened because there would be a reduction in correspondence resulting from a lack of sufficient detail in license applications.

2.3.2 Other Government Agencies

Other government agencies would not be affected.

2.3.3 Industry

The proposed action would contribute to a reduction in the time required for preparing license applications. Applicants would spend less time trying to interpret NRC regulations and requirements for information. More importantly, the proposed action would provide information for design and implementation of a more effective radiation safety program, thereby minimizing the exposure of workers to radiation.

2.3.4 Public

No impact on the public is foreseen.

2.3.5 Worker

The worker would benefit from the proposed action through reduced radiation exposure as discussed in Item 2.3.3.

2.4 Decision on Proposed Action

A proposed revision to Regulatory Guide 10.9, dealing exclusively with self-contained dry source-storage irradiators, should be prepared to conform the guidance to the new license application form, NRC Form 313.

3. TECHNICAL APPROACH

Not applicable.

4. PROCEDURAL APPROACH

4.1 Alternatives

Regulatory Guide 10.9 presently exists. Revision 1 of the guide is necessary because of a change in the application form. The only alternative is to discontinue use of the guide altogether and use individual letters to applicants.

4.2 Discussion

A regulatory guide is the most effective way to transmit information about regulations and licensing requirements. A regulatory guide ensures uniform transmission of information to applicants. Individual letters would be inefficient and, depending on the reviewing official, may not uniformly convey the same information to each applicant. Revision of the guide is the most effective alternative.

5. STATUTORY CONSIDERATIONS

5.1 NRC Authority

Authority for the proposed action is derived from the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended, and implemented through the Commission's regulations, especially 10 CFR Parts 20 and 30.

5.2 Need for NEPA Assessment

Issuance or amendment of guides for the implementation of regulations in Title 10, Chapter I, of the Code of Federal Regulations is a categorical exclusion under paragraph 51.22(c)(16) of 10 CFR Part 51. Thus, an environmental impact statement or assessment is not required for this action.

6. RELATIONSHIP TO OTHER EXISTING OR PROPOSED REGULATIONS OR POLICIES

No conflicts or overlaps appear to exist.

7. SUMMARY AND CONCLUSIONS

The guide, when disseminated, will assist the NRC in its review of applications for the use of byproduct material in self-contained dry source-storage irradiators and will provide applicants with guidance on submitting applications in conformance with the new NRC Form 313. The regulatory guide should be revised.

PART 19

NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS; INSPECTIONS

Sec.

Authority: Secs. 53, 63, 81, 103, 104, 161, 186, 68 Stat. 930, 933, 935, 936, 937, 948, 955, as amended, sec. 234, 83 Stat. 444, as amended (42 U.S.C. 2073, 2093, 2111, 2133, 2134, 2201, 2236, 2282); sec. 201, 88 Stat. 1242, as amended by Pub. L. 94–79, 89 Stat. 413 (42 U.S.C. 5841). Pub. L. 95–601, sec. 10, 92 Stat. 2951 (42 U.S.C. 5851).

For the purposes of sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273); §§ 19.11(a), (c), (d), and (e) and 19.12 are issued under sec. 161b, 68 Stat. 948, as amended (42 U.S.C. 2201(b)); and §§ 19.13 and 19.14(a) are issued under sec. 161o, 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

40 FR 8774

§ 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.

47 FR 57446

§ 19.2 Scope.

The regulations in this part appy 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.

38 FR 22217

§ 19.3 Definitions.

As used in this part:

(a) "Act" means the Atomic Energy Act of 1954, (68 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.

47 FR 57446

(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.

38 FR 22217

(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 areas 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.

40 FR 8774

§ 19.8 Information collection requirements: OMB approval.

49 FR 19623

(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 3150-0044.

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

49 FR 19623

38 FR 22217

§ 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 20 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 2 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.

47 FR 30452

(c) Each licensee and applicant shall post Form NRC-3, (Revision 8–82 or later) "Notice to Employees," as required by Parts 30, 40, 50, 60, 70, 72, and 150 of this chapter.

NOTE: Copies of Form NRC-3 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 20 of this chapter, or the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

38 FR 22217

(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 2 working days after receipt of the documents from the Commission; the licensee's response, if any, shall be posted within 2 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

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 Notifications 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.

(b) 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 (c).

(c) 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 30 days from the time the request is made, or within 30 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 dates and locations of licensed activities in which the worker participated during this period.

(d) When a licensee is required pursuant to § 20.405 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.

(e) 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.

44 FR 32152

§ 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, premises, 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 license, 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 other provisions 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 to 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, to 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 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-

38 FR 22217

38 FR 22217

38 FR 22217

suant 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).

[38 FR 22217]

§ 19.20 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 150 of this chapter is prohibited.

[47 FR 30462]

§ 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.

[40 FR 8774]

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.

[38 FR 22217]

§ 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.

[40 FR 8774]

PART 19

NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS; INSPECTIONS

Sec.

Authority: Secs. 53, 63, 81, 103, 104, 161, 186, 68 Stat. 930, 933, 935, 936, 937, 948, 955, as amended, sec. 234, 83 Stat. 444, as amended (42 U.S.C. 2073, 2093, 2111, 2133, 2134, 2201, 2236, 2282); sec. 201, 88 Stat. 1242, as amended by Pub. L. 94-79, 89 Stat. 413 (42 U.S.C. 5841). Pub. L. 95-601, sec. 10, 92 Stat. 2951 (42 U.S.C. 5851).

For the purposes of sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273); §§ 19.11(a), (c), (d), and (e) and 19.12 are issued under sec. 161b, 68 Stat. 948, as amended (42 U.S.C. 2201(b)); and §§ 19.13 and 19.14(a) are issued under sec. 161o, 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

40 FR 8774

§ 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.

47 FR 57446

§ 19.2 Scope.

The regulations in this part appy 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.

38 FR 22217

§ 19.3 Definitions.

As used in this part:

(a) "Act" means the Atomic Energy Act of 1954, (68 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.

47 FR 57446

(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.

38 FR 22217

(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 areas 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.

40 FR 8774

§ 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.

49 FR 19623

§ 19.8 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 3150-0044.

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

49 FR 19623

36 FR 22217

§ 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 20 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 2 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.

47 FR 30452

(c) Each licensee and applicant shall post Form NRC-3, (Revision 8-82 or later) "Notice to Employees," as required by Parts 30, 40, 50, 60, 70, 72, and 150 of this chapter.

NOTE: Copies of Form NRC-3 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 20 of this chapter, or the Director, Office of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

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(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 2 working days after receipt of the documents from the Commission; the licensee's response, if any, shall be posted within 2 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

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 Notifications 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.

(b) 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 (c).

(c) 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 30 days from the time the request is made, or within 30 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 dates and locations of licensed activities in which the worker participated during this period.

(d) When a licensee is required pursuant to § 20.405 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.

(e) 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, premises, 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 license, 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 other provisions 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 to 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, to 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 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-

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suant 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. 38 FR 22217

(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).

§ 19.20 Employee protection. 47 FR 30452

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, 90, 70, 72, or 150 of this chapter is prohibited.

§ 19.30 Violations. 40 FR 8774

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. 38 FR 22217

§ 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. 40 FR 8774

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.

PART 20 STANDARDS FOR PROTECTION AGAINST RADIATION

PART 20—STANDARDS FOR PROTECTION AGAINST RADIATION

Authority: Secs. 53, 63, 65, 81, 103, 104, 161, 68 Stat. 930, 933, 935, 936, 937, 948, as amended, (42 U.S.C. 2073, 2093, 2095, 2111, 2133, 2134, 2201); secs. 201, as amended, 202, 206, Pub. L. 93-438, 88 Stat. 1242, 1244, 1246, Pub. L. 94-79, 89 Stat. 413 (42 U.S.C. 5841, 5842, 5846).

For the purposes of sec. 223, 68 Stat. 958, as amended, (42 U.S.C. 2273), §§ 20.101, 20.102, 20.103(a) (b), and (f), 20.104 (a) and (b), 20.105(b), 20.106(a), 20.301, 20.302(a), 20.305, 20.307, 20.308, 20.309, 20.304 and 20.305 are issued under sec. 161b, 68 Stat 948, as amended, (42 U.S.C. 2201(b)); and §§ 20.102, 20.103(c), 20.401–20.407, 20.408(b) and 20.409 are issued under sec. 161o, 68 Stat. 950, as amended, (42 U.S.C. 2201(o)).

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. [40 FR 8774]

(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. [44 FR 32352]

(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. [40 FR 50847]

§ 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, 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. [47 FR 57446]

§ 20.3

§ 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; [40 FR 8774]

(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. [40 FR 23837]

PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

(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; (25 FR 10914)

(7) "Individual" means any human being;

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

(9) "License" means a license issued under the regulations in Parts 30 through 35,40,60,61,70 or 72 of this chapter. "Licensee" means the holder of such license; (47 FR 37446)

(10) "Occupational dose" includes exposure of an individual to radiation (i) in a restricted area; or (ii) in the course of employment in which the individual's duties involve exposure to radiation, provided, that "occupational dose" shall not be deemed to include any exposure of an individual to radiation for the purpose of medical diagnosis or medical therapy of such individual. (25 FR 10914)

(11) "Person" means: (i) Any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the Commission 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. (40 FR 8774)

(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; (25 FR 10914)

(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. "Restricted area" shall not include any areas used as residental quarters, although a separate room or rooms in a residential building may be set apart as a restricted area; (25 FR 13952)

(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. (27 FR 5905)

(16) "Special nuclear material" means: (i) Plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission, pursuant to the provisions of section 51 of the act, determines to be special nuclear material, but does not include source material; or (ii) any material artificially enriched by any of the foregoing but does not include source material; (25 FR 10914)

(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. (25 FR 13952)

(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). (45 FR 14199)

(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. (44 FR 32352)

(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. (25 FR 10914)

(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;

(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/cm²)	Average flux to delivery 100 millirem in 40 hours (neutrons/cm² sec.)
Thermal	970 × 10⁶	670
0.0001	720 × 10⁶	500
0.005	820 × 10⁶	570
0.02	400 × 10⁶	280
0.1	120 × 10⁶	80
0.5	43 × 10⁶	30
1.0	26 × 10⁶	18
2.5	29 × 10⁶	20
5.0	26 × 10⁶	18
7.5	24 × 10⁶	17
10	24 × 10⁶	17
10 to 30	14 × 10⁶	10

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

§ 20.5 Units of radioactivity.

