

NRC Form 212 I
(12-81)
10 CFR 30

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

1. APPLICATION FOR:
(Check and/or complete as appropriate)

a. NEW LICENSE

b. AMENDMENT TO:
LICENSE NUMBER

X c. RENEWAL OF:
LICENSE NUMBER
29-20578-01

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

2. APPLICANT'S NAME (Institution, firm, person, etc.)

Clayton Environmental Consultants,
Inc., NJ Laboratory & Office

TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION
201-225-6040

3. NAME AND TITLE OF PERSON TO BE CONTACTED
REGARDING THIS APPLICATION

Kirit H. Vora, Manager

TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION
201-225-6040

4. APPLICANT'S MAILING ADDRESS (Include Zip Code)

(Address to which NRC correspondence, notices, bulletins, etc., should be sent.)

160 Fieldcrest Avenue
Edison, NJ 08837

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED
(Include Zip Code)

160 Fieldcrest Avenue
Edison, NJ 08837

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL

(See Items 16 and 17 for required training and experience of each individual named below)

FULL NAME

TITLE

a. Kirit H. Vora

Manager, NJ Office & Laboratory

b.

c.

7. RADIATION PROTECTION OFFICER

Kirit H. Vora

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

8. LICENSED MATERIAL

L I N E NO.	ELEMENT AND MASS NUMBER A	CHEMICAL AND/OR PHYSICAL FORM B	NAME OF MANUFACTURER AND MODEL NUMBER (If Sealed Source) C	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTI- VITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME D
(1)	Ni-63	Solid source	P-E Sigma-1 ECD #330-0119	10 mc
(2)	H-3	Foil	ECD 511-6007 U.S. Radium Labs 508-1	200 mc
(3)				
(4)				

DESCRIBE USE OF LICENSED MATERIAL
E

- (1) Sealed source is mounted on P-E gas chromatograph for analysis of chlorinated air samples
- (2) Sealed source is for AID Portable GC for analysis of chlorinated samples
- (3)

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9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE WHICH EACH SEALED SOURCE WILL BE STORED OR USED.	NAME OF MANUFACTURER	MODEL NUMBER
	A.	B.	C.
(1)	Stationary Gas Chromatograph	Perkin-Elmer	Sigma-1
(2)	Portable Gas Chromatograph	Analytical Instrument Division	
(3)			
(4)			

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT	MANUFACTURER'S NAME	MODEL NUMBER	NUMBER AVAILABLE	RADIATION DETECTED (alpha, beta, gamma, neutron)	SENSITIVITY RANGE (milliroentgens/hour or counts/minute)
	A	B	C	D	E	F
(1)	Radiation Survey Meter	W.B. Johnson Montville, NJ	GSM-5	2	Beta, Gamma	0-500 mr/hr. 0-0.2 "
(2)	Calibration & count equipment					
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☐ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

Not applicable

☐ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

Not applicable

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
<input type="checkbox"/> (1) FILM BADGE <input type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD) <input type="checkbox"/> (3) OTHER (Specify): _____ _____ _____	None required	<input type="checkbox"/> MONTHLY <input type="checkbox"/> QUARTERLY <input type="checkbox"/> OTHER (Specify): _____ _____ _____

13. FACILITIES AND EQUIPMENT (Check where appropriate and attach annotated sketch(es) and description(s).)

- ☐ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.
- ☐ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.
- ☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.
- ☒ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

Not applicable

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

If required, contact supplier Perkin-Elmer for disposal of sources

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

Not applicable

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures (*if needed*), day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

Program manual attached

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

See Attachment 1

- Principles and practices of radiation protection.
- Radioactivity measurement standardization and monitoring techniques and instruments.
- Mathematics and calculations basic to the use and measurement of radioactivity.
- Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

See Attachment 2

18. CERTIFICATE

(This item must be completed by applicant)

Log	Int. 5 I
Remitter	
Check No.	1059
Amount	\$120
Fee Category	3P
Type of Fee	Renewal
Date Check Rec'd.	7/12/88
Date Completed	7/12/88
By:	S. Kimberley

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

109137

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.

a. LICENSE FEE REQUIRED
(See Section 170.31, 10 CFR 170)

\$120.00

b. CERTIFYING OFFICIAL (Signature)

Kirit H. Vora

c. NAME (Type or print)

Kirit H. Vora

d. TITLE

Manager, NJ Office & Laboratory

e. DATE

June 29, 1988

(1) LICENSE FEE CATEGORY: 3P Byproduct material

(2) LICENSE FEE ENCLOSED: \$ \$120.00

ATTACHMENT 1

Item No. 16: Formal Training In Radiation Safety

The supervising user and location RPO is Mr. Kirit H. Vora, M.S. Bachelor's and master's degrees in chemistry

In addition, formal training included principles and practices of radiation protection, radioactivity measurements, mathematics basic to use and measurement of radioactivity, and biological effects of radiation, as covered in the Radiation Protection Program Manual. Instructions by A.C. Guy, former RPO of American Can Company license No. 06-12392-02.

ATTACHMENT 2

Item No. 17: Experience

The supervising user and RPO is Mr. Kirit H. Vora, MS. The gas chromatographs described herein, with their byproduct material detector sources have been under his supervision since 1976.

Semiannual wipe tests of these sources has been conducted by, or under the direct supervision of Mr. Vora.

RADIATION PROTECTION PROGRAM

Clayton Environmental Consultants, Inc.
New Jersey Office and Laboratory
160 Fieldcrest Avenue
Raritan Center
Edison, New Jersey 08837

CLAYTON ENVIRONMENTAL CONSULTANTS, INC.

1982

This Program Manual also serves as the basis for training in radiation safety, covering the following subjects:

- Principles and practices of radiation protection
- Radioactivity measurement standardization and monitoring instruments
- Mathematics and calculations basic to the use and measurement of radioactivity
- Biological effects of radiation

Clayton Environmental
Consultants, Inc.

1982

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Federal Standards

OSHA 1910.96	Ionizing Radiation
NRC Part 19	Notices, Inspections
NRC Part 20	Standards For Protection
NRC Part 30	General Licensing

A. FUNDAMENTALS OF RADIATION

1. Ionizing Radiation - Basic Concepts

Definitions

Curie:	The measure of activity of a radioactive source. This number is usually used as the "amount of radioactive substance." The units of a curie are disintegrations per second (dps). $1 \text{ curie} = 3.7 \times 10^{10} \text{ dps}$
Beta particle:	A negatively charge particle emitted from radioactive materials.
Alpha particle:	A positively charge particle emitted from radioactive materials.
Half Life:	Classification of decay rate according to the time it takes to decrease the activity of a radioactive substance, to one half of the original intensity.
RAD:	Radiation absorbed dose in a specified material.
REM:	Roentgen equivalent man, the dose unit generally used to indicate human exposure to radiation and to specify safe exposure limits.
Roentgen:	Unit radiation dose in air.

FUNDAMENTALS OF RADIATION - Continued...

Four basic concepts must be considered in an approach to radiation safety.

- a. There are five different types of ionizing radioactivity. The characteristics of each type must be understood in order to recognize potential safety and health problems. The types of radiation are alpha, beta, gamma, X-rays, and neutrons.

- b. Radioactive materials emit energy capable of damaging living tissues.

- c. Radioactive materials may be hazardous in two different situations;

- Externally - located a distance away from the body

- Internally - from inside the body, having entered through ingestion, inhalation, or through broken skin.

- d. There are various methods available to determine the extent of hazards due to radiation. These methods include measurements using instrumentation, as well as mathematical calculation.

- e. Radiation exposure can be reduced by two methods, to approach or achieve safe levels;

- By distance...

The farther away from a source, the less effect it will have on health.

- By shielding...

Materials with mass will "absorb" the damaging properties of the radiation.

The fact that radiation will damage living tissue is of major concern to people. Further, since in most cases the person may be unaware of exposure and consequent damage, there is a certain mysterious quality related to the situation. This mystery may be frightening to some people. This fright is unfortunate, but only serves to stress the importance of a visible radiation protection program. When treated with care and understanding, radioactive materials can pose less hazard than riding in an automobile.

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FUNDAMENTALS OF RADIATION - Continued...

Radiation damage to living tissue is caused by a process called ionization. All of the cells of living tissue are composed of atoms which contain charged electrons.

Ionization occurs when radiation (charged particles or rays) cause the charged electrons or other atomic structures in the cells to become excited and forcibly ejected from their atomic orbitals. As more electrons are displaced from the orbitals, cellular damage occurs due to the loss of electrons. The exact mechanism of ionization and subsequent cellular damage is a very complex process, only roughly and partially explained by the above statements.

Alpha Radiation

Alpha particles are positively charge particles with very low penetration potential as an external hazard to intact skin. Paper and thin plastic film will effectively shield alpha particles. Therefore, as an external hazard, alpha emitters will not pose a health problem.

Alpha particles will pose significant hazard internally. The ionizing ability of alpha particles at short distances in soft tissue, may be likened to a bulldozer effect. Once inside the body, in the lungs, stomach, or an open wound - there is no thick layer of skin to act as a barrier. Alpha emitters that can concentrate in specific parts of the body, are extremely hazardous. Strontium - 90 and radium are examples of these materials. Great care must be taken to prevent ingestion, inhalation, or skin absorption of alpha radiation.

Beta Radiation

Beta particles are negatively charged particles, identical to electrons. As an external hazard, beta particles possess considerably more penetrating energy than do alpha particles. It can take up to one quarter inch of aluminum to properly shield beta particles. Beta particles are also an internal hazard. Special precautions should be used to prevent beta-emitting particles from becoming airborne. Beta radiation is the most common type of radiation used in industrial processes.

FUNDAMENTALS OF RADIATION - Continued...

Radiation sources that emit X-rays, gamma rays, or neutrons pose strictly external hazards. Control of these hazards may include control of exposure time, separation by distance, separation by barriers (shielding), or a combination of factors, to provide adequate protection.

2. <u>Allowable Exposure Limits</u>	<u>Rems Per Calendar Quarter</u>
Whole Body: head and trunk, active blood-forming organs, lens of eyes, or gonads	1 1/4
Hands and forearms, feet and ankles	18 3/4
Skin of whole body	7 1/2
Cumulative lifetime exposure:	5 (n-18)

- Where n = present age in years.
- This formula indicates that children under the age of 18 years are not permitted to work in occupations where radiation exposure may occur.

3. Evaluation of Radiation Hazards

Many types of meters are used to measure various kinds of radiation. But these meters are useless and possibly hazardous unless they are accurately calibrated for the type of radiation they are designed to measure.

Meter with very thin windows in the probes can be used to check for alpha radiation. Geiger-Mueller type instruments are used for measuring beta radiation.

Devices are available that will measure accumulated amount (dose) of radiation. Film badges are often used to record the accumulated amount of radiation received from beta, X-ray, or gamma radiation.

Film badges are worn by an individual for a period of time, and depending upon how they are worn, will allow an estimate of an accumulated dose of radiation to the whole body, or to a part of the body, such as hand or forearm.

Alpha radiation cannot be measured with film badges because it will not penetrate the paper which must be used over the film emulsion to exclude light.

3. Evaluation of Radiation Hazards - continued...

Another device for measuring accumulated dose of X-ray or gamma radiation is the dosimeter, a combination electroscope and ionization chamber which is directly read. The dosimeter requires periodic charging with a battery to return the indicator on the scale to zero.

~~It~~ is more difficult to measure or estimate internal radiation doses. An estimate can be obtained by taking air samples in the breathing zone of the worker on the job and measuring the radioactivity in the air samples. The best procedure, however, is to protect the worker in every way possible but still take samples of body wastes and measure them for activity. The type of bioassay used will depend upon the manner in which the particular radioactive element is excreted.

Time, distance, and shielding are the most important tools commonly involved in handling radioactive materials.

Time as an element of protection is almost self-explanatory. Since radiation occurs at a rate of a certain number of roentgen per hour, the shorter the time of exposure the smaller the radiation dose received. Work procedures involving the use of radioactive materials should be reviewed carefully to keep exposure time to an absolute minimum.

Distance is another evident protection. The radiation level from a source is reduced by distance by a factor of 1 divided by the square of the distance between a worker and the source.

If the radiation level is 1.0 roentgen per hour at a distance of 1 foot from a source, and the distance is increased to 2 feet, then the radiation level will drop by a factor of $(1/2)^2$, or $1/4 \times 1.0 = 0.25$ roentgen per hour. At 3 feet, the level will be reduced by a factor of $(1/3)^2$, or $1/9 \times 1 = 0.11$ RPH.

Thus, by simply putting 3 feet of space between a worker and the source, the radiation level has been reduced by a factor of almost ten.

Shielding is the most commonly used protection against radiation from radioactive sources. The more mass placed between a source and a person, the less radiation the person will receive. If the mass is concentrated, such as lead, the barrier thickness required for the same degree of protection

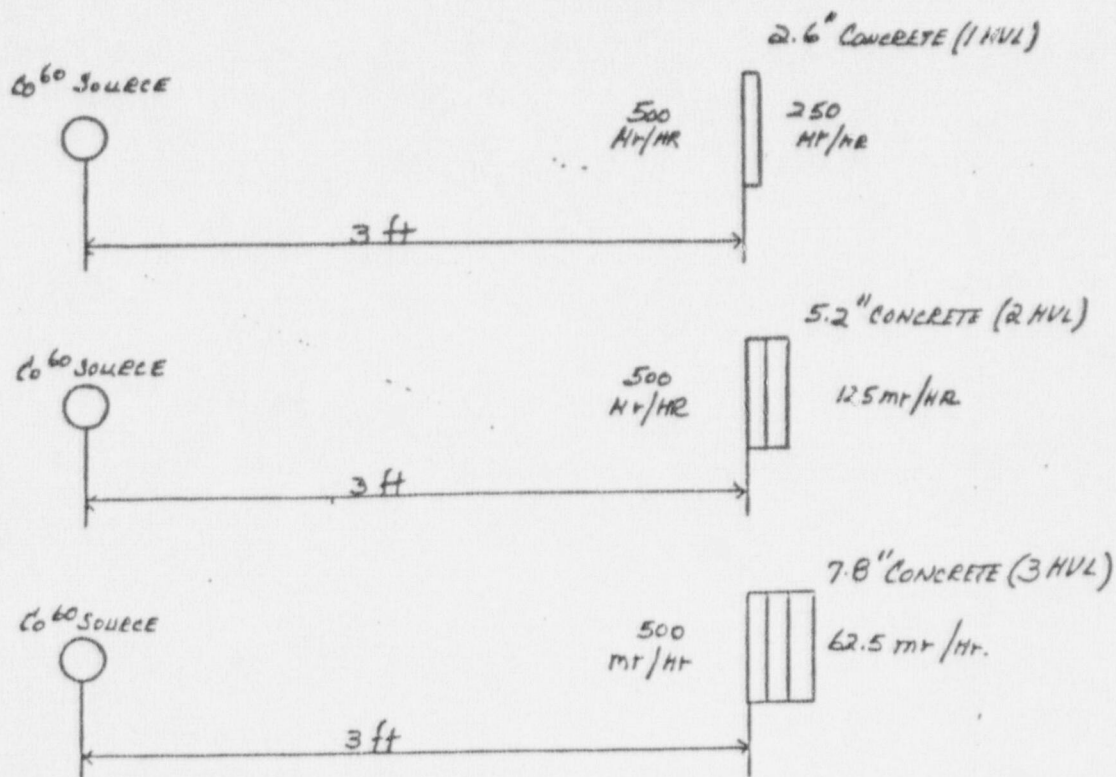
3. Evaluation of Radiation Hazards - Continued...

will be less than it would be for a less dense material, such as a wooden partition. The instrument casing used to hold an industrial radioisotope source serves as an important shielding source.

