

**Department of State  
Division of Publications**

312 Rosa L. Parks Avenue, 8th Floor Snodgrass/TN Tower  
Nashville, TN 37243  
Phone: 615-741-2650  
Fax: 615-741-5133  
Email: [register.information@tn.gov](mailto:register.information@tn.gov)

**For Department of State Use Only**

Sequence Number: REDLINE  
Rule ID(s): \_\_\_\_\_  
File Date: \_\_\_\_\_  
Effective Date: \_\_\_\_\_

# Rulemaking Hearing Rule(s) Filing Form

*Rulemaking Hearing Rules are rules filed after and as a result of a rulemaking hearing. TCA Section 4-5-205*

<b>Agency/Board/Commission:</b>	Environment and Conservation
<b>Division:</b>	Radiological Health
<b>Contact Person:</b>	Beth Murphy
<b>Address:</b>	3 <sup>rd</sup> Floor L&C Annex 401 Church Street Nashville, Tennessee
<b>Zip:</b>	37243-1532
<b>Phone:</b>	(615) 532-0392
<b>Email:</b>	<a href="mailto:beth.murphy@tn.gov">beth.murphy@tn.gov</a>

**Revision Type (check all that apply):**

- Amendment  
 New  
 Repeal

**Rule(s) Revised (ALL chapters and rules contained in filing must be listed here. If needed, copy and paste additional tables to accommodate multiple chapters. Please enter only ONE Rule Number/Rule Title per row)**

Chapter Number	Chapter Title
0400-20-05	Standards for Protection Against Radiation
Rule Number	Rule Title
0400-20-05-.01 through 0400-20-05-.29	Reserved
0400-20-05-.30	Purpose
0400-20-05-.31	Scope
0400-20-05-.32	Definitions
0400-20-05-.33	Units of Radiation Dose
0400-20-05-.34	Units of Radioactivity
0400-20-05-.35	Communications
0400-20-05-.36 through 0400-20-05-.39	Reserved
0400-20-05-.40	Radiation Protection Programs
0400-20-05-.41 through 0400-20-05-.49	Reserved
0400-20-05-.50	Occupational Dose Limits for Adults
0400-20-05-.51	Compliance with Requirements for Summation of External and Internal Doses
0400-20-05-.52	Determination of External Dose from Airborne Radioactive Material
0400-20-05-.53	Determination of Internal Exposure
0400-20-05-.54	Planned Special Exposures
0400-20-05-.55	Occupational Dose Limits for Minors

0400-20-05-.56	Dose to an Embryo/Fetus
0400-20-05-.57	Reserved
0400-20-05-.58	Reserved
0400-20-05-.59	Order Requiring Furnishing of Bioassay Services
0400-20-05-.60	Dose Limits for Individual Members of the Public
0400-20-05-.61	Compliance with Dose Limits for Individual Members of the Public
0400-20-05-.62 through 0400-20-05-.69	Reserved
0400-20-05-.70	General Survey and Monitoring Requirements
0400-20-05-.71	Conditions Requiring Individual Monitoring of External and Internal Occupational Dose
0400-20-05-.72 through 0400-20-05-.79	Reserved
0400-20-05-.80	Control of Access to Very High Radiation Area Requirements
0400-20-05-.81	Control of Access to Very High Radiation Areas
0400-20-05-.82	Control of Access to Very High Radiation Areas-Irradiators
0400-20-05-.83 through 0400-20-05-.89	Reserved
0400-20-05-.90	Use of Process or Other Engineering Controls
0400-20-05-.91	Use of Other Controls
0400-20-05-.92	Use of Individual Respiratory Protection Equipment
0400-20-05-.93	Further Restrictions on the Use of Respiratory Protection Equipment
0400-20-05-.94	Application for Use of Higher Assigned Protection Factors
0400-20-05-.95 through 0400-20-05-.99	Reserved
0400-20-05-.100	Security of Stored Material
0400-20-05-.101	Control of Material Not in Storage
0400-20-05-.102 through 0400-20-05-.109	Reserved
0400-20-05-.110	Caution Signs
0400-20-05-.111	Posting Requirements
0400-20-05-.112	Reserved
0400-20-05-.113	Labeling Containers
0400-20-05-.114	Exemptions to Labeling Requirements
0400-20-05-.115	Procedures for Receiving and Opening Packages
0400-20-05-.116 through 0400-20-05-.119	Reserved
0400-20-05-.120	General Disposal Requirements
0400-20-05-.121	Method for Granting Approval of Alternative Disposal Procedures
0400-20-05-.122	Disposal by Release into Sanitary Sewerage
0400-20-05-.123	Treatment or Disposal by Incineration
0400-20-05-.124	Disposal of Specific Wastes
0400-20-05-.125	Transfer for Disposal and Manifests
0400-20-05-.126	Compliance with Environmental and Health Protection Regulations
0400-20-05-.127	Disposal of Certain Byproduct Material
0400-20-05-.128	Reserved
0400-20-05-.129	Reserved
0400-20-05-.130	General Records Provisions
0400-20-05-.131	Records of Radiation Protection Programs
0400-20-05-.132	Records of Surveys
0400-20-05-.133	Determination of Prior Occupational Dose
0400-20-05-.134	Records of Planned Special Exposures
0400-20-05-.135	Records of Individual Monitoring Results