(a) Radioactivity is commonly, and for purposes of the regulations in this part shall be, measured in terms of disintegrations per unit time or in curies.

One curie = 3.7×10^{10} disintegrations per second (dps) = 2.2×10^{12} 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^{7} dps.

(2) One microcurie (μCi) = 0.000001 curie = 3.7×10^{4} 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, 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.

§ 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 3150-0014.

(b) The approved information collection requirements contained in this part appear in §§ 20.102, 20.103, 20.105, 20.106, 20.203, 20.205, 20.302, 20.311, 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 3150-0006.

(2) In § 20.401, Form NRC-5 is approved under control number 3150-0006.

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	1¼
2. Hands and forearms; feet and ankles	18¾
3. Skin of whole body	7½

(b) A licensee may permit an individual in a restricted area to receive a 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 a licensee is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

Part of body	Column 1—Assumed exposure in rems for calendar quarters prior to Jan. 1, 1961	Column 2—Assumed exposure in rems for calendar quarters beginning on or after Jan. 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye	3¼	1¼

(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.[1][2][3] 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[4] 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[4] 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 1, 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 had 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:

[1] 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 S in Appendix B, Table I, Column 1 for 40 hours per week for 13 weeks.

[2] 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. These nuclides shall be subject to the precautionary procedures required by § 20.103(b)(1).

[3] Multiply the concentration values specified in Appendix B, Table I, Column 1, by 6.3×10^4 ml to obtain the quarterly quantity limit. Multiply the concentration value specified in Appendix B, Table I, Column 1, by 2.5×10^6 ml to obtain the annual quantity limit for Rn-222.

[4] 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.

[5] 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 Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, upon written request.

(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 Director of the appropriate Nuclear Regulatory Commission Inspection and Enforcement 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.

(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 (pH) of liquid effluents; and

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

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

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

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

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

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

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

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

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

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

(f) The provisions of 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 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.

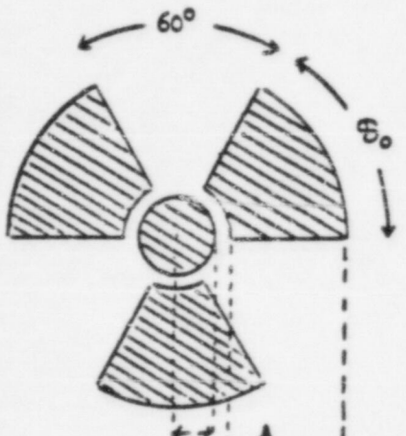
29 FR 14434 29 FR 14434 46 FR 18525 25 FR 10914 25 FR 10914 46 FR 53647 25 FR 10914

§ 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 [1]

RADIATION AREA

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

CAUTION [1]

HIGH RADIATION AREA

[1] Or "Danger".

35 FR 5033

(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.

42 FR 54619

(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 [2] that is used to irradiate materials shall: [3]

43 FR 2167

(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.

42 FR 54619

(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-

[2] 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 sources in non-self-shielded irradiators.

[3] 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.

prise permenent 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). 42 FR 64619

(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. 43 FR 2167

(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 reparis 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. 42 FR 64619

(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. 43 FR 2167

(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. 25 FR 10914

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

CAUTION [1]

AIRBORNE RADIOACTIVITY AREA

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

[1] Or "Danger".

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

CAUTION [1]

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: 25 FR 10914

CAUTION [1]

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 [2] 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: 31 FR 10814

(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. 31 FR 10814 31 FR 16148

(vi) For containers which are accessible [2] 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.

(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. [43 FR 22171]

§ 20.204 Same: exceptions. [35 FR 10914]

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 byproduct 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. [36 FR 5033]

(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. [35 FR 10914]

(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. [36 FR 5033]

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

§ 20.205 Procedures for picking up, receiving, and opening packages. [39 FR 17972]

(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 [41 FR 16445]

(v) Packages containing only radionuclides with half-lives of less than 30 days and a total quantity of no more than 100 millicuries. [39 FR 17972]

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. [41 FR 16445]

TABLE OF EXEMPT AND TYPE A QUANTITIES

Transport group [1]	Exempt quantity limit (in millicuries)	Type A quantity limit (in curies)
I	0.1	0.001
II	0.1	0.050
III	1	3
IV	1	20
V	1	20
VI	1	1000
VII	25,000	1000
Special Form	1	20

[1] 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. [39 FR 17972]

(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. [41 FR 16445]

(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. [39 FR 17972]

§ 20.206 Instruction of personnel. [48 FR 22220]

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. [40 FR 23678]

(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

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

47 FR 57446

(b) As authorized under § 20.302 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).

46 FR 16230

§ 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.

36 FR 23138

(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.

47 FR 57446

§ 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 limits specified in Appendix B, Table I, Column 2 of this part; or

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

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

46 FR 16230

(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.

46 FR 16230

§ 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.

46 FR 16230

(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

47 FR 57446

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 (8) 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 (8) 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 characteristics 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;

(6) 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 Director 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.

(next page is 20-10b)

[25 FR 10914]

§ 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.

[47 FR 57446]

(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 20.206(c), and disposals made under §§ 20.302, 20.303, removed § 20.304,[1] and Part 61 of this chapter.

[41 FR 16300]

(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 §§ 20.302, 20.303, removed § 20.304,[1] 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 § 50.72 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 individuals, 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 § 50.73 (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 § 50.73 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 § 50.72 of this chapter.

(2) All other licensees shall make the reports required by paragraphs (a) and (b) of this section by telephone 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 license;

(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 license;

(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.

[46 FR 33850]

(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.

[46 FR 18525]

(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 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," or in excess of license conditions related to compliance with 40 CFR Part 190.

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

[48 FR 33850]

(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 190 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 50.73 (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 § 50.73 of this chapter need not be reported by a duplicate report under paragraphs (a) or (c) of this section.

[48 FR 33850]

(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.

[43FR44827]

§ 20.406 [Reserved]

[49 FR 24513]

§ 20.407 Personnel monitoring reports.

Each person described in § 20.408 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.[1]

[43 FR 44827]

(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 year was in each of the following estimated exposure ranges:

[43 FR 44827]

Estimated whole body exposure range (rems)	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+	

[1] Individual values exactly 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 § 50.21(b) or § 50.22 of this chapter or a testing facility as defined in § 50.2(r) of this chapter;

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

[46 FR 13971]

(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

[46 FR 58281]

(5) Possess spent fuel in an independent spent fuel storage installation (ISFSI) 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:

[1] 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.

[43 FR 44827]

Radionuclide [1]	Quantity in curies
Cesium-137	1
Cobalt-60	1
Gold-198	100
Iodine-131	1
Indium-192	10
Krypton-85	1,000
Promethium-147	10
Technetium-99m	1,000

[1] 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.

[47 FR 57446]

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

[49 FR 24813]

(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 20.106. 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.

[38 FR 22220]

§ 20.409 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 transmittal to the Commission, and shall comply with the provisions of § 19.13(a) of this chapter.

Exceptions and Additional Requirements

[25 FR 10914]

§ 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

[49 FR 8774]

§ 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.

[Note removed 49 FR 19623]

PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

APPENDIX A.—PROTECTION FACTORS FOR RESPIRATORS [1]

Description [2]	Modes [3]	Protection factors [4]		Tested and certified equipment—National Institute for Occupational Safety and Health/Mine Safety and Health Administration tests for permissibility
		Particulates only	Particulates, gases and vapors [5]	
I. Air-purifying respirators [6]				
Facepiece, half-mask [7]	NP	10		30 CFR Part 11, Subpart K.
Facepiece, full	NP	50		
Facepiece, half-mask, full, or hood	PP	1,000		
II. Atmosphere-supplying respirators				
1. Air-line respirator [8]				
Facepiece, half-mask	CF		1,000	
Facepiece, half-mask	D		5	
Facepiece, full	CF		2,000	
Facepiece, full	D		5	30 CFR Part 11, Subpart J.
Facepiece, full	PD		2,000	
Hood	CF		(9)	
Suit	CF		(9)	(9)
2. Self-contained breathing apparatus (SCBA):				
Facepiece, full	D		50	
Facepiece, full	PD		10,000	30 CFR Part 11, Subpart H.
Facepiece, full	RD		50	
Facepiece, full	RP		10,000	
Facepiece, full			[10]	30 CFR Part 11, § 11.83(b).
III. Combination respirator. Any combination of air-purifying and atmosphere-supplying respirators.				