This introduces another common term; half value layers (HVL). Tables of HVL are given in radiation handbooks, and typical values for two radioactive materials, cobalt-60 and cesium-137, are given in the table below.

	cobalt-60	cesium-137
Lead	0.49 inches	0.25 inches
Copper	0.83 inches	0.65 inches
Iron	0.87 inches	0.68 inches
Zinc	1.05 inches	0.81 inches
Concrete	2.6 inches	2.1 inches

Using concrete as an example, the table states that a 2.6 inch layer or thickness of concrete will reduce the gamma radiation coming from any cobalt-60 source by a factor of 1/2. If the gamma emitter is cesium-137 then the half value layer for concrete becomes 2.1 inches. The reduced value for cesium-137 results from the fact that it is lower in energy than the radiation from cobalt-60. Figure 2 illustrates how additional half layers reduce radiation levels. The example used is a cobalt-60 source that gives a meter reading of 0.5 roentgen per hour (the same as 500 milliroentgen per hour) at a distance of three feet.



B. RADIATION SAFETY PROGRAM

It is essential that the requirements set by the NRC and OSHA for the protection of individuals working in areas where radioactive sources are utilized are met.

1. Sealed Sources

Sealed sources are the safest method of using radio-isotope gauges in industry. Only sealed sources are approved for CEC operations.

Personnel must be continually made aware of the possible radiation hazards of applications. As with all safety programs, frequent reminders to operating personnel are necessary to prevent a tendency toward carelessness.

The Radiation Protection officer should be contacted if assistance is needed in setting safe work procedures, or in instructing employees in necessary precautions.

a. Installation

- Overall installation planning is coordinated with the instrument supplier. Installation radiation surveys must be made to assure safe operating procedures. The location will assure that the manufacturer conducts this survey, and the record is kept on file.
- The local plant protection program will be established, or expanded to include any new installation. In addition, responsibilities for maintenance of the program will be delegated as per the radiation protection license.
- Operation procedure outlines supplied by the gauge manufacturer as well as radiation safety procedures, will be reviewed by the location Radiation Protection officer and operating personnel.

RADIATION SAFETY PROGRAM - continued...

- For initial installations in new areas, operating personnel and supervisors should be instructed in the proper procedures for use of the equipment. This should be accomplished through the manufacturer/supplier. The emphasis of this instruction should concern the necessary precautions to be followed by the immediate operating personnel.

b. Operation

- There must be continuing emphasis on adherence to the specific safe operating precautions originally outlined for the job.
- It should be emphasized that all exposure should be held to a minimum consistent with proper discharge of responsibility while on the job. Any exposure that can be avoided is, by NRC definition, too much.
- Specific operating procedures must not be abandoned because of calibration discrepancies. If this occurs, it is possible for operators, at times, to subject themselves to unnecessary radiation in setting up the gauge.
- Changes in operating procedures or machine layout revisions require re-analysis of operating precautions, which are primarily determined by gauge location.
- Periodic checks of adherence to safety should be made, and safety reminders regarding operation of the radioisotope gauge given when found to be necessary. If at any time it is felt that there is a lack of emphasis on precautions, a review of the circumstances should be made and corrective action initiated.

RADIATION SAFETY PROGRAM - continued...

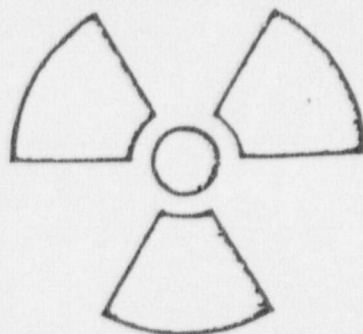
c. Maintenance

- Maintenance or repair involving the radioisotope source, or repair work that would require possible exposure to undesirable radiation levels will not be conducted by location employees. In all such cases, the instrument manufacturer will be contacted to complete such maintenance or repairs.

d. Posting

- The radiation "Caution" sign, posted on the actual radioisotope source container by the manufacturer, must remain in place. If this sign is not adequately visible because of size or location of the source, another caution sign should be posted in a nearby area clearly visible to operators. A sample sign is shown on the following page. The name and phone number of the person responsible in the event of an emergency must be shown on the sign.
- Form NRC-3, "Notice to Employees - Standards for Protection Against Radiation," must be permanently posted in each location containing equipment using radioisotopes, to be observed by all employees on the way to or from their place of employment.

CAUTION



**RADIATION
AREA**

CLOSE SHUTTER BEFORE WORKING
FOR PROLONGED PERIOD WITHIN
THREE FEET OF SOURCE

IN EMERGENCY CALL

UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION
Washington, D.C. 20545



NOTICE TO EMPLOYEES

STANDARDS FOR PROTECTION AGAINST RADIATION

In Part 20 of its Rules and Regulations, the Atomic Energy Commission has established standards for your protection against radiation hazards from radioactive material under license issued by the Atomic Energy Commission.

YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to—

1. Apply these AEC regulations and the conditions of his AEC license to all work under the license.
2. Post an otherwise made available to you a copy of the AEC regulations, license, and operating procedures which apply to work you are engaged in, and explain these provisions to you.

YOUR RESPONSIBILITY AS A WORKER

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

WHAT IS COVERED BY THESE AEC REGULATIONS

1. Limits on exposure to radiation and radioactive material in restricted and unrestricted areas;
2. Measures to be taken after accidental exposure;
3. Personal monitoring, surveys and equipment;
4. Caution signs, labels, and safety instruction equipment;
5. Exposure records and reports; and
6. Related matters.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

1. The AEC regulations require that your employer give you a written report if you receive an exposure in excess of any applicable limit as set forth in the regulations or in the license. The basic limits for exposure to employees are set forth in sections 20.101, 20.103, and 20.104 of the Part 20 regulations. These sections specify limits on exposure to radiation and exposure to concentrations of radioactive material in air.
2. If you wish where personnel monitoring is required pursuant to Section 20.102:
 - (a) your employer must give you a written report of your radiation exposures upon the termination of your employment if you request it, and
 - (b) your employer must advise you annually of your exposure to radiation if you request it.

INSPECTIONS

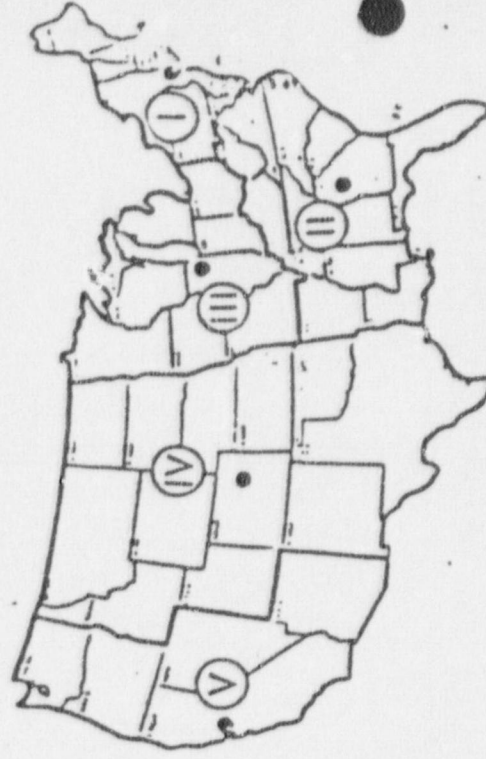
All activities under the license are subject to inspection by representatives of the U.S. Atomic Energy Commission.

INQUIRIES

Inquiries dealing with the matters outlined above can be sent to the United States Atomic Energy Commission Compliance Officer having inspection responsibility over your plant, as shown on the map at the right.

POSTING REQUIREMENT

Copies of this notice must be posted in a sufficient number of places in every establishment where activities licensed by the AEC are conducted, to permit employees working in or frequenting any portion of a restricted area to observe a copy on the way to or from their place of employment.



UNITED STATES ATOMIC ENERGY COMMISSION COMPLIANCE OFFICES

REGION	ADDRESS	TELEPHONE
I	Region I, Division of Compliance, IMAFC 370 Hudson Street New York, New York 10018	810 100-1391 810 100-1391
II	Region II, Division of Compliance, USREC 100 South Street, Northwood Atlanta, Georgia 30323	810 536-1791 810 536-1791
III	Region III, Division of Compliance, IMAFC Suite 410, Oakbrook Professional Building Oak Brook, Illinois 60121	810 625-1600 810 625-1600

RADIATION SAFETY PROGRAM - continued...

- Current copies of the following should be available
 - regulations of part 19 & 20
 - license and other pertinent information
 - operating procedures applicable to licensed activities
 - any notice of violations involving radiological working conditions

e. Reporting

The local plant RPO shall notify the Regional Office of the NRC when any of the following occurs:

- Loss or theft of radioisotopes licensed by NRC
- Physical or fire damage to equipment using radioisotopes that results in damage to the radioisotope source or in which there is reason to suspect damage to the radioisotope such as when shutters or shields for the radioisotope are broken.

Note should be entered in the Radiation Protection file under the following circumstance, as related to NRC license revision:

- Whenever sources are to be disposed of, returned to supplier's or transferred to other company locations.

f. Training

- Periodic refresher sessions for all concerned personnel, including those involved in maintenance, on proper operation and mandatory precautions regarding use of the equipment should be held. These sessions can be conducted at the discretion of the plant Radiation Protection Officer and should be based on that individual's appraisal of actual observed operating procedures.

RADIATION SAFETY PROGRAM - continued...

- Turnover of operators and supervisors will create a need for training employees new to the job. Again, emphasis on adherence to the specific safe operating procedures is necessary.
- Changes in methods of operation or machine layout and the accompanying possible change in safe operating procedures may necessitate a training session for affected employees. Training should include:
 - necessary precautions to minimize exposure
 - responsibility to report conditions that may lead to unnecessary radiation exposure, such as a faulty gauge or damage to source shielding

g. Source Handling

- The Corporate Radiation Protection Officer shall be notified of removal of sources to storage, transport to another company location, and disposal of sources, for NRC license correction.
- The transfer, storage and disposal of radioactive sealed sources must be in accordance with NRC regulations.
- The stored sources shall be labeled in accordance with NRC regulations.
- The transport of sources between locations must be handled by a common carrier. Compliance with all pertinent DOT regulations is required.
- All source disposals will be handled by a licensed contractor, generally a source distributor or manufacturer.

h. Surveys

- Radiation surveys of installed gauges will be coordinated with a qualified industrial hygiene laboratory, or by contract with the equipment manufacturer. Recommendations for changes or improvements in procedures will be made as required.

RADIATION SAFETY PROGRAM - continued...

- It is not required that determination of personnel exposures be made since radiation levels from our uses are relatively low and/or work procedures do not require employees to be in the immediate gauge area for prolonged periods of time unless the gauge shutter is closed. Such determinations have been made in the past and no exposure to excessive radiation has been indicated.

i. Emergency Situations

- Upon the occurrence of a failure of or damage to, or any indication of a possible failure or damage to the shielding of the radioactive material; the on-off mechanism or indicator; or upon detection of 0.005 microcuries or more of removable radioactive material, the operation of the device should be immediately suspended until the damage has been repaired by the manufacturer or individual specifically licensed to repair such devices. An alternative in the case of irreparable damage would be to dispose of the radioactive source by transfer to a person authorized by a specific license to receive the by-product material contained in the device. The device shall not be abandoned and cannot be exported without a specific license. If any of the above situations occurs, the Regional NRC office must be notified immediately.

j. Recordkeeping

- Records showing compliance with the testing requirements, receipt of servicing, installation, removal, licensing and other correspondence should be maintained for as long as the licensee retains possession of the by-product materials and for a period of 2 years from the date of the recorded event or until the device is transferred or disposed of.
- Test records should show:
 - the test results
 - the date the tests were performed

RADIATION SAFETY PROGRAM - continued...

- name(s) of person(s) performing testing, installation, servicing and removal from installation concerning the radioactive material, its shielding or containment.

Records of required tests for leakage of radioactive material shall be maintained for 1 year after the next required leak test is performed or until the sealed source is transferred or disposed of.

C. WIPE AND RADIATION TESTS

1. Procedures

Following is a brief outline of the control tests which are presently being performed. These functions have been in effect since initiation of the Company program in mid-1950.

There are primarily two basic tests which are made:

a. Radiation Survey

This test consists of making radiation intensity surveys in normal work locations at varying distances from the open source at each installation. A second survey is made with the source closed. In addition, estimates are made to determine operator time spent at various locations near the gauge.

b. Wipe Test

All exposed external surfaces of the source holder are wiped thoroughly with a swab of cotton moistened with distilled water or fast drying aliphatic solvent. The swab is then allowed to dry and the radioactivity, if any, is measured against the background level.

Routine leak wipe test will be made for all solid source gauges each six months. Local Plant Radiation Protection officers will make the wipes, or supervise the procedure, in accordance with training and instructions given. Wipes will then be forwarded to a qualified Laboratory by air express for counting. The counting system used will detect presence of 0.005 microcurie or more of removable contamination. Detail of the equipment supplied to plants for leak wipe tests is as follows:

- a. A cotton swab measuring about one inch in ball diameter is cemented to a wooden stick of about 6" length. The swab will be slightly moistened with distilled water as received in a suitable corked glass tube, which is in turn placed in a substantial 2" diameter x 11" mailing tube.
- b. Upon receipt, the swab is removed and the leak wipe test made as trained and instructed for each particular gauge.

WIPE AND RADIATION TESTS - Continued...

- c. Without touching, the swab is returned to the test tube and packed in the mailing tube. The mailing tube may be returned without further packing, or if more than one wipe is involved, the several mailing tubes may be packed in a single carton.
- d. The Plant Radiation Protection Officer will check the package surface with a survey meter to verify that surface radiation level does not statistically exceed the background level. If it does not then the package may be mailed (by air express). If any radiation above background is detected, immediately contact the gauge manufacturer for advice and instructions.

Prior to all tests the source shutter must be either electrically or manually closed depending on the equipment being tested. During the procedure of making the wipe test neither the source windows or test swabs will be touched with the bare hands. The arms and body will be kept out of the potential high radiation area, that is the area extending approximately in a cone of 45° with apex at the window.

To make the wipe test, remove the swab from the container and wipe lightly around the exposed source window (with shutter closed) and shutter. Also wipe around gasketed joints of the source housing, around bolt heads, or openings provided for shutter operating rod or electrical wires. Leakage can only occur where there is a joint of some kind and, therefore, it is not necessary to wipe the entire housing surface. In no case should the holder, frame, or source window be dismantled. It does not matter if the swab becomes dirty from dirt or dust accumulated on the source housing

During the wipe test procedure, the hands and forearms could be subjected to possible radiation levels of from 5.0 to 6.0 mr/hr. Wiping of the source cover (shutter) is the most critical and should be performed as quickly as possible, taking approximately up to 5 seconds. The swab is provided on a stick to reduce hand exposures.

Procedure For Counting Wipes (using W.G. Johnson instruments):

- a. Attach GP-200 probe to survey meter "probe" connector using twist lock cord. Remove cap from probe and slide into top of counting cell. Attach digital recorder to survey meter "Phone connector and to recorder "input" connector using plug jack cord.