0400-20-05-.136	Records of Dose to Individual Members of the Public
0400-20-05-.137	Records of Waste Disposal
0400-20-05-.138	Records of Testing Entry Control Devices for Very High Radiation Areas
0400-20-05-.139	Form of Records
0400-20-05-.140	Reports of Theft or Loss of Licensed Material
0400-20-05-.141	Notification of Incidents
0400-20-05-.142	Reports to Individuals of Exposure to Radiation
0400-20-05-.143	Reports of Exposures, Radiation Levels, and Concentrations of Radioactive Material Exceeding the Limits
0400-20-05-.144	Reports of Planned Special Exposures
0400-20-05-.145	Notifications, Records and Reports of Misadministration
0400-20-05-.146	Reports to Individuals of Exceeding Dose Limits
0400-20-05-.147 through 0400-20-05-.149	Reserved
0400-20-05-.150	Applications for Exemptions
0400-20-05-.151	Additional Requirements
0400-20-05-.152	Vacating Premises
0400-20-05-.153 through 0400-20-05-.159	Reserved
0400-20-05-.160	Violations
0400-20-05-.161	Schedules
0400-20-05-.162	Type X Quantities and Transport Groups
0400-20-05-.163	Reports of Transactions involving Nationally Tracked Sources
0400-20-05-.164	Nationally Tracked Source Thresholds
0400-20-05-.165	Report, Notification, and Records of a Dose to an Embryo/Fetus or a Nursing Child

<b>Chapter Number</b>	<b>Chapter Title</b>
1200-02-05	Standards for Protection Against Radiation
<b>Rule Number</b>	<b>Rule Title</b>
1200-02-05-.01 through 1200-02-05-.29	Repealed
1200-02-05-.30	Purpose
1200-02-05-.31	Scope
1200-02-05-.32	Definitions
1200-02-05-.33	Units of Radiation Dose
1200-02-05-.34	Units of Radioactivity
1200-02-05-.35	Communications
1200-02-05-.36	Repealed
1200-02-05-.37 through 1200-02-05-.39	Reserved
1200-02-05-.40	Radiation Protection Programs
1200-02-05-.41 through 1200-02-05-.49	Reserved
1200-02-05-.50	Occupational Dose Limits for Adults
1200-02-05-.51	Compliance with Requirements for Summation of External and Internal Doses
1200-02-05-.52	Determination of External Dose from Airborne Radioactive Material
1200-02-05-.53	Determination of Internal Exposure
1200-02-05-.54	Planned Special Exposures
1200-02-05-.55	Occupational Dose Limits for Minors
1200-02-05-.56	Dose to an Embryo/Fetus
1200-02-05-.57	Reserved
1200-02-05-.58	Reserved