[1] For use in the selection of respiratory protective devices to be used only where the contaminants have been identified and the concentrations (or possible concentrations) are known.

[2] Only for person faces and where nothing interferes with the seal of facepieces against the skin. (Beards and suits are excepted.)

[3] The mode symbols are defined as follows: CF = continuous flow; D = demand; NP = negative pressure (i.e., negative phase during inhalation); PD = pressure demand (i.e., always positive pressure); PP = positive pressure; RD = demand, recirculating (closed circuit); RP = positive pressure, recirculating (closed circuit).

[4] 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 that inside the equipment (usually inside the facepiece) under conditions of use. It is applied to the ambient airborne concentration to estimate the concentrations inhaled by the wearer according to the following formula:

$$\text{Concentration inhaled} = \frac{\text{Ambient airborne concentration}}{\text{Protection factor}}$$

[5] The protection factors apply:

(a) Only for trained individuals wearing properly fitted respirators used and maintained under supervision in a well-planned respiratory protective program.

(b) For air-purifying respirators only when high efficiency particulate filters (above 99.97% removal efficiency by thermally generated 0.3 μm dioctyl phthalate (DOP) tests) are used in atmospheres not deficient in oxygen and not containing radioactive gas or vapor respiratory hazards.

(c) No allowance is to be made for the use of airborne gaseous radioactive gases or vapors.

(d) For atmosphere-supplying respirators only when supplied with adequate respirable air. Respirable air shall be provided of the quality and quantity required in accordance with MSHA/NIOSH certification described in 30 CFR Part 11. Oxygen and air shall not be used on the same apparatus.

[6] Excluding radioactive contaminants that present an absorption or submersion hazard. For tritium oxide, approximately one half of the intake occurs by absorption through the skin so that an overall protection factor of less than 2 is appropriate when atmosphere-supplying respirators are used to protect against tritium oxide. If the protection factor for a device is 3, the effective protection factor for tritium is about 1.4; for devices with protection factors of 10 the effective factor for tritium oxide is about 1.7; and for devices with protection factors of 100 or more the effective factor for tritium oxide is about 1.8. Air-purifying respirators are not suitable for protection against tritium oxide. See also footnote 7 concerning supplied-air suits.

[7] Canisters and cartridges shall not be used beyond service-life limitations.

[8] Limited-use types only. This type of respirator is not satisfactory for use where it might be possible (e.g., if an accident or emergency were to occur) for the ambient airborne concentration to reach instantaneous values greater than 10 times the pertinent values in Table 1, Column 1 of Appendix B of this part. This type of respirator is not suitable for protection against plutonium or other high-toxicity materials. The mode shall be tested for fit with irritant smoke, prior to use, each time it is donned.

[9] Equipment shall be operated in a manner that ensures that proper air flow-rates are maintained. A protection factor of no more than 1000 may be used for helmet-and-certified supplied-air hoods when a minimum air flow of 6 cubic feet per minute is maintained and calibrated air flow pressure gauges or flow measuring devices are used. A protection factor of up to 2000 may be used for helmet and certified hoods only when the air flow is maintained at the manufacturer's recommended maximum rate for the equipment. This rate is greater than 6 cubic feet per minute, and calibrated airline pressure gauges or flow measuring devices are used.

The design of the supplied-air hood or helmet (with a minimum flow of 6 cfm or more) may determine its overall efficiency and the protection it provides. For example, some hoods ventilate contaminated air into the breathing zone when the wearer works with hands-over-head. This operation may be overcome by a short apron-like extension to the hood to seal under a layer or overalls. Other limitations specified by the approval agency shall be considered before using a hood in certain types of atmospheres, such as the design and its permeability to the contaminant under conditions of use.

[10] Appropriate protection factors shall be determined (see 30 CFR 11), taking into account the ability of the suit and its permeability to the contaminant under conditions of use. There shall be a standby rescue person equipped with self-contained breathing apparatus and communications equipment whenever supplied-air suits are used.

[11] No approval schedules are currently available for this equipment. Equipment shall be evaluated by testing or on the basis of relevant test information.

[12] This type of respirator may provide greater protection and be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure such as skin absorption shall be taken into account in these circumstances.

[13] Quantitative fit testing shall be performed on each individual and no more than 0.02% leakage is allowed with the type of apparatus. Perceptible outward leakage of gas from this or any positive pressure self-contained breathing apparatus is unacceptable because service life will be reduced substantially. Special training in the use of this type of apparatus shall be provided to the wearer (see footnote 9).

[14] Protection factor for type and mode of operation as listed above.

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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 to 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.—Radioactive contaminants 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 at higher concentrations. Under these circumstances, limitations on occupancy may have to be governed by external dose limits.

25 FR 10914

APPENDIX B

Concentrations in Air and Water Above Natural Background

(See notes at end of appendix)

Element (atomic number)	Isotope [1]		Table I		Table II	
			Column 1	Column 2	Column 1	Column 2
			Air	Water	Air	Water
		↑	(μCi/ml)	(μCi/ml)	(μCi/ml)	(μCi/ml)
Actinium (89)	Ac 227	S	2×10^{-11}	6×10^{-3}	8×10^{-14}	2×10^{-4}
		I	3×10^{-11}	9×10^{-3}	9×10^{-13}	3×10^{-4}
	Ac 228	S	8×10^{-9}	3×10^{-5}	3×10^{-9}	9×10^{-7}
		I	2×10^{-8}	3×10^{-5}	6×10^{-10}	9×10^{-7}
Americium (95)	Am 241	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		* I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Am 242m	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	3×10^{-10}	8×10^{-4}	9×10^{-12}	9×10^{-5}
	Am 242	S	4×10^{-8}	4×10^{-5}	1×10^{-9}	1×10^{-6}
		I	8×10^{-8}	4×10^{-5}	2×10^{-9}	1×10^{-6}
	Am 243	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Am 244	S	4×10^{-8}	1×10^{-1}	1×10^{-7}	5×10^{-3}
		I	2×10^{-8}	1×10^{-1}	8×10^{-7}	5×10^{-3}
Antimony (51)	Sb 122	S	2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-5}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
	Sb 124	S	2×10^{-7}	7×10^{-4}	5×10^{-9}	2×10^{-5}
		I	2×10^{-8}	7×10^{-4}	7×10^{-10}	2×10^{-5}
	Sb 125	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	3×10^{-8}	3×10^{-3}	9×10^{-10}	1×10^{-4}
Argon (18)	A 37	Sub[2]	6×10^{-3}	.....	1×10^{-4}	.....
	A 41	Sub	2×10^{-6}	.....	4×10^{-8}	.....
Arsenic (33)	As 72	S	2×10^{-8}	1×10^{-3}	7×10^{-9}	3×10^{-5}
		I	4×10^{-7}	1×10^{-3}	1×10^{-8}	3×10^{-5}
	As 74	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	5×10^{-5}
		I	1×10^{-7}	2×10^{-3}	4×10^{-9}	5×10^{-5}
	As 76	S	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
		I	1×10^{-7}	6×10^{-4}	3×10^{-9}	2×10^{-5}
	As 77	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	8×10^{-5}
		I	4×10^{-7}	3×10^{-3}	1×10^{-8}	8×10^{-5}
Astatine (85)	At 211	S	7×10^{-9}	5×10^{-5}	2×10^{-10}	2×10^{-6}
		I	3×10^{-8}	2×10^{-4}	1×10^{-9}	7×10^{-6}
Barium (56)	Ba 131	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
	Ba 140	S	1×10^{-7}	8×10^{-4}	4×10^{-9}	3×10^{-5}
		I	4×10^{-8}	7×10^{-4}	1×10^{-9}	2×10^{-5}
Berkelium (97)	Bk 249	S	9×10^{-10}	2×10^{-2}	3×10^{-11}	6×10^{-4}
		I	1×10^{-7}	2×10^{-2}	4×10^{-9}	6×10^{-4}
	Bk 250	S	1×10^{-7}	6×10^{-3}	5×10^{-9}	2×10^{-4}
		I	1×10^{-7}	6×10^{-3}	4×10^{-9}	2×10^{-4}
Beryllium (4)	Be 7	S	6×10^{-6}	5×10^{-3}	2×10^{-7}	2×10^{-4}
		I	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
Bismuth (83)	Bi 206	S	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
		I	1×10^{-7}	1×10^{-3}	5×10^{-9}	4×10^{-5}
	Bi 207	S	2×10^{-7}	2×10^{-3}	6×10^{-9}	6×10^{-5}
		I	1×10^{-7}	2×10^{-3}	5×10^{-10}	6×10^{-5}
	Bi 210	S	6×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
		I	6×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
	Bi 212	S	1×10^{-7}	1×10^{-3}	3×10^{-9}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}

APPENDIX B

Concentrations in Air and Water Above Natural Background—Continued

[See notes at end of appendix]