WIPE AND RADIATION TESTS - Continued...

b. To make a count, specimen is placed on counting cell tray at lower level, in position under probe, survey meter turned on using "XI" position unless reading is off scale. Set recorder rotary switch to count 1 min., check to see right switch is set at "Stop, timer reset". Turn recorder "on", push counter "register reset" button to clear numbers. Count is now started by moving right switch to "count". After one minute count will be completed, and red light will switch on. During course of operation leave recorder on-off switch "on", and use "timer-reset" - "count" switch to operate. (When completed, be sure on-off switch is "off" and reset-count switch is at "stop" before storing recorder away.) The recorder is used because at low count levels it is difficult to estimate the count from the survey meter dial. At higher counts it is easier to read the dial (but such counts are unlikely in our work). At very high counts (above about 500 cpm), the Model CM-1 Count Multiplier must be connected in a counting train in order to use the count recorder. Count recorded should be the average of at least three individual counts. Make a similar count using one of the appropriate calibration sources.

c. The following sources will be encountered various ACC plants:

<u>Element</u>	<u>Isotope</u>	<u>Symbol</u>	<u>Emissions</u>	<u>Half-Life</u>
Americium	241	AM-241	a,g	462 yr.
Cesium	137	CE-137	b,g	30 yr.
Cobalt	60	CO-60	b,g	5.3 yr.
Hydrogen	3	H-3 or tritium	b	12.3 yr.
Krypton	85	KR-85	b,g	10.6 yrs.
Radium	226	RA-226	a,b,g	1622 yr.
Strontium	90	SR-90	b	28 yr.
Thallium	204	H-204	b,g	3 yr.

Calibrating source to be used in Step 2 above depends upon source to be wipe tested. The calibration source must emit radiation similar to the instrument source. Thus, use the CO-60 calibration source in all cases except strontium, and in this case use the SR-90 calibration source. Record the calibration source count. Typical counts that will be recorded depend upon the age of the calibration source.

WIPE AND RADIATION TESTS - Continued...

Instrument reading is connected for source calibration as follows:

- Calibration source activity is determined from graph attached (see example), and half-life data from above.

- Contamination activity (dps). $\frac{1}{2}$

$$\frac{\text{contamination count CPM} \times \text{current source activity dps}}{\text{current source count CPM}}$$

- 1 curie = 3.7×10^{10} dps

- Contamination amount (uCi) +

$$\frac{\text{contamination activity} \times 10^{-5}}{3.7}$$

- d. Remove the calibration sources so they do not affect the count, and make a background count. For this count a filter wipe may be placed on the counting cell tray (but not absolutely necessary). Record the average count. Room background may typically average 25-40 CPM.

- e. Calculation of activity that is collected on wipe is calculated as follows:

- Contamination count = wipe count - background count
- The NRC required lower limit of instrumentation sensitivity for contamination amount is 0.005 uCi. Count result will be reported to the plant for retention in the plant file.

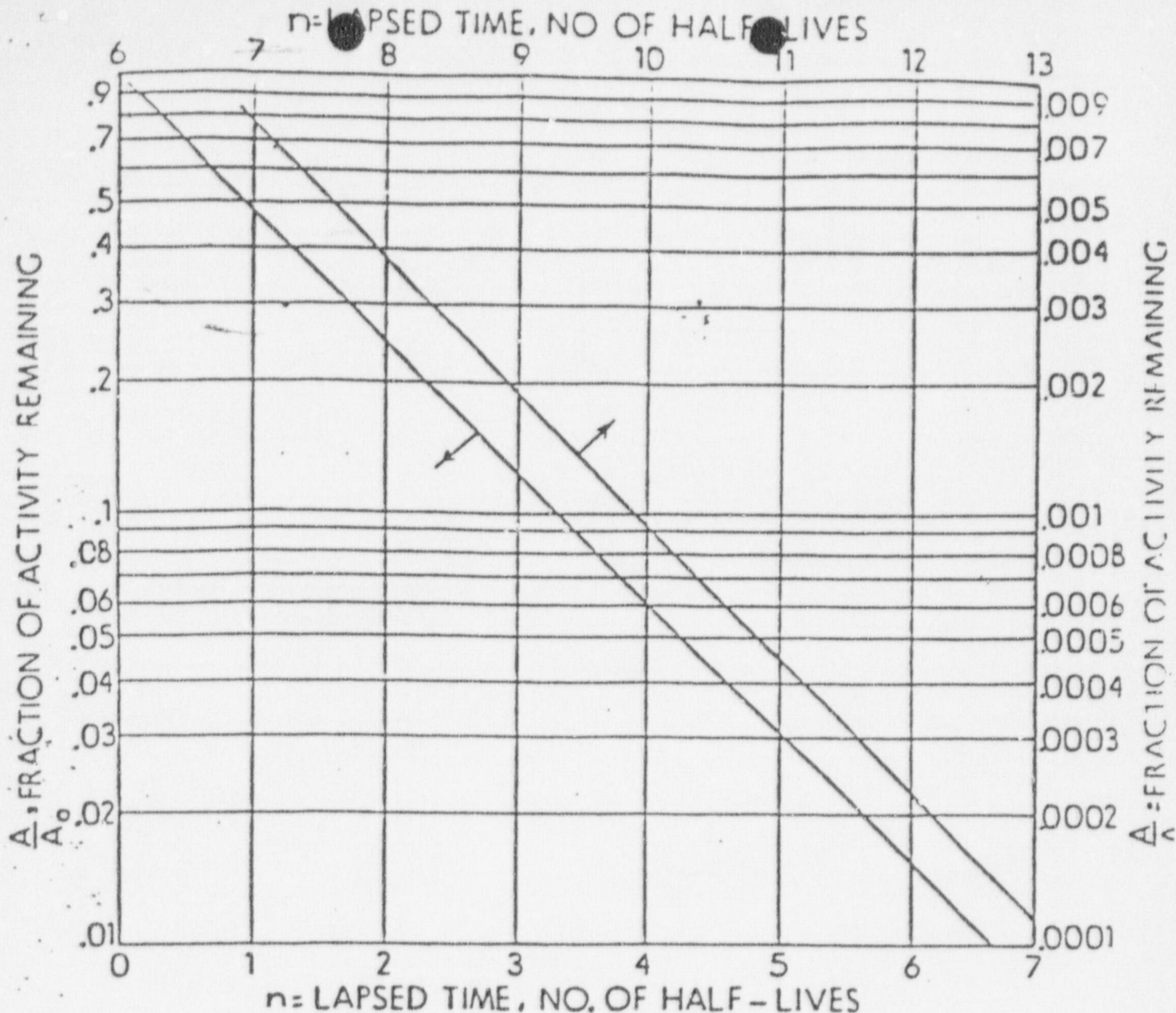
Subsequent procedure followed by the Corporate Radiation Protection Officer if a source is found defective, contaminated, or has reached its useable limit because of half-life limitations:

- a. Removal and replacement of defective or contaminated sources:

The source equipment is put out of service and the area restricted. The equipment supplier is notified and arrangements made for the removal and replacement of the defective source. The supplier will perform all subsequent operations that involve removal of a source from the gauge holder, assisted by the Corporate and Plant Radiation Protection Officers or other specifically qualified personnel.

WIPE AND RADIATION TESTS - Continued...

- b. If the source has merely reached its useable limit because of half-life limitations, and it is to be returned to the supplier within the outer gauge housing, this housing or frame section may be removed and packed directly in a wooden shipping crate. In this case, the shutter is closed and after packing, surface radiation levels are measured and assured to be below the limit permitted. Proper labeling and shipping procedure will be followed, acting on the supplier's advice.



RADIOACTIVE DECAY

Plot of Equation $A = A_0 e^{-\lambda t}$, where:
 A = Radioactivity at any time t
 A_0 = Original activity at zero time
 e = Base of natural Logarithm
 $\frac{A}{A_0}$ = Fraction of activity remaining at Time t

From U.S. Dept. of Health, Radiological Health Handbook PB 121-784R, pg. 118-19.

Example: Calibration source of Cobalt-60 calibrated 7/31/64 had activity of 280 DPS. What is activity on 3/31/67?

Co-60: Half life, $T_{1/2} = 5.3$ yr.
 Lapsed time, $t = 3/31/67 - 7/31/64 = 2.67$ yr.
 t
 No. of half-lives, $n = \frac{t}{T_{1/2}} = \frac{2.67}{5.3} = 0.504$

Follow n value of 0.5 from bottom X-Axis to lower graph line, then to left X-Axis. $\frac{A}{A_0}$ fraction is 0.70.

-21- Remaining activity = $280 \times 0.70 = 196$ DPS.

1. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 2. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 3. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 4. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 5. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 6. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 7. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 8. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 9. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
 10. $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

FOR INFORMATION OF

PLANT RADIATION PROTECTION OFFICE

PLANT SAFETY COORDINATOR

THE DETECTION SYSTEM USED IS CAPABLE OF DETECTING LESS THAN A HUNDREDTH OF THE RADIOACTIVITY CONSIDERED BY AEC AS EVIDENCE THAT A PERSON IS LEAVING, FOR REGULATION PURPOSES .005 MICROCURIES OR MORE OF REMOVABLE CONTAMINATION READINGS.

A ANY ACTIVITY OF THE WIPE DETECTED IS SHOWN IN THE "WIPE" COLUMN IN MICROCURIES. IF NO READING OVER BACKGROUND IS INDICATED, THE REPORT SHOWS "NEGATIVE" (NEG)

IF WHEN THE SHUTTER MECHANISM AND INDICATORS, IF ANY, ARE OPERATING PROPERLY, THE REPORT SHOWS "OK" IN THE "SHUTTER" COLUMN.

A. Equipment Consists Of The Following Parts:

1. Model GSM-5 survey meter.
2. Model GP-90 probe (largest probe with sliding aluminum shield).
3. Model GP-90x10 probe (middle size probe with sliding aluminum shield). This probe increases the range of the survey meter by ~~ten~~ times the marked meter scale readings.
4. Model GP-90x50 probe (smallest probe). This probe increases the range of the survey meter by fifty times the marked meter scale readings.
5. Model GP-200 probe (end window probe with blue cap). This probe is a "thin window" type capable of measuring low energy beta radiation for survey work, but our principal use will be to count wipes when the probe is used with the counting cell.
6. Model MSC-1 manual sample changer or counting cell.
7. Model DIG-1 digital recorder or scaler.
8. Model CM-1 count multiplier.
9. Model VP-2E varipulser. Used for electrical calibration of the survey meter.
10. Model ASA-2 loud speaker gives audible signal for counts.
11. Connecting cords. One has plug jacks at each end, the other has twist lock connections at each end. When using the plug jack cord be sure to push and pull only, to insert or remove from jack holes. Twisting motion will break coaxial center wire from inside of plug jack. Be sure plug jacks are screwed tightly into seats before use.
12. Auxiliary parts consisting of 2 in. square wipes, tongs, and folding rule.
13. Two calibration sources.

B. Electrical Calibration Of Survey Meter:

1. Turn meter range switch from "off" to "XI" position. "XI" stands for "times one". In this position meter reads as drawn. In "X10" (times ten), or "X100" (times one hundred) position meter reads ten or one hundred times numbers drawn on dial. In "XI" position, press red "Bat. Test" button. Meter should read in green area. If in red area, the three $1\frac{1}{2}$ volt alkaline batteries must be replaced. Snap locks at each end open case.

2. Attach varipulser to survey meter using twist lock cord, one end attached to survey meter "probe" connector, other end to varipulser "pulse" connector. Set varipulser as follows: toggle switch to "neg", output rotary switch to 1.0 volt, frequency rotary switch to 50 CPM. Survey meter should go upscale and meter needle should fluctuate at 50 CPM mark. It is helpful to visualize what is occurring by using loud speaker to give audible signal for counts. Remove acorn nut from meter "phone" connector and plug in speaker, switch on.
3. Frequency output of varipulser may now be increased in steps, using appropriate survey meter ranges to check calibration of meter. Errors in reading can be adjusted by turning the "Cal" screw (remove acorn nut for access). It will be noted that calibration will not be exact for all scale ranges, and cannot be made so. It is best to have calibration accurate in the low to middle ranges of the "XI" scale, as this is the range that will be most used for wipe counts and work location surveys. If higher ranges are a little in error, percentage-wise this is not so serious. It is possible to adjust calibration of each scale range separately, in case one is off calibration in relation to others, by adjusting individual range potentiometers (black buttons located at base of battery holder inside case). However, these should normally not be moved.
4. Remove varipulser. Speaker may be used or removed for survey readings.

Note: Survey meter, varipulser and speaker are all battery powered. Be sure to switch them "off" when not in use. Return acorn nuts to survey meter "cal" and "phone" connectors when completed.

C. Radiation Survey Procedure:

1. Attach GP-90 probe to survey meter "probe" connector using twist lock cord. Loosen probe screw and open shield, tighten screw in open position. With shield open both beta and gamma radiations are measured, as for all our cases. With shield closed gamma radiation only is measured. If readings should be off scale in "X100" position, then GP-90x10 or GP-90x50 probes could be used. However, these would be very high values, as would be found only in an open instrument shutter beam or in event of a source leak.

The following relations might be useful to visualize scale and probe ranges. Using one of the exposure limits set by AEC, that of whole body radiation limited to $1\frac{1}{2}$ rems per quarter, the following relations would apply:

- a. If exposure was averaged over entire period during 40-hour work weeks, maximum exposure would be 2.4 mr/hr. (For external beta and gamma radiation rems is equivalent to $\frac{\text{mr}}{1000}$.)

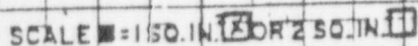
This would be read at lower part of scale on "X100" position with GP-90 probe. This shows that "X1" or "X10" scale range readings are quite insignificant as compared to the above limit.

- b. At maximum reading of GP-90x50 probe, meter in "X100" position, reading would be 1000 mr/hr. Quarter dose at this exposure would be reached in 75 min. With GP-90x10 probe it would be reached in $6\frac{1}{2}$ hr.; with GP-90 probe in $1\frac{1}{2}$ weeks.
2. Place probe in various locations to note radiation readings. Meter will usually fluctuate quite widely, thus best estimate of range must be noted. The following locations should be checked:
 - a. Surface of source container, detector or instrument,
 - b. Accessible locations three feet from source,
 - c. Locations where people work within about a six foot area.
Make one set of readings with shutter closed, repeat with shutter open. Do not read in beam from instrument with shutter open, keep body and hand away from beam area. Do not make surface readings on gauge type instruments with shutter open (however, should be made on density type instrument - where beam is directed through pipe and it is not possible to place hand in beam).
3. Record results on form as attached. Also obtain estimated time study of employees in area to estimate exposures. Note posting of source.

D. Wipe Test Procedure:

1. Attach GP-200 probe to survey meter "probe" connector using twist lock cord. Remove cap from probe and slide into top of counting cell. Attach digital recorder to survey meter, "phone" connector and to recorder "input" connector using plug jack cord.
2. To make a count, specimen is placed on counting cell tray - use lower level, survey meter turned on using "X1" position unless reading is off scale. Set recorder rotary switch to count 1 min., check to see right switch is set at "stop, timer reset". Place one of the calibration sources on the counting cell tray and position under probe. Turn recorder "on", push counter "register reset" button to clear numbers. Count is now started by moving right switch to "count". After one minute count will be completed, and red light will switch on. During course of operating recorder leave on-off switch "on", and use "timer reset" - "count" switch to operate. (When completed, be sure on-off switch is "off", and reset-count switch is at "stop" before storing recorder away.)

NAME OF GAUGE OMART
TYPE OR MODEL NO. HM-8
ISOTOPE Cesium - 137
QUAN. OF ISOTOPE, MILLICURIES 150
LOCATION OF GAUGE - MACH. NAME, NO., OR DESCR. FEED TO BLACK LIQUOR EVAPORATOR
OUTSIDE OF RECOVERY BOILER HOUSE.