1200-02-05-.59	Order Requiring Furnishing of Bioassay Services
1200-02-05-.60	Dose Limits for Individual Members of the Public
1200-02-05-.61	Compliance with Dose Limits for Individual Members of the Public
1200-02-05-.62 through 1200-02-05-.69	Reserved
1200-02-05-.70	General Survey and Monitoring Requirements
1200-02-05-.71	Conditions Requiring Individual Monitoring of External and Internal Occupational Dose
1200-02-05-.72 through 1200-02-05-.79	Reserved
1200-02-05-.80	Control of Access to Very High Radiation Area Requirements
1200-02-05-.81	Control of Access to Very High Radiation Areas
1200-02-05-.82	Control of Access to Very High Radiation Areas-Irradiators
1200-02-05-.83 through 1200-02-05-.89	Reserved
1200-02-05-.90	Use of Process or Other Engineering Controls
1200-02-05-.91	Use of Other Controls
1200-02-05-.92	Use of Individual Respiratory Protection Equipment
1200-02-05-.93	Further Restrictions on the Use of Respiratory Protection Equipment
1200-02-05-.94	Application for Use of Higher Assigned Protection Factors
1200-02-05-.95 through 1200-02-05-.99	Reserved
1200-02-05-.100	Security of Stored Material
1200-02-05-.101	Control of Material Not in Storage
1200-02-05-.102 through 1200-02-05-.109	Reserved
1200-02-05-.110	Caution Signs
1200-02-05-.111	Posting Requirements
1200-02-05-.112	Reserved
1200-02-05-.113	Labeling Containers
1200-02-05-.114	Exemptions to Labeling Requirements
1200-02-05-.115	Procedures for Receiving and Opening Packages
1200-02-05-.116 through 1200-02-05-.119	Reserved
1200-02-05-.120	General Disposal Requirements
1200-02-05-.121	Method for Granting Approval of Alternative Disposal Procedures
1200-02-05-.122	Disposal by Release into Sanitary Sewerage
1200-02-05-.123	Treatment or Disposal by Incineration
1200-02-05-.124	Disposal of Specific Wastes
1200-02-05-.125	Transfer for Disposal and Manifests
1200-02-05-.126	Compliance with Environmental and Health Protection Regulations
1200-02-05-.127 through 1200-02-05-.129	Reserved
1200-02-05-.130	General Records Provisions
1200-02-05-.131	Records of Radiation Protection Programs
1200-02-05-.132	Records of Surveys
1200-02-05-.133	Determination of Prior Occupational Dose
1200-02-05-.134	Records of Planned Special Exposures
1200-02-05-.135	Records of Individual Monitoring Results
1200-02-05-.136	Records of Dose to Individual Members of the Public
1200-02-05-.137	Records of Waste Disposal
1200-02-05-.138	Records of Testing Entry Control Devices for Very High Radiation Areas

1200-02-05-.139	Form of Records
1200-02-05-.140	Reports of Theft or Loss of Licensed Material
1200-02-05-.141	Notification of Incidents
1200-02-05-.142	Reports to Individuals of Exposure to Radiation
1200-02-05-.143	Reports of Exposures, Radiation Levels, and Concentrations of Radioactive Material Exceeding the Limits
1200-02-05-.144	Reports of Planned Special Exposures
1200-02-05-.145	Notifications, Records and Reports of Misadministration
1200-02-05-.146 through 1200-02-05-.149	Reserved
1200-02-05-.150	Applications for Exemptions
1200-02-05-.151	Additional Requirements
1200-02-05-.152	Vacating Premises
1200-02-05-.153 through 1200-02-05-.159	Reserved
1200-02-05-.160	Violations
1200-02-05-.161	Schedules
1200-02-05-.162	Type X Quantities and Transport Groups
1200-02-05-.163	Reports of Transactions involving Nationally Tracked Sources
1200-02-05-.164	Nationally Tracked Source Thresholds
1200-02-05-.165	Report, Notification, and Records of a Dose to an Embryo/Fetus or a Nursing Child