Element (atomic number)	Isotope [1]		Table I		Table II	
			Column 1	Column 2	Column 1	Column 2
		†	Air (μCi/ml)	Water (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)
Bromine (35)	Br 82	S	1×10^{-6}	6×10^{-3}	4×10^{-9}	3×10^{-6}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-6}
Cadmium (48)	Cd 109	S	3×10^{-6}	3×10^{-3}	2×10^{-9}	2×10^{-6}
		I	7×10^{-6}	3×10^{-3}	3×10^{-9}	2×10^{-6}
	Cd 115m	S	4×10^{-6}	7×10^{-4}	1×10^{-9}	3×10^{-7}
		I	4×10^{-6}	7×10^{-4}	1×10^{-9}	3×10^{-7}
	Cd 115	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-7}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-7}
Calcium (20)	Ca 45	S	3×10^{-8}	3×10^{-4}	1×10^{-9}	9×10^{-9}
		I	1×10^{-7}	5×10^{-7}	4×10^{-9}	2×10^{-6}
	Ca 47	S	2×10^{-7}	1×10^{-3}	6×10^{-9}	5×10^{-7}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	3×10^{-7}
Californium (98)	Cf 249	S	2×10^{-12}	1×10^{-4}	5×10^{-14}	4×10^{-9}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	2×10^{-7}
	Cf 250	S	5×10^{-12}	4×10^{-4}	2×10^{-13}	1×10^{-7}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	2×10^{-7}
	Cf 251	S	2×10^{-12}	1×10^{-4}	6×10^{-14}	4×10^{-9}
		I	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-7}
	Cf 252	S	6×10^{-12}	2×10^{-4}	2×10^{-13}	7×10^{-9}
		W	3×10^{-11}	2×10^{-4}	1×10^{-12}	7×10^{-9}
	Cf 253	S	6×10^{-10}	4×10^{-3}	3×10^{-11}	1×10^{-7}
		I	6×10^{-10}	4×10^{-3}	3×10^{-11}	1×10^{-7}
	Cf 254	S	3×10^{-12}	4×10^{-5}	2×10^{-13}	1×10^{-7}
		I	5×10^{-12}	4×10^{-5}	2×10^{-13}	1×10^{-7}
Carbon (6)	C 14	S	4×10^{-6}	2×10^{-3}	1×10^{-7}	8×10^{-6}
	(CO_2)	Sub	3×10^{-7}		1×10^{-9}	
Cerium (58)	Ce 141	S	4×10^{-7}	3×10^{-3}	2×10^{-9}	9×10^{-7}
		I	2×10^{-7}	3×10^{-3}	5×10^{-9}	9×10^{-7}
	Ce 142	S	3×10^{-7}	1×10^{-3}	9×10^{-9}	4×10^{-7}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-7}
	Ce 144	S	1×10^{-6}	3×10^{-4}	3×10^{-10}	1×10^{-7}
		I	6×10^{-6}	3×10^{-4}	2×10^{-10}	1×10^{-7}
Cesium (55)	Cs 131	S	1×10^{-5}	7×10^{-3}	4×10^{-7}	3×10^{-6}
		I	3×10^{-6}	3×10^{-3}	1×10^{-7}	9×10^{-7}
	Cs 134m	S	4×10^{-5}	2×10^{-1}	1×10^{-6}	6×10^{-5}
		I	6×10^{-6}	3×10^{-3}	2×10^{-7}	1×10^{-6}
	Cs 134	S	4×10^{-6}	2×10^{-4}	1×10^{-9}	9×10^{-9}
		I	1×10^{-6}	1×10^{-3}	4×10^{-10}	4×10^{-9}
	Cs 135	S	5×10^{-7}	3×10^{-3}	2×10^{-9}	1×10^{-6}
		I	9×10^{-6}	7×10^{-3}	3×10^{-9}	2×10^{-6}
	Cs 136	S	4×10^{-7}	2×10^{-3}	1×10^{-9}	9×10^{-9}
		I	2×10^{-7}	2×10^{-3}	6×10^{-9}	6×10^{-9}
	Cs 137	S	6×10^{-6}	4×10^{-4}	2×10^{-9}	2×10^{-7}
		I	1×10^{-6}	1×10^{-3}	5×10^{-10}	4×10^{-9}
Chlorine (17)	Cl 36	S	4×10^{-7}	2×10^{-3}	1×10^{-9}	6×10^{-9}
		I	2×10^{-6}	2×10^{-3}	8×10^{-10}	6×10^{-9}
	Cl 38	S	3×10^{-6}	1×10^{-3}	9×10^{-9}	4×10^{-7}
		I	3×10^{-6}	1×10^{-3}	7×10^{-9}	4×10^{-7}
Chromium (24)	Cr 51	S	1×10^{-5}	5×10^{-3}	4×10^{-7}	2×10^{-6}
		I	2×10^{-6}	5×10^{-3}	8×10^{-9}	2×10^{-6}

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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 [1]		Table I		Table II	
			Column 1	Column 2	Column 1	Column 2
		†	Air (μCi/ml)	Water (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)
Cobalt (27)	Co 57	S	3×10^{-6}	3×10^{-3}	1×10^{-7}	5×10^{-4}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-4}
	Co 58m	S	2×10^{-6}	8×10^{-3}	6×10^{-8}	3×10^{-3}
		I	9×10^{-6}	6×10^{-3}	3×10^{-7}	2×10^{-3}
	Co 58	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-3}
		I	8×10^{-6}	3×10^{-3}	3×10^{-8}	9×10^{-4}
	Co 60	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	5×10^{-4}
		I	9×10^{-6}	1×10^{-3}	3×10^{-10}	3×10^{-4}
Copper (29)	Cu 64	S	2×10^{-6}	1×10^{-3}	7×10^{-9}	3×10^{-4}
		I	1×10^{-6}	6×10^{-4}	4×10^{-9}	2×10^{-4}
Curium (96)	Cm 242	S	1×10^{-10}	7×10^{-4}	4×10^{-12}	2×10^{-4}
		W [2]	2×10^{-10}	7×10^{-4}	6×10^{-12}	2×10^{-4}
	Cm 243	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	5×10^{-5}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	2×10^{-4}
	Cm 244	S	9×10^{-12}	3×10^{-4}	3×10^{-13}	7×10^{-5}
		I	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-4}
	Cm 245	S	8×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-5}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-4}
	Cm 246	S	8×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-5}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-4}
	Cm 247	S	8×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-5}
		I	1×10^{-10}	6×10^{-4}	4×10^{-12}	2×10^{-4}
	Cm 248	S	6×10^{-12}	1×10^{-4}	2×10^{-14}	4×10^{-7}
		I	1×10^{-11}	4×10^{-4}	4×10^{-13}	1×10^{-4}
	Cm 249	S	1×10^{-5}	6×10^{-3}	4×10^{-7}	2×10^{-3}
		I	1×10^{-5}	6×10^{-3}	4×10^{-7}	2×10^{-3}
Dysprosium (66)	Dy 165	S	3×10^{-6}	1×10^{-3}	9×10^{-9}	4×10^{-4}
		I	2×10^{-6}	1×10^{-3}	7×10^{-8}	4×10^{-4}
	Dy 166	S	3×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-4}
		I	3×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-4}
Einsteinium (99)	Es 253	S	6×10^{-10}	7×10^{-4}	3×10^{-11}	2×10^{-4}
		I	6×10^{-10}	7×10^{-4}	2×10^{-11}	2×10^{-4}
	Es 254m	S	3×10^{-7}	8×10^{-4}	2×10^{-10}	2×10^{-4}
		I	6×10^{-9}	8×10^{-4}	2×10^{-10}	2×10^{-4}
	Es 254	S	3×10^{-11}	4×10^{-4}	6×10^{-13}	1×10^{-4}
		I	1×10^{-10}	4×10^{-4}	4×10^{-12}	1×10^{-4}
	Es 253	S	8×10^{-10}	8×10^{-4}	2×10^{-11}	3×10^{-4}
		I	4×10^{-10}	8×10^{-4}	1×10^{-11}	3×10^{-4}
Erbium (68)	Er 169	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-4}
		I	4×10^{-7}	3×10^{-3}	1×10^{-8}	9×10^{-4}
	Er 171	S	7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-3}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-3}
Europium (63)	Eu 152 (T/2 = 9.2 hrs)	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-4}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-4}
	Eu 152 (T/2 = 13 yrs)	S	1×10^{-6}	2×10^{-3}	4×10^{-10}	8×10^{-4}
		I	2×10^{-6}	2×10^{-3}	6×10^{-10}	8×10^{-4}
	Eu 154	S	4×10^{-7}	6×10^{-4}	1×10^{-10}	2×10^{-4}
		I	7×10^{-7}	6×10^{-4}	2×10^{-10}	2×10^{-4}
	Eu 155	S	9×10^{-7}	6×10^{-3}	3×10^{-9}	2×10^{-3}
		I	7×10^{-7}	6×10^{-3}	2×10^{-9}	2×10^{-3}

APPENDIX B

Concentrations in Air and Water Above Natural Background—Continued

[See notes at end of appendix]