PLAN SKETCH ☐ ELEVATION SKETCH ☒

LOCATION	DWG. REF.	DIST. FROM LOCATING SURFACE	READINGS	SCALE RANGE	PROBE
AROUND SOURCE CASTING	-	SURFACE	0.03-0.04	x1	GP-9C
UNDER SOURCE CASTING	A	SURFACE	0.06-0.10	x1	"
AROUND DETECTOR CASTING	-	SURFACE	0.03-0.08	x1	"
NEXT TO PIPE, ABOVE AND BELOW DET. CASTING	B	SURFACE	0.12-0.14	x1	"
LOCATION WHERE EMPL MIGHT STAND		3' FROM SOURCE PLANE		x1	"
UNDER EVAPORATOR I		"	0.02	"	"
UPPER PART OF BODY		"	0.005	"	"
LOWER PART OF BODY					

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USE REVERSE FOR ADDL NOT

The recorder is used because at low count levels it is difficult to estimate the count from the survey meter dial. At higher counts it is easier to read the dial (but such counts are unlikely in our work). Count recorded should be the average of at least three individual counts.

3. At very high counts the recorder is not accurate because of its mechanical limitation. Also, it is not accurate for random disintegrations even at moderate counts. This is because some random pulses occur too close together to be counted separately. Note with the SR-90 (350 dps) calibration source the DIG-1 count will be about 565 CPM, whereas the GSM-5 meter will indicate a reading of around 1600 CPM, average. This is an example of random disintegration overloading of the counter. (Note that pulsed, or evenly spaced, pulses as from the VP-2E varipulser do not cause this problem.) To obtain accurate counts when the two problems covered here are encountered, put the CM-1 count multiplier into the circuit. Plug the survey meter "phone" jack to the multiplier "input" twist lock stud, and the multiplier "output" to the scaler jack protected by acorn nut. Switch multiplier to X10 or X100 setting, and operate scaler as normal, except multiply final reading by amount set on multiplier. Clear multiplier with "reset" button before each count (to avoid picking up residual impulses from previous count).

4. The following sources will be encountered in our plants:

<u>Element</u>	<u>Isotope</u>	<u>Symbol</u>	<u>Emissions</u>	<u>Half-Life</u>
Cesium	137	CE-137	b,g	30 yr.
Cobalt	60	CO-60	b,g	5.3 yr.
Hydrogen	3	H-E or tritium	b	12.3 yr.
Krypton	85	KR-85	b,g	10.6 yr.
Strontium	90	SR-90	b	28 yr.
Thallium	204	TH-204	b,g	3 yr.

Calibrating source to be used in D-2 above depends upon source to be wipe tested. The calibration source must emit radiation similar to the instrument source. Thus use the CO-60 calibration source in all cases except strontium, and in this case use the SR-90 calibration source. Record the calibration source count. Typical counts that have been obtained are, for the CO-60 source 280 CPM (7/31/64), and for the SR-90 source 1520 CPM (using multiplier on X10 setting). Room background may average 25-35 CPM. Ni-63 check source will be used for wipe tests for Ni-63 sources.

5. Remove the calibration sources so they do not affect the count and make a background count. For this count a filter wipe may be placed on the counting cell tray (but not absolutely necessary). Record the average count.
6. Sources are wiped using a 2 in. square filter paper held with tongs. Close the source shutter, moisten the filter paper with water or hexane solvent, and wipe around the shutter and other joints of the casting in which the source is located. Only solid

sources need be wiped (Krypton and Hydrogen are not). Allow the filter to dry and make and record a count.

Note: Never wipe a gauge type source (where beam can be entered) with shutter open. Keep hand away from shutter area except for 10-15 seconds needed to wipe closed shutter area. Object of the wipe is to collect any solid particles that may exist on instrument case should source have broken and escaped. Chance of this happening is so remote as to be nearly impossible.

7. Calculation of activity that is collected on wipe is calculated as follows:

. Contamination count = wipe count - background count

. Calibration source activity is determined from graph attached (see example), and half-life data from preceding table.

. Contamination activity (dps) =

$$\frac{\text{contamination count CPM} \times \text{current source activity dps}}{\text{current source count CPM}}$$

. 1 curie = 3.7×10^{10} dps

. Contamination amount (uCi) =

$$\frac{\text{contamination activity} \times 10^{-5}}{3.7}$$

The AEC limitation for contamination amount is 0.005 uCi. Source wipe values should be recorded on the reverse of the survey form shown previously.

RADIOACTIVE DECAY

Plot equation $A = A_0 e^{-\lambda t}$ where:

A = RADIOACTIVITY AT ANY TIME t

A_0 = ORIGINAL ACTIVITY AT ZERO TIME

e = BASE OF NATURAL LOGARITHM

λ = FRACTION OF ACTIVITY REMAINING AT TIME t

FROM U.S. DEPT. OF HEALTH, RADIOLOGICAL HEALTH HANDBOOK

PHYS-7842, p. 118-19

EXAMPLE: CALIBRATION SOURCE OF ^{90}Sr -90
CALIBRATED 7/21/64 HAD ACTIVITY OF 280 DPS.
WHAT IS ACTIVITY ON 2/21/67?

CO-60: HALF-LIFE, $T_1 = 5.3$ YR.

LAPSED TIME $t = 2/21/67 - 7/21/64 = 2.67$ YR.

NO. OF HALF-LIVES, $n = \frac{t}{T_1} = \frac{2.67}{5.3} = 0.504$

Follow a value of 0.5 from bottom
X-axis to lower graph line then
to left Y-axis. A fraction is 0.70.
 $\frac{A}{A_0}$

REMAINING ACTIVITY = $280 \times 0.70 = 196$ DPS.

Semi-Logarithmic
2 Cycles = 10 to the inch

REMAINING

$\frac{A}{A_0}$ = FRACTION OF ACTIVITY

$\frac{A}{A_0}$ = FRACTION OF ACTIVITY REMAINING

n = LAPSED TIME - NO. OF HALF-LIVES

Q-16. feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

(2) If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

(3) In all cases where the sound levels exceed the values shown herein, a continuing effective hearing conservation program shall be administered.

TABLE G-16—PERMISSIBLE NOISE EXPOSURES

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
¾	110
½ or less	115

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1 + C_2/T_2 + \dots + C_n/T_n$ exceeds unity, then the mixed exposure should be considered to exceed the limit value. C_n indicates the total time of exposure at a specified noise level, and T_n indicates the total time of exposure permitted at that level.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

[1910.95 Table G16 amended at 39 FR 9468, June 3, 1974]

§ 1910.96 Ionizing radiation.

(a) Definitions applicable to this section. (1) "Radiation" includes alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles, but such term does not include sound or radio waves, or visible light, or infrared or ultraviolet light.

(2) "Radioactive material" means any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.

(3) "Restricted area" means any area access to which is controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

(4) "Unrestricted area" means any area access to which is not controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

(5) "Dose" means the quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body. When the provisions in this section specify a dose during a period of time, the dose is 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 used in this section are set forth in subparagraphs (6) and (7) of this paragraph.

(6) "Rad" means a measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit of mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue (1 millirad (mrad) = 0.001 rad).

(7) "Rem" means a measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen (r) of X-rays (1 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 for irradiation. Each of the following is considered to be equivalent to a dose of 1 rem:

(i) A dose of 1 roentgen due to X- or gamma radiation;

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

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

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

(v) If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron dose in rads, as provided in subdivision (iii) of this subparagraph, 1 rem of neutron radiation may, for purposes of the provisions in this section be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there is 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 1 rem may be estimated from Table G-17:

TABLE G-17—NEUTRON FLUX DOSE EQUIVALENTS

Neutron energy (million electron volts (MeV))	Number of neutrons per square centimeter equivalent to a dose of 1 rem (neutrons/cm ²)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm ² per sec.)
Thermal	970 × 10 ⁶	670
0.0001	720 × 10 ⁶	500
0.001	820 × 10 ⁶	470
0.01	400 × 10 ⁶	280
0.1	120 × 10 ⁶	80
0.5	43 × 10 ⁶	30
1.0	28 × 10 ⁶	18
2.5	26 × 10 ⁶	20
5.0	26 × 10 ⁶	18
7.5	24 × 10 ⁶	17
10	24 × 10 ⁶	17
10 to 20	14 × 10 ⁶	10

(8) For determining exposures to X- or gamma rays up to 3 Mev., the dose limits specified in this section may be assumed to be equivalent to the "air dose". For the purpose of this section "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 the highest dosage rate.

(b) Exposure of individuals to radiation in restricted areas. (1) Except as provided in subparagraph (2) of this paragraph, no employer shall possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to re-

ceive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified in Table G-18.

TABLE G-18

	Rems per calendar quarter
Whole body: Head and trunk; active blood-forming organs; lens of eyes, or gonads	1½
Hands and forearms; feet and ankles	15%
Skin of whole body	7½

(2) An employer may permit an individual in a restricted area to receive doses to the whole body greater than those permitted under subparagraph (1) of this paragraph, so long as:

(i) During any calendar quarter the dose to the whole body shall not exceed 3 rems; and

(ii) 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

(iii) The employer maintains adequate past and current exposure records which show that the addition of such a dose will not cause the individual to exceed the amount authorized in this subparagraph. Dose to the whole body shall be deemed to include any dose to the whole body, head and trunk, or lens of the eye.

[1910.96(b)(2)(iii) amended at 39 FR 19468, June 3, 1974]

(3) No employer shall permit any employee who is under 18 years of age to receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in Table G-18.

(4) "Calendar quarter" means any 3-month period determined as follows:

(i) The first period of any year may begin on any date in January. Provided, That the second, third, and fourth periods accordingly begin on the same date in April, July, and October, respectively, and that the fourth period extends into January of the succeeding year, if necessary to complete a 3-month quarter. During the first year of use of this method of determination, the first period for that year shall also include any additional days in January preceding the starting date for the first period; or

(ii) The first period in a calendar year of 13 complete, consecutive calendar weeks; the second period in a calendar year of 13 complete consecutive weeks; the third period in a calendar year of 13 complete, consecutive calendar weeks; the fourth period in a calendar year of 13 complete, consecutive calendar weeks. If at the end of a calendar year there are any days not falling within a complete calendar week of that year, such days shall be included within the last complete calendar week of that year. If at the beginning of any calendar year there are days not falling within a complete calendar week of that year, such days shall be included within

the last complete calendar week of the previous year; or

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

(5) [Revoked]

(c) Exposure to airborne radioactive material. (1) No employer shall possess, use or transport radioactive material in such a manner as to cause any employee, within a restricted area, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Table 1 of Appendix B to 10 CFR Part 20. The limits given in Table 1 are for exposure to the concentrations specified for 40 hours in any workweek of 7 consecutive days. In any such period where the number of hours of exposure is less than 40, the limits specified in the table may be increased proportionately. In any such period where the number of hours of exposure is greater than 40, the limits specified in the table shall be decreased proportionately.

(2) No employer shall possess, use, or transfer radioactive 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 in an average concentration in excess of the limits specified in Table II of Appendix B to 10 CFR Part 20. For purposes of this subparagraph, concentrations may be averaged over periods not greater than 1 week.

(3) "Exposed" as used in this paragraph means that the individual is present in an airborne concentration. No allowance shall be made for the use of protective clothing or equipment, or particle size.

(d) Precautionary procedures and personal monitoring. (1) Every employer shall make such surveys as may be necessary for him to comply with the provisions in this section. "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.

(2) Every employer shall supply appropriate personnel monitoring equipment, such as film badges, pocket cham-

bers, pocket dosimeters, or film rings, to and shall require the use of such equipment by:

(i) Each employee 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 (b) (1) of this section; and

(ii) Each employee 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 (b) (1) of this section; and

(iii) Each employee who enters a high radiation area.

(3) As used in this section:

(i) "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.);

(ii) "Radiation area" means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirem, or in any 5 consecutive days a dose in excess of 100 millirem; and

(iii) "High radiation area" means any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of 100 millirem.

(e) Caution signs, labels, and signals—

(1) General. (i) Symbols prescribed by this paragraph shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this paragraph is the conventional three-bladed design:

RADIATION SYMBOL

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

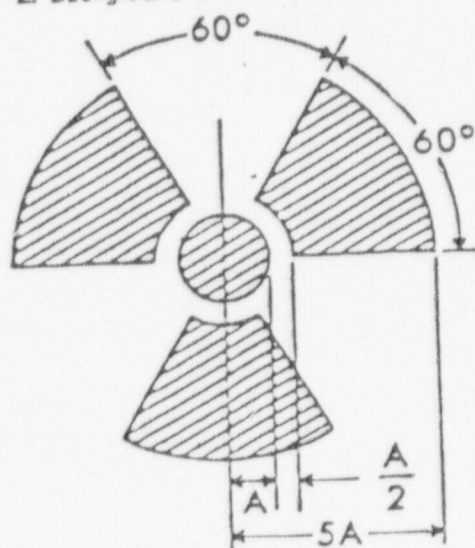


FIGURE G-10

(ii) In addition to the contents of signs and labels prescribed in this paragraph, employers 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.

(2) Radiation area. Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION RADIATION AREA

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

CAUTION HIGH RADIATION AREA

(ii) [Revoked]

(4) Airborne radioactivity area. (i) As used in the provisions of this section, "airborne radioactivity area" means:

(a) Any room, enclosure, or operating area in which airborne radioactive materials, composed wholly or partly of radioactive material, exist in concentrations in excess of the amounts specified in column 1 of Table 1 of Appendix B to 10 CFR Part 20 or

(b) Any room, enclosure, or operating area in which airborne radioactive materials exist 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 column 1 of Table 1 of Appendix B to 10 CFR Part 20.

(ii) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION AIRBORNE RADIOACTIVITY AREA

(5) Additional requirements.

(i) Each area or room in which radioactive material is used or stored and which contains any radioactive material (other than natural uranium or thorium) in any amount exceeding 10 times the quantity of such material specified in Appendix C to 10 CFR Part 20 shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

CAUTION RADIOACTIVE MATERIALS

(ii) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity of such material specified in 10 CFR Part 20 shall be conspicuously posted with a sign or signs bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

**CAUTION
RADIOACTIVE MATERIALS**

(b) Containers. (i) Each container in which is transported, stored, or used a quantity of any radioactive material (other than natural uranium or thorium) greater than the quantity of such material specified in Appendix C to 10 CFR Part 20 shall bear a durable, clearly visible label bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

**CAUTION
RADIOACTIVE MATERIALS**

(ii) Each container in which natural uranium or thorium is transported, stored, or used in a quantity greater than 10 times the quantity specified in Appendix C to 10 CFR Part 20 shall bear a durable, clearly visible label bearing the radiation caution symbol described in subparagraph (1) of this paragraph and the words:

**CAUTION
RADIOACTIVE MATERIALS**

(iii) Notwithstanding the provisions of subdivisions (i) and (ii) of this subparagraph a label shall not be required:

(a) If the concentration of the material in the container does not exceed that specified in column 2 of Table 1 of Appendix B to 10 CFR Part 20, or

(b) For laboratory containers, such as beakers, flasks, and test tubes, used transiently in laboratory procedures, when the user is present.

(iv) Where containers are used for storage, the labels required in this subparagraph shall state also the quantities and kinds of radioactive materials in the containers and the date of measurement of the quantities.

(f) Immediate evacuation warning signal—(1) Signal characteristics. (i) The signal shall be a midfrequency complex sound wave amplitude modulated at a subsonic frequency. The complex sound wave in free space shall have a fundamental frequency (f) between 450 and 500 hertz (Hz) modulated at a subsonic rate between 4 and 5 hertz.

(ii) The signal generator shall not be less than 75 decibels at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

(iii) A sufficient number of signal units shall be installed such that the requirements of subdivision (ii) of this subparagraph are met at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential.

(iv) The signal shall be unique in the plant or facility in which it is installed.