(Place substance of rules and other info here. Statutory authority must be given for each rule change. For information on formatting rules go to <http://tn.gov/sos/rules/1360/1360.htm>)

### Repeal

Chapter 1200-02-05 Standards for Protection Against Radiation is repealed.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

### New Rules

#### Chapter 0400-20-05 Standards for Protection Against Radiation

#### Table of Contents

0400-20-05-.01	
through	
0400-20-05-.29	Reserved
0400-20-05-.30	Purpose
0400-20-05-.31	Scope
0400-20-05-.32	Definitions
0400-20-05-.33	Units of Radiation Dose
0400-20-05-.34	Units of Radioactivity
0400-20-05-.35	Communications
0400-20-05-.36	
through	
0400-20-05-.39	Reserved
0400-20-05-.40	Radiation Protection Programs
0400-20-05-.41	
through	
0400-20-05-.49	Reserved
0400-20-05-.50	Occupational Dose Limits for Adults
0400-20-05-.51	Compliance with Requirements for Summation of External and Internal Doses
0400-20-05-.52	Determination of External Dose from Airborne Radioactive Material
0400-20-05-.53	Determination of Internal Exposure
0400-20-05-.54	Planned Special Exposures
0400-20-05-.55	Occupational Dose Limits for Minors
0400-20-05-.56	Dose to an Embryo/Fetus
0400-20-05-.57	Reserved
0400-20-05-.58	Reserved
0400-20-05-.59	Order Requiring Furnishing of Bioassay Services
0400-20-05-.60	Dose Limits for Individual Members of the Public
0400-20-05-.61	Compliance with Dose Limits for Individual Members of the Public
0400-20-05-.62	
through	
0400-20-05-.69	Reserved
0400-20-05-.70	General Survey and Monitoring Requirements
0400-20-05-.71	Conditions Requiring Individual Monitoring of External and Internal Occupational Dose
0400-20-05-.72	
through	
0400-20-05-.79	Reserved
0400-20-05-.80	Control of Access to Very High Radiation Area Requirements
0400-20-05-.81	Control of Access to Very High Radiation Areas
0400-20-05-.82	Control of Access to Very High Radiation Areas-Irradiators
0400-20-05-.83	
through	
0400-20-05-.89	Reserved
0400-20-05-.90	Use of Process or Other Engineering Controls
0400-20-05-.91	Use of Other Controls
0400-20-05-.92	Use of Individual Respiratory Protection Equipment