Element (atomic number)	Isotope [1]		Table I		Table II	
			Column 1	Column 2	Column 1	Column 2
		†	Air (μCi/ml)	Water (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)
Fermium (100)	Fm 254	S	6×10^{-4}	4×10^{-2}	2×10^{-9}	1×10^{-4}
		I	7×10^{-4}	4×10^{-2}	2×10^{-9}	1×10^{-4}
	Fm 255	S	2×10^{-4}	1×10^{-2}	6×10^{-10}	3×10^{-5}
		I	1×10^{-4}	1×10^{-2}	4×10^{-10}	3×10^{-5}
	Fm 256	S	3×10^{-6}	3×10^{-4}	1×10^{-10}	9×10^{-7}
		I	2×10^{-6}	3×10^{-4}	6×10^{-11}	9×10^{-7}
Fluorine (9)	F 18	S	5×10^{-6}	2×10^{-3}	2×10^{-7}	8×10^{-5}
		I	3×10^{-6}	1×10^{-3}	9×10^{-8}	5×10^{-5}
Gadolinium (64)	Gd 153	S	2×10^{-7}	6×10^{-5}	8×10^{-9}	2×10^{-6}
		I	9×10^{-6}	6×10^{-5}	3×10^{-9}	2×10^{-6}
	Gd 159	S	2×10^{-7}	2×10^{-5}	2×10^{-9}	8×10^{-7}
		I	4×10^{-7}	2×10^{-5}	1×10^{-9}	8×10^{-7}
Gallium (31)	Ga 72	S	2×10^{-7}	1×10^{-5}	8×10^{-9}	4×10^{-7}
		I	2×10^{-7}	1×10^{-5}	6×10^{-9}	4×10^{-7}
Germanium (32)	Ge 71	S	1×10^{-4}	8×10^{-3}	4×10^{-7}	2×10^{-4}
		I	6×10^{-6}	8×10^{-3}	2×10^{-7}	2×10^{-4}
Gold (79)	Au 196	S	1×10^{-6}	8×10^{-5}	4×10^{-9}	2×10^{-6}
		I	6×10^{-7}	4×10^{-5}	2×10^{-9}	1×10^{-6}
	Au 198	S	3×10^{-7}	2×10^{-5}	1×10^{-9}	5×10^{-7}
		I	2×10^{-7}	1×10^{-5}	6×10^{-10}	5×10^{-7}
	Au 199	S	1×10^{-6}	8×10^{-5}	4×10^{-9}	2×10^{-6}
		I	8×10^{-7}	4×10^{-5}	3×10^{-9}	2×10^{-6}
Hafnium (72)	Hf 181	S	4×10^{-6}	2×10^{-3}	1×10^{-8}	7×10^{-5}
		I	7×10^{-6}	2×10^{-3}	3×10^{-8}	7×10^{-5}
Holmium (67)	Ho 166	S	2×10^{-7}	9×10^{-6}	7×10^{-9}	3×10^{-7}
		I	2×10^{-7}	9×10^{-6}	6×10^{-9}	3×10^{-7}
Hydrogen (1)	H3	S	3×10^{-6}	1×10^{-3}	2×10^{-7}	3×10^{-5}
		I	8×10^{-6}	1×10^{-3}	2×10^{-7}	3×10^{-5}
		SAC	2×10^{-3}		4×10^{-5}	
Indium (49)	In 113m	S	8×10^{-6}	4×10^{-3}	3×10^{-7}	1×10^{-4}
		I	7×10^{-6}	4×10^{-3}	2×10^{-7}	1×10^{-4}
	In 114m	S	1×10^{-7}	8×10^{-6}	4×10^{-9}	2×10^{-7}
		I	2×10^{-6}	8×10^{-6}	7×10^{-10}	2×10^{-7}
	In 115m	S	2×10^{-6}	1×10^{-3}	8×10^{-9}	4×10^{-5}
		I	2×10^{-6}	1×10^{-3}	6×10^{-9}	4×10^{-5}
	In 115	S	2×10^{-7}	2×10^{-5}	9×10^{-9}	9×10^{-7}
		I	3×10^{-6}	2×10^{-5}	1×10^{-9}	9×10^{-7}
Iodine (53)	I 125	S	3×10^{-7}	4×10^{-5}	8×10^{-11}	2×10^{-7}
		I	2×10^{-7}	6×10^{-5}	6×10^{-9}	2×10^{-6}
	I 126	S	8×10^{-8}	5×10^{-6}	9×10^{-11}	3×10^{-7}
		I	3×10^{-7}	3×10^{-5}	1×10^{-9}	9×10^{-7}
	I 129	S	2×10^{-8}	1×10^{-6}	2×10^{-11}	6×10^{-9}
		I	7×10^{-8}	6×10^{-6}	2×10^{-9}	2×10^{-6}
	I 131	S	9×10^{-8}	6×10^{-6}	1×10^{-10}	3×10^{-7}
		I	3×10^{-7}	2×10^{-5}	1×10^{-9}	6×10^{-7}
	I 132	S	2×10^{-7}	2×10^{-5}	3×10^{-9}	8×10^{-7}
		I	9×10^{-7}	8×10^{-5}	3×10^{-9}	2×10^{-6}
	I 133	S	3×10^{-7}	2×10^{-5}	4×10^{-10}	1×10^{-6}
		I	2×10^{-7}	1×10^{-5}	7×10^{-9}	4×10^{-7}
	I 134	S	8×10^{-7}	4×10^{-5}	6×10^{-9}	2×10^{-6}

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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 [1]		Table I		Table II	
			Column 1	Column 2	Column 1	Column 2
			Air	Water	Air	Water
		†	(μCi/ml)	(μCi/ml)	(μCi/ml)	(μCi/ml)
Iodine (53)	I 134	I	3×10^{-6}	2×10^{-3}	1×10^{-7}	6×10^{-4}
	I 135	S	1×10^{-7}	7×10^{-4}	1×10^{-8}	4×10^{-4}
		I	4×10^{-7}	3×10^{-3}	1×10^{-8}	7×10^{-3}
Iridium (77)	Ir 190	S	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	3×10^{-3}	1×10^{-8}	2×10^{-4}
	Ir 192	S	1×10^{-7}	1×10^{-3}	4×10^{-9}	4×10^{-5}
		I	3×10^{-6}	1×10^{-3}	9×10^{-10}	4×10^{-5}
	Ir 194	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-5}
		I	2×10^{-7}	9×10^{-4}	8×10^{-9}	3×10^{-5}
Iron (26)	Fe 55	S	9×10^{-7}	2×10^{-3}	3×10^{-8}	8×10^{-4}
		I	1×10^{-6}	7×10^{-3}	3×10^{-8}	2×10^{-3}
	Fe 59	S	1×10^{-7}	2×10^{-3}	3×10^{-9}	6×10^{-5}
		I	3×10^{-6}	2×10^{-3}	3×10^{-8}	8×10^{-5}
Krypton (36)	Kr 83m	Sub	4×10^{-6}	. . . . .	1×10^{-7}	. . . . .
	Kr 85	Sub	1×10^{-5}	. . . . .	3×10^{-7}	. . . . .
	Kr 87	Sub	1×10^{-6}	. . . . .	2×10^{-8}	. . . . .
	Kr 88	Sub	1×10^{-6}	. . . . .	2×10^{-8}	. . . . .
Lanthanum (57)	La 140	S	2×10^{-7}	7×10^{-4}	3×10^{-9}	2×10^{-5}
		I	1×10^{-7}	7×10^{-4}	4×10^{-9}	2×10^{-5}
Lead (82)	Pb 203	S	3×10^{-6}	1×10^{-3}	9×10^{-8}	4×10^{-5}
		I	2×10^{-6}	1×10^{-3}	6×10^{-8}	4×10^{-5}
	Pb 210	S	1×10^{-10}	4×10^{-6}	4×10^{-12}	1×10^{-7}
		I	2×10^{-10}	5×10^{-6}	8×10^{-12}	2×10^{-7}
	Pb 212	S	2×10^{-6}	6×10^{-4}	6×10^{-10}	2×10^{-5}
		I	2×10^{-6}	5×10^{-4}	7×10^{-10}	2×10^{-5}
Lutetium (71)	Lu 177	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Manganese (25)	Mn 52	S	2×10^{-7}	1×10^{-3}	7×10^{-9}	3×10^{-5}
		I	1×10^{-7}	9×10^{-4}	5×10^{-9}	3×10^{-5}
	Mn 54	S	4×10^{-7}	4×10^{-3}	1×10^{-8}	1×10^{-4}
		I	4×10^{-6}	3×10^{-3}	1×10^{-8}	1×10^{-4}
	Mn 56	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Mercury (80)	Hg 197m	S	7×10^{-7}	6×10^{-3}	3×10^{-8}	2×10^{-4}
		I	8×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
	Hg 197	S	1×10^{-6}	9×10^{-3}	4×10^{-8}	3×10^{-4}
		I	3×10^{-6}	1×10^{-2}	9×10^{-8}	5×10^{-4}
	Hg 203	S	7×10^{-8}	5×10^{-4}	2×10^{-8}	2×10^{-5}
		I	1×10^{-7}	3×10^{-3}	4×10^{-8}	1×10^{-4}
Molybdenum (42)	Mo 99	S	7×10^{-7}	3×10^{-3}	3×10^{-8}	2×10^{-4}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	5×10^{-5}
Neodymium (60)	Nd 144	S	8×10^{-11}	3×10^{-6}	3×10^{-12}	1×10^{-7}
		I	3×10^{-10}	2×10^{-5}	1×10^{-11}	8×10^{-7}
	Nd 147	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	2×10^{-7}	2×10^{-3}	8×10^{-9}	6×10^{-5}
	Nd 149	S	2×10^{-6}	8×10^{-3}	6×10^{-8}	3×10^{-4}
		I	1×10^{-6}	8×10^{-3}	5×10^{-8}	3×10^{-4}

APPENDIX B

Concentrations in Air and Water Above Natural Background—Continued

(See notes at end of appendix)

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

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Concentrations in Air and Water Above Natural Background—Continued

(See notes at end of appendix)