(v) The minimum duration of the signal shall be sufficient to insure that all affected persons hear the signal.

(vi) The signal-generating system shall respond automatically to an initiating event without requiring any human action to sound the signal.

(2) Design objectives. (i) The signal-generating system shall be designed to incorporate components which enable the system to produce the desired signal each time it is activated within one-half second of activation.

(ii) The signal-generating system shall be provided with an automatically activated secondary power supply which is adequate to simultaneously power all emergency equipment to which it is connected, if operation during power failure is necessary, except in those systems using batteries as the primary source of power.

(iii) All components of the signal-generating system shall be located to provide maximum practicable protection against damage in case of fire, explosion, corrosive atmosphere, or other environmental extremes consistent with adequate system performance.

(iv) The signal-generating system shall be designed with the minimum number of components necessary to make it function as intended, and should utilize components which do not require frequent servicing such as lubrication or cleaning.

(v) Where several activating devices feed activating information to a central signal generator, failure of any activating device shall not render the signal-generator system inoperable to activating information from the remaining devices.

(vi) The signal-generating system shall be designed to enhance the probability that alarm occurs only when immediate evacuation is warranted. The number of false alarms shall not be so great that the signal will come to be disregarded and shall be low enough to minimize personal injuries or excessive property damage that might result from such evacuation.

(3) Testing. (i) Initial tests, inspections, and checks of the signal-generating system shall be made to verify that the fabrication and installation were made in accordance with design plans and specifications and to develop a thorough knowledge of the performance of the system and all components under normal and hostile conditions.

(ii) Once the system has been placed in service, periodic tests, inspections, and checks shall be made to minimize the possibility of malfunction.

(iii) Following significant alterations or revisions to the system, tests and checks similar to the initial installation tests shall be made.

(iv) Tests shall be designed to minimize hazards while conducting the tests.

(v) Prior to normal operation the signal-generating system shall be checked physically and functionally to assure reliability and to demonstrate accuracy and performance. Specific tests shall include:

- (a) All power sources.
- (b) Calibration and calibration stability.
- (c) Trip levels and stability.
- (d) Continuity of function with loss and return of required services such as AC or DC power, air pressure, etc.
- (e) All indicators.

(f) Trouble indicator circuits and signals, where used.

(g) Air pressure (if used).

(h) Determining that sound level of the signal is within the limit of subparagraph (1)(ii) of this paragraph at all points that require immediate evacuation.

(vi) In addition to the initial startup and operating tests, periodic scheduled performance tests and status checks must be made to insure that the system is at all times operating within design limits and capable of the required response. Specific periodic tests or checks or both shall include:

(a) Adequacy of signal activation device.

(b) All power sources.

(c) Function of all alarm circuits and trouble indicator circuits including trip levels.

(d) Air pressure (if used).

(e) Function of entire system including operation without power where required.

(f) Complete operational tests including sounding of the signal and determination that sound levels are adequate.

(vii) Periodic tests shall be scheduled on the basis of need, experience, difficulty, and disruption of operations. The entire system should be operationally tested at least quarterly.

(viii) All employees whose work may necessitate their presence in an area covered by the signal shall be made familiar with the actual sound of the signal—preferably as it sounds at their work location. Before placing the system into operation, all employees normally working in the area shall be made acquainted with the signal by actual demonstration at their work locations.

(g) Exceptions from posting requirements. Notwithstanding the provisions of paragraph (e) of this section:

(1) 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 12 inches from the surface of the source container or housing does not exceed 5 millirem per hour.

(2) Rooms or other areas in onsite medical facilities are not required to be posted with caution signs because of the presence of patients containing radioactive material, provided that there are personnel in attendance who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in the provisions of this section.

(3) Caution signs are not required to be posted at areas or rooms containing radioactive materials for periods of less than 8 hours: Provided, That

(i) 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 provisions of this section; and

(ii) Such area or room is subject to the employer's control.

(h) Exemptions for radioactive materials packaged for shipment. Radioac-

tive materials packaged and labeled in accordance with regulations of the Department of Transportation published in 49 CFR Chapter I, are exempt from the labeling and posting requirements of this subpart during shipment, provided that the inside containers are labeled in accordance with the provisions of paragraph (e) of this section.

(1) *Instruction of personnel, posting.* (1) Employers regulated by the Atomic Energy Commission shall be governed by 10 CFR Part 20 standards. Employers in a State named in paragraph (p)(3) of this section shall be governed by the requirements of the laws and regulations of that State. All other employers shall be regulated by the following:

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

(3) Each employer to whom this section applies shall post a current copy of its provisions and a copy of the operating procedures applicable to the work conspicuously in such locations as to insure that employees working in or frequenting radiation areas will observe these documents on the way to and from their place of employment, or shall keep such documents available for examination of employees upon request.

(j) *Storage of radioactive materials.* Radioactive materials stored in a non-radiation area shall be secured against unauthorized removal from the place of storage.

(k) *Waste disposal.* No employer shall dispose of radioactive material except by transfer to an authorized recipient, or in a manner approved by the Atomic Energy Commission or a State named in paragraph (p)(3) of this section.

(1) *Notification of incidents.*—(1) *Immediate notification.* Each employer shall immediately notify the Assistant Secretary of Labor or his duly authorized representative, for employees not protected by the Atomic Energy Commission by means of 10 CFR Part 20: paragraph (p)(2) of this section, or the requirements of the laws and regulations of States named in paragraph (p)(3) of this section, by telephone or telegraph of any incident involving radiation which may have caused or threatens to cause:

(i) Exposure of the whole body of any individual to 25 rems or more of radia-

tion; exposure of the skin of the whole body of any individual to 150 rems or more of radiation; or exposure of the feet, ankles, hands, or forearms of any individual to 375 rems or more of radiation; or

(ii) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limit specified for such materials in Table II of Appendix B to 10 CFR Part 20.

(iii) [Revoked]

(iv) [Revoked]

(2) *Twenty-four hour notification.* Each employer shall within 24 hours following its occurrence notify the Assistant Secretary of Labor or his duly authorized representative for employees not protected by the Atomic Energy Commission by means of 10 CFR Part 20: paragraph (p)(2) of this section, or the requirements of the laws and applicable regulations of States named in paragraph (p)(3) of this section, by telephone or telegraph of any incident involving radiation which may have caused or threatens to cause:

(i) 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

(ii) [Revoked]

(iii) [Revoked]

(m) *Reports of overexposure and excessive levels and concentrations.* (1) In addition to any notification required by paragraph (1) of this section each employer shall make a report in writing within 30 days to the Assistant Secretary of Labor or his duly authorized representative, for employees not protected by the Atomic Energy Commission by means of 10 CFR Part 20; or under paragraph (p)(2) of this section, or the requirements of the laws and regulations of States named in paragraph (p)(3) of this section, of each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit in this section. Each report required under this subparagraph shall describe the extent of exposure of persons to radiation or to radioactive material; levels of radiation and concentration of radioactive material involved, the cause of the exposure, levels of concentrations; and corrective steps taken or planned to assure against a recurrence.

(2) In any case where an employer is required pursuant to the provisions of this paragraph to report to the U.S. Department of Labor any exposure of an individual to radiation or to concentrations of radioactive material, the employer shall also notify such individual of the nature and extent of exposure. Such notice shall be in writing and shall

contain the following statement: "You should preserve this report for future reference."

(n) *Records.* (1) Every employer shall maintain records of the radiation exposure of all employees for whom personnel monitoring is required under paragraph (d) of this section and advise each of his employees of his individual exposure on at least an annual basis.

(2) Every employer shall maintain records in the same units used in tables in paragraph (b) of this section and Appendix B to 10 CFR Part 20.

(o) *Disclosure to former employee of individual employee's record.* (1) At the request of a former employee an employer shall furnish to the employee a report of the employee's exposure to radiation as shown in records maintained by the employer pursuant to paragraph (n)(1) of this section. Such report shall be furnished within 30 days from the time the request is made, and shall cover each calendar quarter of the individual's employment involving exposure to radiation or such lesser period as may be requested by the employee. The report shall also include the results of any calculations and analysis of radioactive material deposited in the body of the employee. The report shall be in writing and contain the following statement: "You should preserve this report for future reference."

(2) [Revoked]

(p) *Atomic Energy Commission licensees—AEC contractors operating AEC plants and facilities—AEC Agreement State licensees or registrants.* (1) Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended, under a license issued by the Atomic Energy Commission and in accordance with the requirements of 10 CFR Part 20 shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.

(2) AEC contractors operating AEC plants and facilities: Any employer who possesses or uses source material, byproduct material, special nuclear material, or other radiation sources under a contract with the Atomic Energy Commission for the operation of AEC plants and facilities and in accordance with the standards, procedures, and other requirements for radiation protection established by the Commission for such contract pursuant to the Atomic Energy Act of 1954 as amended (42 U.S.C. 2011 et seq.), shall be deemed to be in compliance with the requirements of this section with respect to such possession and use.

(3) AEC-agreement State licensees or registrants:

(1) Atomic Energy Act sources. Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by, a State which has an agreement in effect with the Atomic Energy Commission pursuant to section 274(b) (42 U.S.C. 2021(b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, unless the Secretary of Labor, after conference with the Atomic Energy Commission, shall determine that the State's program for control of these radiation sources is incompatible with the requirements of this section. Such agreements currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia.

(2) Other sources. Any employer who possesses or uses radiation sources other than source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by a State which has an agreement in effect with the Atomic Energy Commission pursuant to section 274(b) (42 U.S.C. 2021(b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, provided the State's program for control of

these radiation sources is the subject of a currently effective determination by the Assistant Secretary of Labor that such program is compatible with the requirements of this section. Such determinations currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia.

(q) [Reserved]

(r) Radiation standards for mining.

(1) [Revoked]

(2) [Revoked]

(3)(i) [Revoked]

(ii) [Revoked]

(4)(i) [Revoked]

(ii) [Revoked]

[Sections 1910.96(b)(5), (e)(1)(ii), (1)(iii) and (iv), (1)(2)(ii) and (iii), (e)(2), (r)(1) and (2), (r)(3)(i) and (ii), and (r)(4)(i) and (ii) revoked at 43 FR 49726, October 24, 1978, effective November 24, 1978; typographical error corrected at 43 FR 51759, November 7, 1978]

UNITED STATES NUCLEAR REGULATORY COMMISSION
RULES and REGULATIONS

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

PART
19

NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS;
INSPECTIONS

Sec.	Purpose.
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AUTHORITY: Secs. 53, 63, 81, 103, 104, 161, Pub. L. 83-703, 68 Stat. 930, 933, 935, 936, 937, 948, as amended (42 U.S.C. 2073, 2093, 2111, 2133, 2134, 2201); Sec. 401, Pub. L. 93-438, 88 Stat. 1254 (42 U.S.C. 5891)

§ 19.1 Purpose.

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

§ 19.2 Scope.

The regulations in this part apply to all persons who receive, possess, use, or transfer material licensed by the Nuclear Regulatory Commission pursuant to the regulations in Parts 30 through 35, 40, or 70 of this chapter, including persons licensed to operate a production or utilization facility pursuant to Part 50 of this chapter.

§ 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.

(d) "License" means a license issued under the regulations in Parts 30 through 35, 40, or 70 of this chapter, including licenses to operate a production or utilization facility pursuant to Part 50 of this chapter. "Licensee" means the holder of such a license.

(e) "Restricted area" means any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials. "Restricted area" shall not include any 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.

§ 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 is-

sued 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.

(c) Form NRC-3, "Notice to Employees", shall be posted by each licensee wherever individuals work in or frequent any portion of a restricted area.

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.

(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 licensee, for example, a consultant to the licensee or to the workers' representative, shall be afforded the opportunity to accompany Commission inspectors during the inspection of physical working conditions.

(g) Notwithstanding the 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.

(c) No licensee shall discharge or in any manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under the regulations in this chapter or has testified or is about to testify in any such proceeding or because of the exercise by such worker on behalf of himself or others of any option afforded by this part.

§ 19.17 Inspections not warranted; informal review.

(a) If the Director of Inspection and Enforcement or of the appropriate Regional

Office determines, with respect to a complaint under § 19.16, that an inspection is not warranted because there are no reasonable grounds to believe that a violation exists or has occurred, he shall notify the complainant in writing of such determination. The complainant may obtain review of such determination by submitting a written statement of position with the Executive Director for Operations, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, who will provide the licensee with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant. The licensee may submit an opposing written statement of position with the Executive Director for Operations who will provide the complainant with a copy of such statement by certified mail. Upon the request of the complainant, the Executive Director for Operations or his designee may

hold an informal conference in which the complainant and the licensee may orally present their views. An informal conference may also be held at the request of the licensee, but disclosure of the identity of the complainant will be made only following receipt of written authorization from the complainant. After considering all written and oral views presented, the Executive Director for Operations shall affirm, modify, or reverse the determination of the Director of Inspection and Enforcement or of the appropriate Regional Office and furnish the complainant and the licensee a written notification of his decision and the reason therefor.

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

§ 19.30 Violations.

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

A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of section 53, 57, 62, 63, 81, 82, 101, 103, 104, 107, or 109 of the Act or any rule, regula-

tion, or order issued thereunder, or any term, condition or limitation of any license issued thereunder, or for any violation for which a license may be revoked under section 186 of the Act. Any person who willfully violates any provision of the Act or any regulation or order issued thereunder may be guilty of a crime and upon conviction, may be punished by fine or imprisonment or both, as provided by law.

§ 19.31 Application for exemption.

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.

UNITED STATES NUCLEAR REGULATORY COMMISSION
RULES and REGULATIONS
TITLE 10, CHAPTER 1, CODE OF FEDERAL REGULATIONS - ENERGY

**PART
20**

STANDARDS FOR PROTECTION AGAINST RADIATION

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Appendix C.
Appendix D—United States Nuclear Regulatory Commission Inspection and Enforcement Regional Offices.

AUTHORITY: The provisions of this Part 20 issued under 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. For the purposes of sec. 223, 68 Stat. 958, as amended; 42 U.S.C. 2273, § 520.401-20.409, issued under sec. 161 o., 68 Stat. 950, as amended; 42 U.S.C. 2201 (c). Secs. 202, 206, Pub. L. 93-438, 88 Stat. 1244, 1246 (42 U.S.C. 5842, 5846).

§ 20.1 Purpose.

(a) The regulations in this part establish standards for protection against radiation hazards arising out of activities under licenses issued by the Nuclear Regulatory Commission and are issued pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974.

(b) The use of radioactive material or other sources of radiation not licensed by the Commission is not subject to the regulations in this part. However, it is the purpose of the regulations in this part to control the possession, use, and transfer of licensed material by any licensee in such a manner that the total dose to an individual (including exposures to licensed and unlicensed radioactive material and to other unlicensed sources of radiation, whether in the possession of the licensee or any other person, but not including exposures to radiation from natural background sources or medical diagnosis and therapy) does not exceed the standards of radiation protection prescribed in the regulations in this part.

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

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

§ 20.2 Scope.

The regulations in this part apply to all persons who receive, possess, use, or transfer material licensed pursuant to the regulations in Parts 30 through 35, 40, or 70 of this chapter, including persons licensed to operate a production or utilization facility pursuant to Part 50 of this chapter.

§ 20.3 Definitions.

(a) As used in this part:

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

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

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

(4) "Calendar quarter" means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be such that no day is included in more than one calendar quarter or omitted from inclusion within a calendar quarter. No licensee shall change the method observed by him of determining calendar quarters except at the beginning of a calendar year.

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

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

(7) "Individual" means any human being;

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

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

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

(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 Administration (except that the Administration shall be considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to section 202 of the Energy Reorganization Act of 1974 (88 Stat. 1244)), any State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (ii) any legal successor, representative, agent, or agency of the foregoing.