0400-20-05-.93	Further Restrictions on the Use of Respiratory Protection Equipment
0400-20-05-.94	Application for Use of Higher Assigned Protection Factors
0400-20-05-.95	
through	
0400-20-05-.99	Reserved
0400-20-05-.100	Security of Stored Material
0400-20-05-.101	Control of Material Not in Storage
0400-20-05-.102	
through	
0400-20-05-.109	Reserved
0400-20-05-.110	Caution Signs
0400-20-05-.111	Posting Requirements
0400-20-05-.112	Reserved
0400-20-05-.113	Labeling Containers
0400-20-05-.114	Exemptions to Labeling Requirements
0400-20-05-.115	Procedures for Receiving and Opening Packages
0400-20-05-.116	
through	
0400-20-05-.119	Reserved
0400-20-05-.120	General Disposal Requirements
0400-20-05-.121	Method for Granting Approval of Alternative Disposal Procedures
0400-20-05-.122	Disposal by Release into Sanitary Sewerage
0400-20-05-.123	Treatment or Disposal by Incineration
0400-20-05-.124	Disposal of Specific Wastes
0400-20-05-.125	Transfer for Disposal and Manifests
0400-20-05-.126	Compliance with Environmental and Health Protection Regulations
0400-20-05-.127	Disposal of Certain Byproduct Material
0400-20-05-.128	Reserved
0400-20-05-.129	Reserved
0400-20-05-.130	General Records Provisions
0400-20-05-.131	Records of Radiation Protection Programs
0400-20-05-.132	Records of Surveys
0400-20-05-.133	Determination of Prior Occupational Dose
0400-20-05-.134	Records of Planned Special Exposures
0400-20-05-.135	Records of Individual Monitoring Results
0400-20-05-.136	Records of Dose to Individual Members of the Public
0400-20-05-.137	Records of Waste Disposal
0400-20-05-.138	Records of Testing Entry Control Devices for Very High Radiation Areas
0400-20-05-.139	Form of Records
0400-20-05-.140	Reports of Theft or Loss of Licensed Material
0400-20-05-.141	Notification of Incidents
0400-20-05-.142	Reports to Individuals of Exposure to Radiation
0400-20-05-.143	Reports of Exposures, Radiation Levels, and Concentrations of Radioactive Material Exceeding the Limits
0400-20-05-.144	Reports of Planned Special Exposures
0400-20-05-.145	Notifications, Records and Reports of Misadministration
0400-20-05-.146	Reports to Individuals of Exceeding Dose Limits
0400-20-05-.147	
through	
0400-20-05-.149	Reserved
0400-20-05-.150	Applications for Exemptions
0400-20-05-.151	Additional Requirements
0400-20-05-.152	Vacating Premises
0400-20-05-.153	
through	
0400-20-05-.159	Reserved
0400-20-05-.160	Violations
0400-20-05-.161	Schedules
0400-20-05-.162	Type X Quantities and Transport Groups
0400-20-05-.163	Reports of Transactions involving Nationally Tracked Sources
0400-20-05-.164	Nationally Tracked Source Thresholds

~~1200-02-05-.01~~ 0400-20-05-.01 through ~~1200-02-05-.29~~ 0400-20-05-.29 Reserved

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.30~~ 0400-20-05-.30 Purpose.

- (1) The regulations in Rules ~~1200-02-05-.30~~ 0400-20-05-.30 through ~~1200-02-05-.162~~ 0400-20-05-.165 establish standards for protection against ionizing radiation. These standards are issued under Tennessee Code Annotated (T.C.A.) 4-5-201 et seq. and 68-202-203 and 206, as amended. These standards are also issued to meet the Nuclear Regulatory Commission's requirements for compatibility as set out in 42 United States Code Annotated (USCA) Section 2021(d)(2) and 10 CFR 20. It is the intent of the Division of Radiological Health of the Tennessee Department of Environment and Conservation that these rules enable the State of Tennessee to maintain its compatibility as an Agreement State. This principle should be considered, when relevant, in any interpretation of these rules. To that end, judicial or administrative interpretation of corresponding rules in other jurisdictions should be given persuasive authority.
- (2) The purpose of these standards is to control the receipt, possession, use, transfer and disposal of sources of radiation by any person. This is done so that the total dose to an individual from all sources of radiation other than background radiation does not exceed these standards. However, nothing in these standards shall be construed as limiting a licensee's or registrant's actions that may be necessary to protect health and safety during an emergency.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.31~~ 0400-20-05-.31 Scope.

These standards apply to all persons who receive, possess, use, transfer, or dispose of sources of radiation within the jurisdiction of the State of Tennessee. The limits in these standards do not apply to doses due to background radiation or to exposure of patients to radiation for medical diagnosis or therapy.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.32~~ 0400-20-05-.32 Definitions.

- (1) "Absorbed dose" means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).
- (2) "Act" means the Tennessee Code Annotated, Title 68, Chapter 202, as amended.
- (3) "Activity" is the rate of disintegration (transformation) or decay of radioactive material. The units of activity are the curie (Ci) and the becquerel (Bq).
- (4) "Adult" means an individual 18 or more years of age.
- (5) "Airborne radioactive material" means radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors or gases.
- (6) "Airborne radioactivity area" means a room, enclosure, or area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations:
  - (a) In excess of the derived air concentrations (DACs) specified in Schedule RHS 8-30; or
  - (b) To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake (ALI) or 12 DAC-hours.