Element (atomic number)	Isotope [1]	†	Table I, Column 1 Air (μCi/ml)	Table I, Column 2 Water (μCi/ml)	Table II, Column 1 Air (μCi/ml)	Table II, Column 3 Water (μCi/ml)
Plutonium (94)	Pu 242	S	2×10^{-10}	1×10^{-6}	6×10^{-14}	3×10^{-8}
		I	4×10^{-11}	9×10^{-8}	1×10^{-12}	3×10^{-9}
	Pu 243	S	2×10^{-6}	1×10^{-2}	6×10^{-9}	3×10^{-4}
		I	2×10^{-6}	1×10^{-2}	8×10^{-9}	3×10^{-4}
	Pu 244	S	2×10^{-10}	1×10^{-6}	6×10^{-14}	4×10^{-8}
		I	2×10^{-11}	2×10^{-8}	1×10^{-12}	1×10^{-8}
Polonium (84)	Po 210	S	3×10^{-10}	2×10^{-6}	2×10^{-11}	7×10^{-7}
		I	3×10^{-10}	8×10^{-7}	7×10^{-12}	3×10^{-8}
Potassium (19)	K 42	S	2×10^{-6}	9×10^{-3}	7×10^{-9}	3×10^{-4}
		I	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
Praseodymium (59)	Pr 143	S	2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I	2×10^{-7}	9×10^{-4}	8×10^{-9}	3×10^{-5}
	Pr 142	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	5×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	3×10^{-5}
Promethium (61)	Pm 147	S	6×10^{-8}	6×10^{-5}	2×10^{-9}	2×10^{-6}
		I	1×10^{-7}	6×10^{-5}	3×10^{-9}	2×10^{-6}
	Pm 149	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	5×10^{-9}	4×10^{-5}
Protactinium (91)	Pa 230	S	2×10^{-9}	7×10^{-5}	6×10^{-11}	2×10^{-6}
		I	8×10^{-10}	7×10^{-5}	3×10^{-11}	2×10^{-6}
	Pa 231	S	1×10^{-11}	3×10^{-8}	4×10^{-14}	9×10^{-10}
		I	1×10^{-10}	8×10^{-8}	4×10^{-12}	3×10^{-9}
	Pa 233	S	6×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
		I	2×10^{-7}	3×10^{-3}	6×10^{-9}	1×10^{-4}
Radium (88)	Ra 223	S	2×10^{-9}	2×10^{-5}	6×10^{-11}	7×10^{-7}
		I	2×10^{-10}	1×10^{-5}	8×10^{-12}	4×10^{-7}
	Ra 224	S	5×10^{-9}	7×10^{-5}	2×10^{-10}	2×10^{-6}
		I	7×10^{-10}	2×10^{-6}	2×10^{-11}	8×10^{-8}
	Ra 226	S	3×10^{-11}	4×10^{-7}	3×10^{-12}	3×10^{-8}
		I	8×10^{-11}	9×10^{-7}	2×10^{-12}	3×10^{-8}
	Ra 228	S	7×10^{-11}	8×10^{-7}	2×10^{-12}	3×10^{-8}
		I	4×10^{-11}	7×10^{-6}	1×10^{-12}	3×10^{-8}
Radon (86)	Rn 220	S	3×10^{-7}		1×10^{-8}	
	Rn 222 [3] ***	***	3×10^{-8}		3×10^{-9}	
Rhenium (75)	Re 183	S	3×10^{-6}	2×10^{-2}	9×10^{-8}	6×10^{-4}
		I	2×10^{-7}	8×10^{-3}	5×10^{-9}	3×10^{-4}
	Re 186	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	5×10^{-5}
	Re 187	S	9×10^{-6}	7×10^{-2}	3×10^{-7}	3×10^{-3}
		I	5×10^{-7}	4×10^{-3}	2×10^{-8}	2×10^{-4}
	Re 188	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-5}
Rhodium (45)	Rh 103m	S	8×10^{-5}	4×10^{-1}	3×10^{-6}	1×10^{-2}
		I	6×10^{-6}	3×10^{-1}	2×10^{-7}	1×10^{-2}
	Rh 105	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	8×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Rubidium (37)	Rb 86	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
		I	7×10^{-9}	7×10^{-5}	2×10^{-9}	2×10^{-6}
	Rb 87	S	8×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	7×10^{-9}	8×10^{-5}	2×10^{-9}	2×10^{-6}

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Concentrations in Air and Water Above Natural Background—Continued

(See notes at end of appendix)

Element (atomic number)	Isotope [1]	†	Table I Column 1 Air (μCi/ml)	Table I Column 2 Water (μCi/ml)	Table II Column 1 Air (μCi/ml)	Table II Column 2 Water (μCi/ml)
Ruthenium (44)	Ru 97	S	2×10^{-6}	1×10^{-3}	6×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-3}	6×10^{-8}	3×10^{-4}
	Ru 103	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-4}
		I	8×10^{-9}	2×10^{-3}	3×10^{-8}	8×10^{-4}
	Ru 105	S	7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-3}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-3}
	Ru 106	S	8×10^{-8}	4×10^{-4}	3×10^{-9}	1×10^{-4}
		I	6×10^{-9}	3×10^{-4}	2×10^{-10}	1×10^{-4}
Samarium (62)	Sm 147	S	7×10^{-11}	3×10^{-7}	2×10^{-12}	6×10^{-8}
		I	3×10^{-10}	2×10^{-7}	9×10^{-12}	7×10^{-8}
	Sm 151	S	6×10^{-6}	1×10^{-2}	2×10^{-7}	4×10^{-3}
		I	1×10^{-7}	1×10^{-2}	5×10^{-9}	4×10^{-3}
	Sm 153	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-4}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-4}
Scandium (21)	Sc 46	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-4}
		I	2×10^{-8}	1×10^{-3}	6×10^{-10}	4×10^{-4}
	Sc 47	S	6×10^{-7}	2×10^{-3}	2×10^{-8}	9×10^{-4}
		I	5×10^{-7}	2×10^{-3}	2×10^{-8}	9×10^{-4}
	Sc 48	S	2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-4}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-4}
Selenium (34)	Se 75	S	1×10^{-6}	9×10^{-3}	4×10^{-8}	3×10^{-3}
		I	1×10^{-7}	8×10^{-3}	4×10^{-8}	3×10^{-3}
Silicon (14)	Si 31	S	6×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-3}
		I	1×10^{-6}	6×10^{-3}	5×10^{-8}	2×10^{-3}
Silver (47)	Ag 105	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-3}
		I	8×10^{-9}	3×10^{-3}	3×10^{-8}	1×10^{-3}
	Ag 110m	S	2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-4}
		I	1×10^{-9}	9×10^{-4}	3×10^{-10}	3×10^{-4}
	Ag 111	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	4×10^{-4}
		I	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-4}
Sodium (11)	Na 22	S	3×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-4}
		I	9×10^{-9}	9×10^{-4}	3×10^{-10}	3×10^{-4}
	Na 24	S	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-3}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-4}
Strontium (38)	Sr 85m	S	4×10^{-6}	2×10^{-2}	1×10^{-7}	7×10^{-3}
		I	3×10^{-6}	2×10^{-2}	1×10^{-7}	7×10^{-3}
	Sr 85	S	2×10^{-7}	3×10^{-3}	8×10^{-9}	1×10^{-3}
		I	1×10^{-7}	8×10^{-3}	4×10^{-8}	3×10^{-3}
	Sr 89	S	3×10^{-8}	3×10^{-4}	3×10^{-10}	3×10^{-4}
		I	4×10^{-8}	8×10^{-4}	1×10^{-9}	3×10^{-4}
	Sr 90	S	1×10^{-8}	1×10^{-4}	3×10^{-11}	3×10^{-5}
		I	8×10^{-9}	1×10^{-3}	3×10^{-10}	4×10^{-4}
	Sr 91	S	4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-4}
		I	3×10^{-7}	1×10^{-3}	9×10^{-9}	5×10^{-4}
	Sr 92	S	4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-4}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-4}
Sulfur (16)	S 35	S	3×10^{-7}	2×10^{-3}	9×10^{-9}	6×10^{-4}
		I	3×10^{-7}	2×10^{-3}	9×10^{-9}	3×10^{-4}
Tantalum (73)	Ta 182	S	4×10^{-8}	1×10^{-3}	1×10^{-9}	4×10^{-4}
		I	2×10^{-8}	1×10^{-3}	7×10^{-10}	4×10^{-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 [1]		Table I		Table II	
			Column 1	Column 2	Column 1	Column 2
		†	Air (μCi/ml)	Water (μCi/ml)	Air (μCi/ml)	Water (μCi/ml)
Technetium (43)	Tc 96m	S	8×10^{-4}	4×10^{-1}	3×10^{-6}	1×10^{-3}
		I	3×10^{-4}	3×10^{-1}	1×10^{-6}	1×10^{-3}
	Tc 96	S	6×10^{-7}	3×10^{-3}	2×10^{-9}	1×10^{-6}
		I	2×10^{-7}	1×10^{-3}	8×10^{-10}	5×10^{-7}
	Tc 97m	S	2×10^{-6}	1×10^{-2}	8×10^{-9}	4×10^{-6}
		I	2×10^{-7}	8×10^{-3}	8×10^{-10}	3×10^{-6}
	Tc 97	S	1×10^{-6}	5×10^{-3}	4×10^{-9}	2×10^{-6}
		I	3×10^{-7}	2×10^{-2}	1×10^{-9}	8×10^{-7}
	Tc 99m	S	4×10^{-6}	2×10^{-2}	1×10^{-8}	6×10^{-6}
		I	1×10^{-6}	8×10^{-3}	5×10^{-9}	3×10^{-6}
	Tc 99	S	2×10^{-6}	1×10^{-2}	7×10^{-9}	3×10^{-6}
		I	6×10^{-6}	3×10^{-2}	2×10^{-8}	2×10^{-5}
Tellurium (52)	Te 125m	S	4×10^{-6}	3×10^{-2}	1×10^{-8}	2×10^{-5}
		I	1×10^{-6}	3×10^{-2}	4×10^{-9}	1×10^{-5}
	Te 127m	S	1×10^{-6}	2×10^{-2}	8×10^{-9}	6×10^{-6}
		I	4×10^{-6}	2×10^{-2}	1×10^{-8}	8×10^{-6}
	Te 127	S	2×10^{-5}	8×10^{-2}	6×10^{-8}	3×10^{-5}
		I	9×10^{-7}	8×10^{-3}	3×10^{-9}	2×10^{-6}
	Te 129m	S	8×10^{-6}	1×10^{-2}	3×10^{-8}	2×10^{-5}
		I	3×10^{-6}	6×10^{-3}	1×10^{-8}	2×10^{-5}
	Te 129	S	6×10^{-5}	3×10^{-2}	2×10^{-7}	8×10^{-5}
		I	4×10^{-6}	2×10^{-2}	1×10^{-7}	8×10^{-5}
	Te 131m	S	4×10^{-7}	2×10^{-2}	1×10^{-8}	6×10^{-5}
		I	2×10^{-7}	1×10^{-2}	6×10^{-9}	4×10^{-5}
	Te 132	C	2×10^{-7}	9×10^{-3}	7×10^{-9}	3×10^{-5}
		I	1×10^{-7}	6×10^{-3}	4×10^{-9}	2×10^{-5}
Terbium (65)	Tb 160	S	1×10^{-7}	1×10^{-3}	3×10^{-9}	4×10^{-6}
		I	2×10^{-6}	1×10^{-2}	1×10^{-8}	4×10^{-5}
Thallium (81)	Tl 200	S	3×10^{-6}	1×10^{-2}	9×10^{-9}	4×10^{-5}
		I	1×10^{-6}	7×10^{-3}	4×10^{-9}	2×10^{-5}
	Tl 201	S	2×10^{-6}	9×10^{-3}	7×10^{-9}	3×10^{-5}
		I	9×10^{-7}	8×10^{-3}	3×10^{-9}	3×10^{-5}
	Tl 202	S	8×10^{-7}	4×10^{-3}	3×10^{-9}	1×10^{-5}
		I	2×10^{-7}	2×10^{-3}	8×10^{-10}	7×10^{-7}
	Tl 204	S	6×10^{-7}	3×10^{-3}	2×10^{-9}	1×10^{-5}
		I	3×10^{-6}	2×10^{-2}	9×10^{-9}	6×10^{-5}
Thorium (90)	Th 227	S	3×10^{-10}	5×10^{-6}	1×10^{-11}	2×10^{-8}
		I	2×10^{-10}	5×10^{-6}	6×10^{-11}	2×10^{-8}
	Th 228	S	9×10^{-12}	2×10^{-6}	3×10^{-13}	7×10^{-9}
		I	6×10^{-12}	1×10^{-6}	2×10^{-13}	1×10^{-8}
	Th 230	S	2×10^{-12}	6×10^{-7}	6×10^{-14}	2×10^{-9}
		I	1×10^{-11}	9×10^{-6}	3×10^{-13}	3×10^{-8}
	Th 231	S	1×10^{-6}	7×10^{-3}	5×10^{-8}	2×10^{-5}
		I	1×10^{-6}	7×10^{-3}	4×10^{-8}	2×10^{-5}
	Th 232	S	3×10^{-11}	8×10^{-8}	1×10^{-13}	2×10^{-9}
		I	3×10^{-11}	1×10^{-8}	1×10^{-13}	4×10^{-9}
	Th natural	S	6×10^{-11}	4×10^{-8}	2×10^{-13}	2×10^{-9}
		I	6×10^{-11}	4×10^{-8}	2×10^{-13}	2×10^{-9}