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

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

(14) "Restricted area" means any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials. "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;

(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, thorium or any combination thereof. Source material does not include special nuclear material.

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

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

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

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

(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.

(a) "Dose," as used in this part, is the quantity of radiation absorbed, per unit of mass, by the body or by any portion of

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

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

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

- (1) A dose of 1 r due to X- or gamma radiation;
- (2) A dose of 1 rad due to X-, gamma, or beta radiation;
- (3) A dose of 0.1 rad due to neutrons or high energy protons;
- (4) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye;

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

NEUTRON FLUX DOSE EQUIVALENTS

Neutron energy (Mev)	Number of neutrons per square centimeter equivalent to a dose of 1 rem (neutrons/cm ²)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm ² per sec.)
Thermal	970 × 10 ⁶	670
0.0001	720 × 10 ⁶	500
0.001	630 × 10 ⁶	470
0.01	430 × 10 ⁶	290
0.1	13 × 10 ⁶	80
0.5	4.3 × 10 ⁶	30
1.0	2.6 × 10 ⁶	18
2.5	2.0 × 10 ⁶	14
5.0	1.6 × 10 ⁶	11
7.5	1.4 × 10 ⁶	10
10	1.3 × 10 ⁶	9
10 to ∞	1.4 × 10 ⁶	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.

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§ 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^{10} disintegrations per minute (dpm). Commonly used sub-multiples 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 (μ Ci) = 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.

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..... | 11 1/4 |
| 2. Hands and forearms; feet and ankles..... | 18 1/2 |
| 3. Skin of whole body..... | 7 1/2 |

(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:

(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.	3 1/4	1 1/4

(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} 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 intake³ 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.

¹ Wherever possible, the appropriate unit should be written out as "curie(s)," "millicurie(s)," or "microcurie(s)," and the abbreviations should not be used.

² Amended 36 FR 1466.

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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 2.5×10^5 ml to obtain the annual quantity limit for Rn-222.

Footnotes 4 and 5 on page 20-4.

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(2) No licensee shall possess, use, or transfer mixtures of U-234, U-235, and U-238 in soluble form in such a manner as to permit any individual in a restricted area to inhale a quantity of such material in excess of the intake limits specified in Appendix B, Table I, Column 1 of this part. If such soluble uranium is of a form such that absorption through the skin is likely, individual exposures to such material shall be controlled so that the uptake of such material by any organ from either inhalation or absorption or both routes of intake does not exceed that which would result from inhaling such material at the limits specified in Appendix B, Table I, Column 1 and footnote 4 thereto.

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

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

(2) When it is impracticable to apply process or other engineering controls to

limit concentrations of radioactive material in air below those defined in § 20.203(d) (1) (ii), other precautionary procedures, such as increased surveillance, limitation of working times, or provision of respiratory protective equipment, shall be used to maintain intake of radioactive material by any individual within any period of seven consecutive days as far below that intake of radioactive material which would result from inhalation of such material for 40 hours at the uniform concentrations specified in Appendix B, Table I, Column 1 as is reasonably achievable. Whenever the intake of radioactive material by any individual exceeds this 40-hour control measure, the licensee shall make such evaluations and take such actions as are necessary to assure against recurrence. The licensee shall maintain records of such occurrences, evaluations, and actions taken in a clear and readily identifiable form suitable for summary review and evaluation.

(c) When respiratory protective equipment is used to limit the inhalation of airborne radioactive material pursuant to paragraph (b) (2) of this section, the licensee may make allowance for such use in estimating exposures of individuals to such materials provided that such equipment is used as stipulated in Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection."

(d) Notwithstanding the provisions of paragraphs (b) and (c) of this section, the Commission may impose further restrictions:

(1) On the extent to which a licensee may make allowance for use of respirators in lieu of provision of process, containment, ventilation, or other engineering controls, if application of such controls is found to be practicable; and

(2) As might be necessary to assure that the respiratory protective program of the licensee is adequate in limiting exposures of personnel to airborne radioactive materials.

(e) 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.

(f) A licensee who was authorized to make allowance for use of respiratory protective equipment prior to December 29, 1976 shall bring his respiratory protective program into conformity with the requirements of paragraph (c) of this section within one year of that date, and is exempt from the requirement of paragraph (e) of this section.

* This incorporation by reference provision was approved by the Director of the Federal Register on October 19, 1976. Single copies of Regulatory Guide 8.15 are available from the Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, upon written request.

§ 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.

§ 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

* 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.

* 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.

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

§ 20.107 Medical diagnosis and therapy.

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

§ 20.108 Orders requiring furnishing of bio-assay services.

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

PRECAUTIONARY PROCEDURES

§ 20.201 Surveys.

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

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

§ 20.202 Personnel monitoring.

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

equipment by

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

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

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

(b) As used in this part,

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

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

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

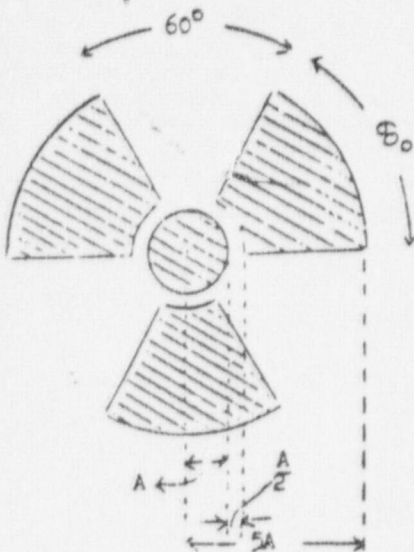
§ 20.203 Caution signs, labels, signals, and controls.

(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:

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RADIATION SYMBOL

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



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

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

CAUTION
RADIATION AREA

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

CAUTION
HIGH RADIATION AREA

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

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

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

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

(3) The controls required by subparagraph (2) of this paragraph 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 subparagraph (2) of this paragraph.

(5) Any licensee, or applicant for a license, may apply to the Commission for approval of methods not included in subparagraphs (2) and (4) of this paragraph 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 subparagraph (3) of this paragraph is met.

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

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

(ii) Be equipped with additional con-

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.

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 1020.203 until such compliance is achieved. For such persons compliance must be achieved not later than Dec. 14, 1978.

Amended 43 FR 2167.

trol 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.

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

(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 procedures* and such devices as are necessary to assure that the area is cleared of personnel prior to each use of the source preceding which use it might have been possible for an individual to have entered the area.

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

(vii) Have entry control devices required in paragraph (c)(6)(i) of this section which have been tested for proper functioning prior to initial operation with such source of radiation on any day that operations are not uninterruptedly continued from the previous day or before resuming operations after any unintended interruption, and for which records are kept of the dates, times, and results of such tests of func-

*Amended.

Or Danger

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tion. No operations other than those necessary to place the source in safe condition or to effect repairs on controls shall be conducted with such source unless control devices are functioning properly. The licensee shall submit an acceptable schedule for more complete periodic tests of the entry control and warning systems to be established and adhered to as a condition of the license.

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

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

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

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

CAUTION
AIRBORNE RADIOACTIVITY AREA

Or: Danger

* Amended.

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

CAUTION
RADIOACTIVE MATERIAL(S)

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

CAUTION
RADIOACTIVE MATERIAL(S)

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

(2) A label required pursuant to subparagraph (1) of this paragraph shall bear the radiation caution symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL". It shall also provide sufficient information¹ 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 subparagraph (1) of this paragraph, labeling is not required:

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

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

(iii) For containers that do not contain licensed materials in concentrations greater than the applicable concentrations listed in Column 2, Table I, Appendix B of this part.

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

(v) For containers when they are in transport and packaged and labeled in accordance with regulations of the Department of Transportation.

(vi) For containers which are accessible² 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 manufacturing³ 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.

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

² For example, containers in locations such as water-filled canals, storage vaults, or hot cells.

³ Amended 34 FR 1546.

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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.

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

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

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

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

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

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

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

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

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

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

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

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

(v) Packages containing only radionuclides with half-lives of less than 30

days and a total quantity of no more than 100 millicuries.

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

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

TABLE OF EXEMPT AND TYPE A QUANTITIES

Transport group ¹	Exempt quantity limit (in millicuries)	Type A quantity limit (in curies)
I.....	0.01	0.001
II.....	0.1	0.050
III.....	1	3
IV.....	1	30
V.....	1	100
VI.....	20,000	100
VII.....	1	30
Special Form.....	1	30

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

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

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

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

§ 20.206 Instruction of personnel.

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

§ 20.204 Same: exceptions.

Notwithstanding the provisions of § 20.203,

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

(b) Rooms or other areas in hospitals are not required to be posted with caution signs, and control of entrance or access thereto pursuant to § 20.203(c) is not required, because of the presence of

¹ The definitions of "transport group" and "special form" are specified in § 71.4 of this chapter.

[†] Amended 41 FR 16445.

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

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

(b) Licensed materials in an unrestricted area and not in storage shall be tended under the constant surveillance and immediate control of the licensee.

WASTE DISPOSAL

§ 20.301 General requirements.

No licensee shall dispose of licensed material except:

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

(b) As authorized pursuant to § 20.302; or

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

§ 20.302 Method for obtaining approval of proposed disposal procedures.

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

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

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

§ 20.303 Disposal by release into sanitary sewerage systems.

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

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

(b) The quantity of any licensed or other radioactive material released into the system by the licensee in any one

day does not exceed the larger of subparagraphs (1) or (2) of this paragraph:

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

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

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

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

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

§ 20.304 Disposal by burial in soil.

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

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

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

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

§ 20.305 Treatment or disposal by incineration.

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

RECORDS, REPORTS, AND NOTIFICATION

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

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

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

(c) (1) Records of individual exposure to radiation and to radioactive material

* Redesignated 36 FR 23138.

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 material made pursuant to §§ 20.302, 20.303, or 20.304 shall 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) Each licensee shall report by telephone to the Director of the appropriate Nuclear Regulatory Commission of the appropriate Nuclear Regulatory Commission Inspection and Enforcement Regional Office listed in Appendix D, immediately after its occurrence becomes known to the licensee, any loss or theft of licensed material in such quantities and under such circumstances that it appears to the licensee that a substantial hazard may result to persons in unrestricted areas.

(b) Each licensee who is required to make a report pursuant to paragraph (a) of this section shall, within thirty (30) days after he learns of the loss or theft, make a report in writing to the appropriate NRC Regional Office listed in Appen-

† Amended 42 FR 43965.

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dix D with copies to the Director of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, setting forth 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.

§ 20.403 Notifications of incidents.

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

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

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

(3) A loss of one working week or

more of the operation of any facilities affected; or

(4) Damage to property in excess of \$200,00.†

(b) *Twenty-four hour notification.*

Each licensee shall within 24 hours notify by telephone and telegraph, mailgram, or facsimile, the Director of the appropriate NRC Regional Office listed in Appendix D of any incident involving licensed material possessed by him and which may have caused or threatens to cause:

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

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

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

(4) Damage to property in excess of \$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) For nuclear power reactors licensed under § 50.21 or § 50.22, the incidents included in paragraph (a) and paragraph (b) in this section shall in addition be reported pursuant to § 50.72.

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diation 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. Each report required under this paragraph shall describe the extent of exposure of individuals** to radiation or to radioactive material, including estimates of each individual's exposure as required by paragraph (b) of this section; levels of radiation and concentrations of radioactive material involved; the cause of the exposure, levels or concentrations; and corrective steps taken or planned to assure against a recurrence.

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

(c) [Deleted 38 FR 22220.]

§ 20.406 [Deleted 38 FR 22220.]

§ 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 of Management and Program Analysis, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, the reports specified in paragraphs (a) and (b) of this section covering the preceding calendar year. All other persons specifically licensed by the Commission shall, within the first quarter of calendar years 1979 and 1980, submit to the Director of Management and Program Analysis, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, the reports specified in paragraphs (a) and (b) of this section covering the preceding calendar years 1978 and 1979.

(a) A report of either (1) the total number of individuals for whom personnel monitoring was required under §§ 20.202(a) or 24.33(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 24.33(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:

Estimated whole body exposure range (rem)**	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 +	

* 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;

(3) Process or use at any one time, for purposes of fuel processing, fabrication, 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; or

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

** Amended 43 FR 29270.

* 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.

* The Commission will evaluate the data obtained for 1978 and 1979 pursuant to this paragraph, and the benefits derived therefrom and may take action, including publication of notice of proposed rulemaking, to extend or otherwise modify this reporting requirement.

† Amended 42 FR 43965.

§ 20.404 [Deleted 38 FR 22220.]

§ 20.405 Reports of overexposures and excessive levels and concentrations.

(a) In addition to any notification required by § 20.403, each licensee shall make a report in writing within 30 days to the appropriate NRC Regional Office listed in Appendix D with a copy to the Director of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, of:

(1) each exposure of an individual to radiation in excess of the applicable limits in §§ 20.101 or 20.104 (a) or the license; (2) each exposure of an individual to radioactive material in excess of the applicable limits in §§ 20.103(a)(1), 20.103(a)(2), 20.104(b) or the license; (3) levels of radiation or concentrations of radioactive material in a restricted area in excess of any other applicable limit in the license; (4) any incident for which notification is required by § 20.403; and (5) levels of ra-

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APPENDIX A [Reserved]

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

^aThe 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.

(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 of Management and Program Analysis, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, a report of the individual's exposures to radiation and radioactive material, incurred during the period of employment or work assignment in the licensee's facility, containing information recorded by the licensee pursuant to §§ 20.401(a) and 20.108. Such report shall be furnished within 30 days after the exposure of the individual has been determined by the licensee or 90 days after the date of termination of employment or work assignment, whichever is earlier.

§ 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

§ 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.

§ 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—The reporting and record keeping requirements contained in this part have been approved by the General Accounting Office under E-180225 (R0043), (R0044), and (R0084).

Element (atomic number)	Table I			Table II			Isotope	Table I			Table II			
	Column 1	Column 2	Water	Column 1	Column 2	Water		Column 1	Column 2	Water	Column 1	Column 2	Water	
$+ (\mu\text{Ci}/\text{ml})(\mu\text{Ci}/\text{ml})(\mu\text{Ci}/\text{ml})$														
Actinium (89)	Ac 227	5	2×10^{-12}	6×10^{-13}	2×10^{-4}	8×10^{-14}	Bromine (35)	Br 82	5	1×10^{-6}	16×10^{-3}	4×10^{-6}	3×10^{-4}	
		1	3×10^{-11}	9×10^{-12}	3×10^{-4}	9×10^{-13}			1	3×10^{-7}	1×10^{-3}	6×10^{-6}	4×10^{-4}	
	Ac 228	5	8×10^{-8}	3×10^{-7}	9×10^{-3}	3×10^{-6}		Cadmium (48)	Cd 109	5	5×10^{-8}	5×10^{-3}	2×10^{-6}	2×10^{-4}
		1	2×10^{-6}	3×10^{-5}	6×10^{-1}	6×10^{-16}				1	7×10^{-6}	5×10^{-3}	3×10^{-6}	2×10^{-4}
Americium (95)	Am 241	5	6×10^{-12}	2×10^{-11}	4×10^{-6}	2×10^{-12}	Cadmium (48)	Cd 115m	5	4×10^{-6}	7×10^{-4}	1×10^{-6}	3×10^{-3}	
		*	1×10^{-10}	8×10^{-10}	4×10^{-12}	4×10^{-12}			1	4×10^{-8}	7×10^{-4}	1×10^{-6}	3×10^{-3}	
	Am 242m	5	6×10^{-12}	3×10^{-11}	9×10^{-3}	9×10^{-13}		Cadmium (48)	Cd 115	5	2×10^{-7}	1×10^{-3}	8×10^{-6}	3×10^{-3}
		1	3×10^{-10}	1×10^{-9}	4×10^{-4}	4×10^{-4}				1	2×10^{-7}	1×10^{-3}	4×10^{-4}	4×10^{-3}
Americium (95)	Am 242	5	4×10^{-6}	4×10^{-3}	1×10^{-4}	1×10^{-4}	Calcium (20)	Ce 45	5	3×10^{-8}	3×10^{-4}	1×10^{-6}	9×10^{-4}	
		1	5×10^{-6}	4×10^{-3}	2×10^{-4}	1×10^{-4}			1	1×10^{-7}	5×10^{-3}	2×10^{-6}	2×10^{-4}	
	Am 243	5	6×10^{-12}	1×10^{-11}	2×10^{-4}	2×10^{-4}		Cerium (58)	Ce 47	5	2×10^{-7}	1×10^{-3}	6×10^{-6}	5×10^{-3}
		1	1×10^{-10}	8×10^{-10}	4×10^{-12}	3×10^{-3}				1	2×10^{-7}	1×10^{-3}	6×10^{-6}	3×10^{-3}
Antimony (51)	Am 244	5	2×10^{-6}	1×10^{-5}	5×10^{-3}	5×10^{-3}	Cerium (58)	Cr 249	5	2×10^{-11}	1×10^{-4}	5×10^{-12}	4×10^{-4}	
		1	2×10^{-5}	1×10^{-4}	8×10^{-7}	5×10^{-2}			1	1×10^{-10}	7×10^{-4}	2×10^{-13}	2×10^{-3}	
	Sb 122	5	2×10^{-7}	8×10^{-4}	6×10^{-4}	3×10^{-3}		Chlorine (17)	Cr 250	5	5×10^{-12}	4×10^{-2}	2×10^{-13}	1×10^{-3}
		1	1×10^{-7}	8×10^{-4}	5×10^{-4}	3×10^{-3}				1	2×10^{-10}	1×10^{-4}	3×10^{-12}	4×10^{-4}
Argon (18)	Sb 124	5	2×10^{-7}	7×10^{-4}	5×10^{-4}	5×10^{-4}	Chlorine (17)	Cr 251	5	2×10^{-10}	1×10^{-4}	6×10^{-12}	3×10^{-3}	
		1	2×10^{-6}	7×10^{-4}	2×10^{-4}	2×10^{-4}			1	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-3}	
	Sb 125	5	3×10^{-7}	3×10^{-3}	2×10^{-4}	1×10^{-4}		Chromium (24)	Cr 252	5	6×10^{-11}	2×10^{-4}	2×10^{-13}	7×10^{-4}
		1	3×10^{-6}	3×10^{-3}	1×10^{-4}	1×10^{-4}				1	3×10^{-11}	2×10^{-4}	1×10^{-11}	1×10^{-4}
Arsenic (33)	Ar 37	Sub ²	6×10^{-3}	4×10^{-4}	1×10^{-4}	1×10^{-4}	Chromium (24)	Cr 253	5	8×10^{-15}	4×10^{-3}	3×10^{-11}	1×10^{-4}	
	Ar 41	Sub	2×10^{-6}	4×10^{-4}	5×10^{-4}	5×10^{-4}			1	8×10^{-16}	4×10^{-3}	3×10^{-11}	1×10^{-4}	
	As 73	5	2×10^{-6}	2×10^{-4}	5×10^{-4}	5×10^{-4}		Carbon (6)	Cr 254	5	5×10^{-13}	4×10^{-6}	2×10^{-13}	1×10^{-7}
		1	4×10^{-7}	1×10^{-3}	1×10^{-4}	1×10^{-4}				1	5×10^{-12}	4×10^{-6}	2×10^{-13}	1×10^{-7}
Astatine (85)	As 74	5	3×10^{-7}	2×10^{-3}	5×10^{-4}	5×10^{-4}	Cesium (55)	C 14	5	5×10^{-8}	2×10^{-3}	1×10^{-4}	8×10^{-4}	
		1	1×10^{-7}	2×10^{-3}	4×10^{-4}	4×10^{-4}		Cesium (55)	(CO ₂)	Sub	5×10^{-3}	3×10^{-3}	2×10^{-6}	9×10^{-3}
	As 76	5	1×10^{-7}	6×10^{-4}	4×10^{-4}	2×10^{-3}				5	4×10^{-7}	3×10^{-3}	5×10^{-6}	4×10^{-3}
		1	1×10^{-7}	6×10^{-4}	3×10^{-4}	2×10^{-3}			1	2×10^{-7}	1×10^{-3}	7×10^{-6}	4×10^{-3}	
Barium (56)	As 77	5	5×10^{-7}	2×10^{-3}	2×10^{-3}	8×10^{-3}	Cesium (55)	Ce 143	5	2×10^{-7}	1×10^{-3}	9×10^{-6}	4×10^{-3}	
		1	4×10^{-7}	2×10^{-3}	1×10^{-3}	8×10^{-3}			1	2×10^{-7}	1×10^{-3}	7×10^{-6}	4×10^{-3}	
	At 211	5	7×10^{-9}	5×10^{-3}	2×10^{-10}	2×10^{-10}		Cesium (55)	Ce 144	5	6×10^{-8}	3×10^{-4}	3×10^{-10}	1×10^{-3}
		1	3×10^{-9}	7×10^{-3}	1×10^{-9}	7×10^{-3}				1	6×10^{-8}	3×10^{-4}	2×10^{-10}	1×10^{-3}
Berkelium (97)	Ba 131	5	1×10^{-6}	5×10^{-3}	4×10^{-6}	2×10^{-2}	Cesium (55)	Ce 131	5	1×10^{-5}	7×10^{-3}	4×10^{-7}	2×10^{-3}	
		1	4×10^{-7}	5×10^{-3}	2×10^{-6}	2×10^{-6}			1	3×10^{-6}	2×10^{-3}	1×10^{-6}	9×10^{-3}	
	Ba 140	5	1×10^{-6}	8×10^{-4}	4×10^{-4}	3×10^{-4}		Cesium (55)	Ce 134m	5	4×10^{-3}	2×10^{-3}	1×10^{-6}	6×10^{-3}
		1	4×10^{-8}	8×10^{-4}	4×10^{-4}	3×10^{-4}				1	4×10^{-3}	2×10^{-3}	1×10^{-6}	6×10^{-3}
Beryllium (4)	Bk 249	5	9×10^{-16}	2×10^{-3}	1×10^{-11}	6×10^{-4}	Chlorine (17)	Ce 134	5	4×10^{-6}	3×10^{-4}	1×10^{-10}	4×10^{-3}	
		1	1×10^{-7}	2×10^{-3}	1×10^{-9}	6×10^{-4}			1	1×10^{-9}	1×10^{-3}	4×10^{-10}	4×10^{-3}	
	Bk 250	5	1×10^{-7}	6×10^{-3}	5×10^{-9}	2×10^{-4}		Chlorine (17)	Ce 135	5	5×10^{-7}	3×10^{-3}	2×10^{-6}	1×10^{-3}
		1	1×10^{-6}	6×10^{-3}	5×10^{-9}	2×10^{-4}				1	9×10^{-6}	7×10^{-3}	3×10^{-6}	2×10^{-3}
Bismuth (83)	Be 7	5	6×10^{-4}	5×10^{-3}	2×10^{-4}	2×10^{-4}	Chlorine (17)	Ce 136	5	4×10^{-7}	2×10^{-3}	1×10^{-6}	9×10^{-3}	
		1	1×10^{-4}	5×10^{-3}	2×10^{-4}	2×10^{-4}			1	2×10^{-7}	2×10^{-3}	6×10^{-6}	6×10^{-3}	
	Bi 206	5	2×10^{-7}	1×10^{-3}	4×10^{-3}	4×10^{-3}		Chlorine (17)	Ce 137	5	6×10^{-6}	4×10^{-3}	2×10^{-6}	2×10^{-3}
		1	1×10^{-7}	1×10^{-3}	5×10^{-4}	4×10^{-3}				1	1×10^{-6}	4×10^{-3}	5×10^{-6}	4×10^{-3}
Bismuth (83)	Bi 207	5	2×10^{-7}	2×10^{-3}	6×10^{-3}	6×10^{-3}	Chromium (24)	Cl 36	5	4×10^{-7}	2×10^{-3}	1×10^{-6}	8×10^{-3}	
		1	1×10^{-6}	2×10^{-3}	5×10^{-16}	6×10^{-3}			1	2×10^{-6}	2×10^{-3}	8×10^{-6}	6×10^{-3}	
	Bi 210	5	6×10^{-9}	1×10^{-3}	2×10^{-16}	4×10^{-3}		Chromium (24)	Cl 38	5	2×10^{-6}	1×10^{-3}	9×10^{-6}	4×10^{-3}
		1	6×10^{-9}	1×10^{-3}	2×10^{-16}	4×10^{-3}				1	2×10^{-6}	1×10^{-3}	7×10^{-6}	4×10^{-3}
	Bi 212	5	1×10^{-7}	1×10^{-3}	4×10^{-4}	4×10^{-4}		Ce 51	5	2×10^{-6}	3×10^{-3}	8×10^{-6}	2×10^{-3}	
		1	2×10^{-7}	1×10^{-3}	7×10^{-4}	4×10^{-4}		1	2×10^{-6}	3×10^{-3}	8×10^{-6}	2×10^{-3}		

UNITED STATES NUCLEAR REGULATORY COMMISSION
RULES and REGULATIONS

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

**PART
30**

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

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

AUTHORITY: Secs. 81, 82, 161, 182, 183, 68 Stat. 935, 948, 953, 954, as amended (42 U.S.C. 2111, 2112, 2201, 2232, 2233); secs. 202, 206, 88 Stat. 1244, 1246 (42 U.S.C. 5842 and 5846).

Section 30.34(b) also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C. 2234). For the purposes of sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273), § 30.34(c) issued under sec. 161b., 68 Stat. 948 (42 U.S.C. 2201 (b)) and §§ 30.51 and 30.52 issued under sec. 161, 68 Stat. 950, as amended (42 U.S.C. 2201 (c)).

§ 30.1 Purpose and Scope.

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

§ 30.2 Resolution of conflict.

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

** Amended 43 FR 6915.

§ 30.3 Activities requiring license.

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

§ 30.4 Definitions.

As used in this part and Parts 31-35** of this chapter:

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

(a-1) "Department" and "Department of Energy" means the Department of Energy established by the Department of Energy Organization Act (Pub. L. 95-61, 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. 95-61, 91 Stat. 565 at 577-578, 42 U.S.C. 7151).

(b) Terms defined in section 11 of the Act shall have the same meaning when used in the regulations in this part and Parts 31-35** to the extent such terms are not specifically defined in this part;

* Amended 36 FR 1466.

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

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

(e) "Commission" means the Nuclear Regulatory Commission and its duly authorized representatives;

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

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

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

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

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

(2) "Millicurie" means that amount of radioactive material which disintegrates at the rate of 37 million atoms per second;

(k) "Person" means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, Government agency other than the Commission or the Department **, except that the Department ** shall be considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to section 202 of

the Energy Reorganization Act of 1974 (86 Stat. 1244),⁵ any State or any political subdivision of or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing.

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

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

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

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

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

⁵ The ** Department facilities and activities identified in section 202 are:

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

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

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

(4) Retrievable Surface Storage Facilities and other facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the ** Department, which are not used for, or are part of, research and development activities.

(q) "Research and development" means (1) theoretical analysis, exploration, or experimentation, or (2) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials and processes. "Research and development" as used in this part and Parts 31-35† does not include the internal or external administration of byproduct material, or the radiation therefrom, to human beings;

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

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

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

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

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

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

§ 30.5 Interpretations.

Except as specifically authorized by the Commission in writing, no interpretation of the meaning of the regulations in this part and Parts 31-35† by any officer or employee of the Commission other than a written interpretation by the General Counsel will be recognized to be binding upon the Commission.

§ 30.6 Communications.

Except where otherwise specified, all communications and reports concerning

† Amended 43 FR 6915.

* Amended 36 FR 1466.

** Amended 45 FR 14199

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the regulations in this part and Parts 31-35† and applications filed under them, should be addressed to the Director of Nuclear Material Safety and Safeguards, 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 N.W., Washington, D.C., or **7920 Norfolk Avenue, Bethesda, Md.

EXEMPTIONS

§ 30.11 Specific exemptions.

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

(b) Any person subject to the provisions of §§ 30.32(1) and 30.33(a)(5) may request an exemption from the requirements of those provisions. The Commission may grant an exemption from the provisions of § 30.32(f) and 30.33(a)(5) upon considering and balancing the following factors:

(1) Whether conduct of the proposed activities will give rise to a significant adverse impact on the environment and the nature and extent of such impact, if any; -

(2) Whether redress of any adverse environmental impact from conduct of the proposed activities can reasonably be effected should such redress be necessary;

(3) Whether conduct of the proposed activities would foreclose subsequent adoption of alternatives; and

(4) The effect of delay conducting such activities on the public interest. During the period of any exemption granted pursuant to this paragraph (b), any activities conducted shall be carried out in such a manner as will minimize or reduce their environmental impact.

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

Except to the extent that *** Department facilities or activities of the types

subject to licensing pursuant to section 202 of the Energy Reorganization Act of 1974 are involved, any prime contractor of the *** Department is exempt from the requirements for a license set forth in sections 81 and 82 of the Act and from the regulations in this part to the extent that such contractor, under his prime contract with the *** Department manufactures, produces, transfers, receives, acquires, owns, possesses, or uses† byproduct material for: (a) the performance of work for the *** Department at a United States Government-owned or controlled site, including the transportation of byproduct material to or from such site and the performance of contract services during temporary interruptions of such transportation; (b) research in, or development, manufacture, storage, testing or transportation of, atomic weapons or components thereof; or (c) the use or operation of nuclear reactors or other nuclear devices in a United States Government-owned vehicle or vessel. In addition to the foregoing exemptions and subject to the requirement for licensing of *** Department facilities and activities pursuant to section 202 of the Energy Reorganization Act of 1974, any prime contractor or subcontractor of the *** Department or the Commission is exempt from the requirements for a license set forth in sections 81 and 82 of the Act and from the regulations in this part to the extent that such prime contractor or subcontractor manufactures, produces, transfers, receives, acquires, owns, possesses, or uses† byproduct material under his prime contract or subcontract when the Commission determines that the exemption of the prime contractor or subcontractor is authorized by law; and that, under the terms of the contract or subcontract, there is adequate assurance that the work thereunder can be accomplished without undue risk to the public health and safety.

§ 30.13 Carriers.

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

§ 30.14 Exempt concentrations.

(a) Except as provided in paragraphs (c) and (d) of this section, any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in this part and Parts 31-35† of this chapter to the extent that such person receives, possesses, uses, transfers, owns or acquires products or materials containing byproduct material in concentrations not in excess of those listed in § 30.70.

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

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

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

§ 30.15 Certain items containing byproduct material.

(a) Except for persons who apply byproduct material to, or persons who incorporate byproduct material into, the following products, or persons who initially transfer† for sale or distribution the following products containing byproduct material, any person is exempt from the requirements for a license set

† Amended 43 FR 6915.