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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 [1]	†	Table I, Column 1 Air (μCi/ml)	Table I, Column 2 Water (μCi/ml)	Table II, Column 1 Air (μCi/ml)	Table II, Column 2 Water (μCi/ml)
Thorium (90)	Th 234	S	6×10^{-6}	8×10^{-4}	2×10^{-9}	2×10^{-7}
		I	3×10^{-8}	8×10^{-4}	1×10^{-8}	2×10^{-7}
Thulium (69)	Tm 170	S	4×10^{-8}	1×10^{-3}	1×10^{-8}	3×10^{-7}
		I	3×10^{-8}	1×10^{-3}	1×10^{-8}	3×10^{-7}
	Tm 171	S	1×10^{-7}	1×10^{-3}	4×10^{-8}	3×10^{-4}
		I	2×10^{-7}	1×10^{-3}	6×10^{-8}	3×10^{-4}
Tin (50)	Sn 113	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	9×10^{-7}
		I	8×10^{-8}	2×10^{-3}	2×10^{-8}	9×10^{-7}
	Sn 125	S	1×10^{-7}	8×10^{-4}	4×10^{-8}	2×10^{-7}
		I	8×10^{-8}	8×10^{-4}	2×10^{-8}	2×10^{-7}
Tungsten (Wolfram) (74)	W 181	S	2×10^{-6}	1×10^{-3}	6×10^{-8}	4×10^{-4}
		I	1×10^{-7}	1×10^{-3}	4×10^{-8}	3×10^{-4}
	W 185	S	6×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
		I	1×10^{-7}	3×10^{-3}	4×10^{-8}	1×10^{-4}
	W 187	S	4×10^{-7}	3×10^{-3}	2×10^{-8}	7×10^{-7}
		I	5×10^{-7}	3×10^{-3}	1×10^{-8}	6×10^{-7}
Uranium (92)	U 230	S	3×10^{-10}	1×10^{-4}	1×10^{-11}	3×10^{-9}
		I	1×10^{-10}	1×10^{-4}	4×10^{-10}	3×10^{-9}
	U 232	S	1×10^{-10}	8×10^{-4}	3×10^{-10}	3×10^{-7}
		I	3×10^{-11}	8×10^{-4}	9×10^{-10}	3×10^{-7}
	U 233	S	5×10^{-10}	9×10^{-4}	2×10^{-11}	3×10^{-7}
		I	1×10^{-10}	9×10^{-4}	4×10^{-10}	3×10^{-7}
	oo U 234	S[4]	6×10^{-10}	9×10^{-4}	2×10^{-11}	3×10^{-7}
		I	1×10^{-10}	9×10^{-4}	4×10^{-10}	3×10^{-7}
	oo U 235	S[4]	5×10^{-10}	8×10^{-4}	2×10^{-11}	3×10^{-7}
		I	1×10^{-10}	8×10^{-4}	4×10^{-10}	3×10^{-7}
	U 236	S	6×10^{-10}	1×10^{-3}	2×10^{-11}	4×10^{-7}
		I	1×10^{-10}	1×10^{-3}	4×10^{-10}	3×10^{-7}
	oo U 238	S[4]	7×10^{-11}	1×10^{-3}	3×10^{-10}	4×10^{-7}
		I	1×10^{-10}	1×10^{-3}	5×10^{-10}	4×10^{-7}
	U 240	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-7}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	3×10^{-7}
	oo U-natural	S[4]	1×10^{-10}	1×10^{-3}	5×10^{-10}	3×10^{-7}
		I	1×10^{-10}	1×10^{-3}	5×10^{-10}	3×10^{-7}
Vanadium (23)	V 48	S	2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-7}
		I	6×10^{-8}	8×10^{-4}	2×10^{-8}	3×10^{-7}
Xenon (54)	Xe 131m	Sub	2×10^{-6}		4×10^{-7}	
	Xe 133	Sub	1×10^{-6}		3×10^{-7}	
	Xe 133m	Sub	1×10^{-6}		3×10^{-7}	
	Xe 135	Sub	4×10^{-7}		1×10^{-7}	
Ytterbium (70)	Yb 175	S	7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Yttrium (39)	Y 90	S	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-7}
		I	1×10^{-7}	6×10^{-4}	3×10^{-9}	2×10^{-7}
	Y 91m	S	2×10^{-6}	1×10^{-1}	8×10^{-7}	3×10^{-5}
		I	2×10^{-6}	1×10^{-1}	6×10^{-7}	3×10^{-5}
	Y 91	S	4×10^{-8}	8×10^{-4}	1×10^{-8}	3×10^{-7}
		I	3×10^{-8}	8×10^{-4}	1×10^{-8}	3×10^{-7}
	Y 92	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-7}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-7}
	Y 93	S	2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-7}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-7}

[26 F.R. 10084]

APPENDIX B

Concentrations in Air and Water Above Natural Background—Continued

Element (atomic number)	Isotope [1]		Table I		Table II	
			Column 1 Air (μCi/ml)	Column 2 Water (μCi/ml)	Column 1 Air (μCi/ml)	Column 2 Water (μCi/ml)
Zinc (30)	Zn 65	S	1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
		I	6×10^{-8}	3×10^{-3}	2×10^{-9}	2×10^{-4}
	Zn 69m	S	4×10^{-7}	2×10^{-2}	1×10^{-8}	7×10^{-4}
		I	2×10^{-7}	2×10^{-2}	1×10^{-8}	6×10^{-4}
	Zn 69	S	7×10^{-6}	3×10^{-2}	2×10^{-7}	2×10^{-3}
		I	9×10^{-6}	3×10^{-2}	3×10^{-7}	2×10^{-3}
Zirconium (40)	Zr 93	S	1×10^{-7}	2×10^{-3}	4×10^{-9}	8×10^{-5}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
	Zr 95	S	1×10^{-7}	2×10^{-3}	4×10^{-9}	6×10^{-5}
		I	3×10^{-6}	2×10^{-3}	1×10^{-8}	6×10^{-5}
	Zr 97	S	1×10^{-7}	8×10^{-4}	4×10^{-9}	2×10^{-5}
		I	9×10^{-6}	8×10^{-4}	3×10^{-7}	2×10^{-5}
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.		Sub	1×10^{-5}		3×10^{-9}	
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.			3×10^{-9}	9×10^{-4}	1×10^{-10}	3×10^{-5}
Any single radionuclide not listed above, which decays by alpha emission or spontaneous fission.			6×10^{-10}	4×10^{-7}	2×10^{-11}	2×10^{-8}

[1] Soluble (S); insoluble (I).

[2] "Sub" means that values given are for submersion in a semi-infinite cloud of airborne material.

[3] 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 (⅓) "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 1.3×10^5 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.

[4] For soluble mixtures of U-nat, U-234 and U-235 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 0.2 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 8×10^{-2} SA μCi-hr/ml, where SA is the specific activity of the uranium inhaled. The concentration value for Table II is 0.007 milligrams uranium per cubic meter of air. The specific activity for natural uranium is 6.77×10^{-7} curies per gram U. The specific activity for other mixtures of U-nat, U-234 and U-235, if not known, shall be:

SA = 0.6×10^{-6} curies/gram U (U-depleted)

SA = $(0.4 + 0.38\,E + 0.0034\,E^2) \times 10^{-6}$ (E enriched)

where E is the percentage by weight of U-235, expressed as percent.

[*] Amended 37 FR 23319.

[**] Amended 39 FR 23990; footnote redesignated 40 FR 50704.

[***] Amended 40 FR 50704.

[†] Amended 38 FR 29314.

[‡] Amended 39 FR 25463; redesignated 40 FR 50704.

NOTE TO APPENDIX B

[25 FR 10914]

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_A, C_B, and C_C, and if the applicable MPC's are MPC_A, and MPC_B, and MPC_C respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_A}{MPC_A}+\frac{C_B}{MPC_B}+\frac{C_C}{MPC_C}\leq 1$$

[30 FR 15804]

2. If either the identity or the concentration of any radionuclide in the mixture is not known, the limiting values for purposes of Appendix B shall be:

a. For purposes of Table I, Col. 1—6×10^{-16}

b. For purposes of Table I, Col. 2—4×10^{-7}

c. For purposes of Table II, Col. 1—2×10^{-10}

d. For purposes of Table II, Col. 2—8×10^{-4}

[25 FR 10914, as amended at 26 FR 6046]

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

[30 FR 15804]

a. Element (atomic number) and isotope	Table I		Table II	
	Column 1 Air (μCi/ml)	Column 2 Water (μCi/ml)	Column 1 Air (μCi/ml)	Column 2 Water (μCi/ml)
If it is known that Sr 90, I 125, I 126, I 129, I 131, (I 133, table II only), Pb 210, Po 210, At 211, Ra 223, Ra 224, Ra 226, Ac 227, Ra 228, Th 230, Pa 231, Th 232, Th-nat, Cm 248, Cf 254, and Fm 256 are not present	----------	9×10^{-9}	----------	8×10^{-4}
If it is known that Sr 90, I 125, I 126, I 129, (I 131, I 133, table II only), Pb 210, Po 210, Ra 223, Ra 226, Ra 228, Pa 231, Th-nat, Cm 245, Cf 254, and Fm 256 are not present	----------	6×10^{-9}	----------	8×10^{-4}
If it is known that Sr 90, I 126, (I 129, I 130, I 131, table II only), Pb 210, Ra 226, Ra 228, Cm 248, and Cf 254 are not present	----------	2×10^{-9}	----------	8×10^{-5}
If it is known that (I 129, table II only), Ra 226, and Ra 228 are not present	----------	8×10^{-9}	----------	1×10^{-4}
If it is known that alpha-emitters and Sr 90, I 129, Pb 210, Ac 227, Ra 228, Pa 230, Pu 241, and Bk 249 are not present	8×10^{-9}	----------	1×10^{-10}	----------
If it is known that alpha-emitters and Pb 210, Ac 227, Ra 228, and Pu 241 are not present	2×10^{-10}	----------	1×10^{-11}	----------
If it is known that alpha-emitters and Ac 227 are not present	8×10^{-11}	----------	1×10^{-12}	----------
If it is known that Ac 227, Th 230, Pa 231, Pu 238, Pu 239, Pu 240, Pu 242, Pu 244, Cm 248, Cf 249 and Cf 251 are not present	8×10^{-12}	----------	1×10^{-13}	----------

[40 FR 50704]

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.

[38 FR 29313]

a. For purposes of Table I, Col. 1—1×10^{-12} μCi/ml gross alpha activity; or 3×10^{-11} μCi/ml natural uranium; or 70 micrograms per cubic meter of air natural uranium.

b. For purposes of Table II, Col. 1—6×10^{-11} μCi/ml gross alpha activity; or 2×10^{-10} μCi/ml natural uranium; or 3 micrograms per cubic meter of air natural uranium.

[26 FR 10088]

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_A) to the concentration limit for that radionuclide specified in Table II of Appendix B (MPC_A) does not exceed the fraction $\frac{1}{10}$ (i.e. $\frac{C_A}{MPC_A}\leq\frac{1}{10}$) and (b) the sum of such ratios for all the radionuclides considered as not present in the mixture does not exceed $\frac{1}{10}$

(i.e. $\frac{C_A}{MPC_A}+\frac{C_B}{MPC_B}+\cdots\leq\frac{1}{10}$).

APPENDIX C

Material	Microcuries
Americium-241	.01
Antimony-122	100
Antimony-124	10
Antimony-126	10
Arsenic-73	100
Arsenic-74	10
Arsenic-76	10
Arsenic-77	100
Barium-131	10
Barium-133	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	100
Europium-152 13 yr	1
Europium-154	1
Europium-155	10
Fluorine-18	1,000
Gadolinium-153	10
Gadolinium-159	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-52	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-59	100
Nickel-63	10
Nickel-65	100
Niobium-93m	10
Niobium-95	10
Niobium-97	10
Osmium-185	10

35 FR 6425

Material	Microcuries
Osmium-191m*	100
Osmium-191	100
Osmium-193	100
Palladium-103	100
Palladium-109	100
Phosphorus-32	10
Platinum-191	100
Platinum-193m	100
Platinum-193	100
Platinum-197m	100
Platinum-197	100
Plutonium-239	.01
Polonium-210	0.1
Potassium-42	10
Praseodymium-142	100
Praseodymium-143	100
Promethium-147	10
Promethium-149	10
Radium-226	.01
Rhenium-186	100
Rhenium-188	100
Rhodium-103m	100
Rhodium-105	100
Rubidium-86	10
Rubidium-87	10
Ruthenium-97	100
Ruthenium-103	10
Ruthenium-105	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-105	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
Sulphur-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-129	100
Tellurium-131m	10
Tellurium-132	10
Terbium-160	10
Thallium-200	100
Thallium-201	100
Thallium-202	100
Thallium-204	10
**Thorium (natural)[1]	100
Thulium-170	10
Thulium-171	10
Tin-113	10
Tin-125	10
Tungsten-181	10
Tungsten-185	10
Tungsten-187	100
**Uranium (natural)[2]	100
Uranium-233	.01
Uranium-234 Uranium-238	.01
Vanadium-48	10
Xenon-131m	1,000
Xenon-133	100
Xenon-135	100
Ytterbium-175	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

35 FR 6425

48 FR 7196

Any alpha emitting radionuclide not listed above or mixture of alpha emitters of unknown composition .01

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

Note.—*For purposes of* § 20.303, where there is involved a combination of isotopes in known amounts, the limit for the combination should 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").

[1] Based on alpha disintegration rate of Th-232, Th-230 and their daughter products.

[2] Based on alpha disintegration rate of U-238, U-234, and U-235.

* Amended 36 FR 16898.

** Amended 39 FR 23990.

APPENDIX D.—UNITED STATES NUCLEAR REGULATORY COMMISSION REGIONAL OFFICES

	Addresses	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, 631 Park Avenue, King of Prussia, PA 19405.	(215) 337-5000 (FTS) 488-1000
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) 221-4503 (FTS) 242-4503
Region III: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.	USNRC, 799 Roosevelt Road, Glen Ellyn, IL 60137.	(312) 790-5500 (FTS) 388-5500
Region IV: Arkansas, Colorado, Idaho, Kansas, Louisiana, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming.	USNRC, 611 Ryan Plaza Drive, Suite 1000, Arlington, TX 76011.	(817) 860-8100 (FTS) 729-8100
Region IV: Field Office	USNRC, Region IV Uranium Recovery Field Office, 730 Simms Street, P.O. Box 25325, Denver, CO 80225.	(303) 234-7232 (FTS) 234-7232
Region V: Alaska, Arizona, California, Hawaii, Nevada, Oregon, Pacific Trust Territories, and Washington	USNRC, 1450 Maria Lane, Suite 210, Walnut Creek, CA 94596.	(415) 943-3700 (FTS) 463-3700

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