** Amended 34 FR 19546.

*** Amended 45 FR 14199

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forth in section 81 of the Act and from the regulations in Parts 20 and 30-35* of this chapter to the extent that such person receives, possesses, uses, transfers,* owns, or acquires the following products:

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

- (i) 25 millicuries of tritium per timepiece,
- (ii) 5 millicuries of tritium per hand,
- (iii) 15 millicuries of tritium per dial (bezels when used shall be considered as part of the dial),
- (iv) 100 microcuries of promethium-147 per watch or 200 microcuries of promethium-147 per any other timepiece,
- (v) 20 microcuries of promethium-147 per watch hand or 40 microcuries of promethium-147 per other timepiece hand,
- (vi) 60 microcuries of promethium-147 per watch dial or 120 microcuries of promethium-147 per other timepiece dial (bezels when used shall be considered as part of the dial),
- (vii) The levels of radiation from hands and dials containing promethium-147 will not exceed, when measured through 50 milligrams per square centimeter of absorber:

(a) For wrist watches, 0.1 millirad per hour at 10 centimeters from any surface.

(b) For pocket watches, 0.1 millirad per hour at 1 centimeter from any surface.

(c) For any other timepiece, 0.2 millirad per hour at 10 centimeters from any surface.

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

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

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

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

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

(7) [Deleted 34 FR 6651.]

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

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

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

(9) Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, a source of byproduct material not exceeding the applicable quantity set forth in § 30.71, Schedule B.

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

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

* Amended 43 FR 6915.

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

§ 32.14 of this chapter, which license states that the product may be distributed by the licensee to persons exempt from the regulations pursuant to paragraph (a) of this section.

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

Any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in Parts 20 and 30-35* of this chapter to the extent that such person receives, possesses, uses, transfers,* owns, or acquires synthetic plastic resins containing scandium-46 which are designed for sand-consolidation in oil wells, and which have been manufactured or initially transferred* for sale or distribution, in accordance with a specific license issued pursuant to § 32.17 of this chapter or equivalent regulations of an Agreement State. The exemption in this section does not authorize the manufacture or initial transfer for sale or distribution* of any resins containing scandium-46.

§ 30.18 Exempt quantities.

(a) Except as provided in paragraphs (c) and (d) of this section, any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in Parts 30-34 of this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires byproduct material in individual quantities each of which does not exceed the applicable quantity set forth in § 30.71, Schedule B.

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

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

(d) No person may, for purposes of commercial distribution,* transfer byproduct material in the individual quantities set forth in § 30.71 Schedule

B. knowing or having reason to believe that such quantities of byproduct material will be transferred to persons exempt under this section or equivalent regulations of an Agreement State, except in accordance with a license issued under § 32.18 of this chapter, which license states that the byproduct material may be transferred by the licensee to persons exempt under this section or the equivalent regulations of an Agreement State.

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

(a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution* self-luminous products containing tritium, krypton-85, or promethium-147,* and except as provided in paragraph (c) of this section, any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in Parts 20 and 30-35* of this chapter to the extent that such person receives, possesses, uses, transfers,* owns, or acquires tritium, krypton-85, or promethium-147 in self-luminous products manufactured, processed, produced, or initially* transferred in accordance with a specific license issued pursuant to § 32.22 of this chapter, which license authorizes the initial* transfer of the product for use under this section.

(b) Any person who desires to manufacture, process, or produce self-luminous products containing tritium, krypton-85, or promethium-147, or to transfer* such products for use pursuant to paragraph (a) of this section, should apply for a license pursuant to § 32.22 of this chapter, which license states that the product may be transferred by the licensee to persons exempt from the regulations pursuant to paragraph (a) of this section or equivalent regulations of an Agreement State.

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

§ 30.20 Gas and aerosol detectors containing byproduct material.

(a) Except for persons who manufacture, process, produce, or initially transfer for sale or distribution* gas and

aerosol detectors containing byproduct material,* any person is exempt from the requirements for a license set forth in section 81 of the Act and from the regulations in Parts 20 and 30-35* of this chapter to the extent that such person receives, possesses, uses, transfers,* owns, or acquires byproduct material in gas and aerosol detectors designed to protect life or property from fires and airborne hazards, and manufactured, processed, produced, or initially* transferred in accordance with a specific license issued pursuant to § 32.26 of this chapter, which license authorizes the initial* transfer of the product for use under this section.

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

LICENSES

§ 30.31 Types of licenses.

Licenses for byproduct material are of two types: General and specific. Specific licenses are issued to named persons upon applications filed pursuant to the regulations in this part and Parts 32-35.* General licenses are effective without the filing of applications with the Commission or the issuance of licensing documents to particular persons.

§ 30.32 Application for specific licenses.

(a) Applications for specific licenses should be filed in duplicate on Form NRC-313, "Application for Byproduct Material License," with the Director of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

Applications may be filed in person at the Commission's offices at 1717 H Street, N.W., Washington, D.C., or 7920 Norfolk Avenue, Bethesda, Maryland. Information contained in previous applications, statements, or reports filed with the Commission or the Atomic Energy Commission may be incorporated by reference, provided that such references are clear and specific.

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

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

(d) An application for license filed pursuant to the regulations in this part and Parts 32-35* will be considered also as an application for licenses authorizing other activities for which licenses are required by the Act, provided that the application specifies the additional activities for which licenses are requested and complies with regulations of the Commission as to applications for such licenses.

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

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

§ 30.33 General requirements for issuance of specific licenses.

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

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

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

(3) The applicant is qualified by training and experience to use the material for the purpose requested in such

* Amended 43 FR 6915.

** Amended 39 FR 26279.

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manner as to protect health and minimize danger to life or property.

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

(5) In the case of an application for a license to receive and possess byproduct material for commercial waste disposal by land burial or for the conduct of any other activity which the Commission determines will significantly affect the quality of the environment, the Director of Nuclear Material Safety and Safeguards or his designee, before commencement of construction of the plan or facility in which the activity will be conducted, on the basis of information filed and evaluations made pursuant to Part 51** of this chapter, has concluded, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. Commencement of construction prior to such conclusion may be grounds for denial of a license to receive and possess byproduct material in such plant or facility.

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

§ 30.34 Terms and conditions of licenses.

(a) Each license issued pursuant to the regulations in this part and the regulations in Parts 31-35* shall be subject to all the provisions of the Act, now or hereafter in effect, and to all valid rules, regulations and orders of the Commission.

(b) No license issued or granted pursuant to the regulations in this part and Parts 31-35,* nor any right under a license shall be transferred, assigned or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person, unless the Commission shall, after securing full information, find that the transfer is in

accordance with the provisions of the Act and shall give its consent in writing.

(c) Each person licensed by the Commission pursuant to the regulations in this part and Parts 31-35* shall confine his possession and use of the byproduct material to the locations and purposes authorized in the license. Except as otherwise provided in the license, a license issued pursuant to the regulations in this part and Parts 31-35* of this chapter shall carry with it the right to receive, acquire, own, and possess,* byproduct material. Preparation for shipment and transport of byproduct material shall be in accordance with the provisions of Part 71 of this chapter.

(d) Each license issued pursuant to the regulations in this part and Parts 31-35* shall be deemed to contain the provisions set forth in section 183b-d., inclusive, of the Act, whether or not these provisions are expressly set forth in the license.

(e) The Commission may incorporate, in any license issued pursuant to the regulations in this part and Parts 31-35,* at the time of issuance, or thereafter by appropriate rule, regulation or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use and transfer of byproduct material as it deems appropriate or necessary in order to:

- (1) Promote the common defense and security;
- (2) Protect health or to minimize danger to life or property;
- (3) Protect restricted data;
- (4) Require such reports and the keeping of such records, and to provide for such inspections of activities under the license as may be necessary or appropriate to effectuate the purposes of the Act and regulations thereunder.

(f) Each licensee shall notify the Commission in writing when the licensee decides to permanently discontinue all activities involving materials authorized under the license. This notification requirement applies to all specific licenses issued under this Part and Parts 32 through 35 of this chapter.

(g) Each licensee preparing technetium-99m radiopharmaceuticals from molybdenum-99/technetium-99m generators shall test the generator eluates for molybdenum-99 breakthrough in accordance with § 35.14(b)(4) (i) thru (iv).

§ 30.35 [Deleted 40 FR #774.]

§ 30.36 Expiration of licenses.

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

§ 30.37 Applications for renewal of licenses.

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

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

§ 30.38 Applications for amendment of licenses.

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

§ 30.39 Commission action on applications to renew or amend.

In considering an application by a licensee to renew or amend his license the Commission will apply the applicable criteria set forth in § 30.33 and Parts 32-35* of this chapter.

§ 30.41 Transfer of byproduct material.

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

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

- (1) To the Administration;
- (2) To the agency in any Agreement State which regulates radioactive material pursuant to an agreement under section 274 of the Act;
- (3) To any person exempt from the licensing requirements of the Act and regulations in this part, to the extent permitted under such exemption;
- (4) To any person in an Agreement State, subject to the jurisdiction of that State, who has been exempted from the

* Amended 43 FR 6915.

** Amended 39 FR 26279.

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licensing requirements and regulations of that State, to the extent permitted under such exemption.

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

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

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

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

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

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

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

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

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

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

RECORDS, INSPECTIONS, TESTS, PROCEDURES, AND REPORTS†

§ 30.51 Records.

(a) Each person who receives byproduct material pursuant to a license issued pursuant to the regulations in this part and Parts 31-35* shall keep records showing the receipt, transfer,* and disposal of such byproduct material.

(b) Records which are required by the regulations in this part and Parts 31-35* or by license condition shall be maintained for the period specified by the appropriate regulation or license condition. If a retention period is not otherwise specified by regulation or license condition, such records shall be maintained until the Commission authorizes their disposition.

(c)(1) Records of receipt of byproduct material which must be maintained pursuant to paragraph (a) of this section shall be maintained as long as the licensee retains possession of the byproduct material and for two years following transfer,* or disposal of the byproduct material. (2) [Deleted 43 FR 6915.] (3) Records of transfer of byproduct material shall be maintained by the licensee who transferred the material for five years after such transfer. (4) Records of disposal of byproduct material shall be maintained in accordance with § 20.401 (c) of this chapter.

(d)(1) Records which must be maintained pursuant to this part and Parts 31-35* may be the original or a reproduced copy of 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.

(2) If there is a conflict between the Commission's regulations in this part and Parts 31-35,* license condition, or other written Commission approval or authorization pertaining to the retention period

for the same type of record, the retention period specified in the regulations in this part and Parts 31-35* for such records shall apply unless the Commission, pursuant to § 30.11, has granted a specific exemption from the record retention requirements specified in the regulations in this part or Parts 31-35.*

§ 30.52 Inspections.

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

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

§ 30.53 Tests.

Each licensee shall perform, or permit the Commission to perform, such tests as the Commission deems appropriate or necessary for the administration of the regulations in this part and Parts 31-35,* including tests of:

(a) Byproduct material;

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

(c) Radiation detection and monitoring instruments; and

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

§ 30.54 Control and accounting procedures for tritium.

(a) Except as specified in paragraph (b) of this section, each licensee who is authorized to possess at any one time and location more than 10,000 curies of tritium shall establish and maintain written material control and accounting procedures that are sufficient to enable the licensee to account for the tritium in his possession under specific license.

The written material control and accounting procedures shall be maintained as long as the licensee retains possession of the tritium and for two years following transfer* of the tritium.

(b) Written material control and accounting procedures are not required for (1) tritium produced or possessed within a production or utilization facility inci-

† Amended 37 FR 9207.

‡ Redesignated 43 FR 6915.

* Amended 43 FR 6915.

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dental to the operation of the facility, and * (2) tritium contained in spent fuel, other than tritium intentionally produced in or recovered from a production or utilization facility for any subsequent use. * (3) [Deleted 43 FR 6915.] (4) [Deleted 43 FR 6915.]

§ 30.55 Tritium reports.

(a) Except as specified in paragraph (d) of this section, each licensee who transfers or receives at any one time 1,000 curies or more of tritium shall complete and distribute a Nuclear Material Transaction** Report on Form NRC-741, in accordance with the printed instructions for completing the form. Each licensee who transfers such material shall submit a completed copy of Form NRC-741 to the Commission and three copies to the receiver of the material promptly after the transfer takes place. Each licensee who receives such material shall submit a completed copy of Form NRC-741 to the Commission and to the shipper of the material within ten (10) days after the material is received. The Commission's copies of the report shall be submitted to the U.S. Energy Research and Development Administration, Post Office Box E, Oak Ridge, Tennessee 37830, and shall include the Reporting Identification Symbol (RIS) assigned by the Commission to the licensee.

(b) Except as specified in paragraph (d) and (e) of this section, each licensee who is authorized to possess at any one time and location more than 10,000 curies of tritium shall submit to the Commission within thirty (30) days after March 31 and September 30† of each year a statement of his tritium inventory to the nearest hundredth of a gram calculated at 10,000 curies per gram.

The reports shall be submitted to the U.S. Energy Research and Development Administration, Post Office Box E, Oak Ridge, Tennessee 37830, and shall include the Reporting Identification Symbol (RIS) assigned by the Commission to the licensee.

(c) Except as specified in paragraph (d) of this section, each licensee who is authorized to possess* tritium shall report promptly to the appropriate NRC Regional Office listed in Appendix D of

Part 20 of this chapter by telephone and telegraph, mailgram, or facsimile any incident in which an attempt has been made or is believed to have been made to commit a theft or unlawful diversion of more than 10 curies of such material at any one time or more than 100 curies of such material in any one calendar year.

The initial report shall be followed within a period of fifteen (15) days by a written report submitted to the appropriate NRC Regional Office which sets forth the details of the incident and its consequences. Copies of such written report shall be sent to the Director of Inspection and Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

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

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

(e) The reports described in paragraph (b) of this section are not required for (1) tritium produced or possessed within a production or utilization facility incidental to the operation of the facility, other than tritium intentionally produced by or recovered from a production or utilization facility for any subsequent use. * (2) [Deleted 43 FR 6915.] (3) [Deleted 43 FR 6915.]

ENFORCEMENT

§ 30.61 Modification and revocation of licenses.

(a) The terms and conditions of each license issued pursuant to the regulations in this part and Parts 31-35* shall be subject to amendment, revision or modification by reason of amendments to the Act, or by reason of rules, regulations and orders issued in accordance with the terms of the Act.

(b) Any license may be revoked, suspended or modified, in whole or in part, for any material false statement in the application or any statement of fact required under section 182 of the Act, or because of conditions revealed by such application or statement of fact or any

report, record or inspection or other means which would warrant the Commission to refuse to grant a license on an original application, or for violation of, or failure to observe any of the terms and provisions of the Act or of any rule, regulation or order of the Commission.

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

§ 30.62 Right to cause the withholding or recall of byproduct materials.

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

§ 30.63 Violations.

An injunction or other court order may be obtained prohibiting any violation of any provision of the Atomic Energy Act of 1954, as amended, or Title II of the Energy Reorganization Act of 1974, or any regulation or order issued thereunder. A court order may be obtained for the payment of a civil penalty imposed pursuant to section 234 of the Act for violation of sections 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.

* Amended 42 FR 33265.

* Amended 43 FR 6915.

** Amended 38 FR 2330.

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03123
STATUS CODE: 2
FEE CATEGORY: 3P
EXP. DATE: 19880630
FEE COMMENTS:

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

APPLICANT/LICENSEE: CLAYTON ENVIRONMENTAL CONSULTANTS
RECEIVED DATE: 880630
DOCKET NO: 3019440
CONTROL NO.: 109137
LICENSE NO.: 29-20578-01
ACTION TYPE: RENEWAL

2. FEE ATTACHED

AMOUNT: 120.00
CHECK NO.: 1059

3. COMMENTS

SIGNED
DATE

BP
7/5/88

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED 1-45)

1. FEE CATEGORY AND AMOUNT:

3P

8120

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:

AMENDMENT
RENEWAL
LICENSE

3. OTHER

SIGNED
DATE

S. Kimberley
7/12/88