~~(84)(7)~~ "Air-purifying respirator" means a respirator with an air-purifying filter, cartridge or canister that removes

specific air contaminants by passing ambient air through the air-purifying element.

~~(7)~~(8) "ALARA" (acronym for "as low as is reasonably achievable") means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these standards as is practical consistent with the purpose for which the activity is undertaken and taking into account:

- (a) The state of technology;
- (b) The economics of improvements in relation to:
  - 1. The state of technology;
  - 2. Benefits to public health and safety, and other societal and socioeconomic considerations; and
  - 3. Utilization of radiation and radioactive materials in the public interest.

~~(8)~~(9) "Annual limit on intake" (ALI) means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue. ALI values for intake by ingestion and by inhalation of selected radionuclides are given in Schedule RHS 8-30.

~~(82)~~(10) "Assigned protection factor" (APF) means the expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users. Operationally, the inhaled concentration can be estimated by dividing the ambient airborne concentration by the APF.

~~(83)~~(11) "Atmosphere-supplying respirator" means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

~~(9)~~(12) "Background radiation" means radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material), and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. "Background radiation" does not include radiation from sources of radiation subject to licensing or registering by the Division.

~~(40)~~(13) "Bioassay" ("radiobioassay") means the determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement (in vivo counting) or by analysis and evaluation of materials excreted or removed from the human body.

~~(14)~~(14) "Byproduct material" means:

- (a) 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;
- (b) The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute "byproduct material" within this definition;
- (c)
  - 1. Any discrete source of radium-226 that is produced, extracted, or converted after extraction for use for a commercial, medical, or research activity; or
  - 2. Any material that—
    - (i) Has been made radioactive by use of a particle accelerator; and

- (ii) Is produced, extracted, or converted after extraction for use for a commercial, medical, or research activity; and
- (d) Any discrete source of naturally occurring radioactive material, other than source material, that—
  1. The Commission, in consultation with the Administrator of the Environmental Protection Agency, the Secretary of Energy, the Secretary of Homeland Security, and the head of any other appropriate Federal agency, determines would pose a threat similar to the threat posed by a discrete source of radium-226 to the public health and safety or the common defense and security; and
  2. Is extracted or converted after extraction for use in a commercial, medical, or research activity.

~~(42)~~(15) "Class" (or "lung class" or "inhalation class") means a classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which applies to a range of clearance half-times: for Class D (Days) of less than 10 days, for Class W (Weeks) from 10 to 100 days, and for Class Y (Years) of greater than 100 days.

~~(13)~~(16) "Collective dose" is the sum of the individual doses received in a given period of time by a specific population from exposure to a specific source of radiation.

~~(44)~~(17) "Committed dose equivalent" (CDE) ( $H_{T,50}$ ) is the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the 50 year period following the intake.

~~(45)~~(18) "Committed effective dose equivalent" (CEDE) ( $H_{E,50}$ ) is the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues ( $H_{E,50} = (\sum W_T H_{T,50})$ ).

~~(80)~~(19) "Constraint" (or "dose constraint") means a value above which specified licensee actions are required.

~~(46)~~(20) "Declared pregnant woman" means a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant woman withdraws the declaration in writing or is no longer pregnant.

~~(47)~~(21) "Deep-dose equivalent" (DDE) ( $H_d$ ), which applies to external whole-body exposure, is the dose equivalent at a tissue depth of 1 cm (1000 mg/cm<sup>2</sup>).

~~(84)~~(22) "Demand respirator" means an atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

~~(48)~~(23) "Department" refers to the Tennessee Department of Environment and Conservation.

~~(49)~~(24) "Derived air concentration" (DAC) means the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an intake of one ALI. DAC values are given in Schedule RHS 8-30.

~~(20)~~(25) "Derived air concentration-hour" (DAC-hour) is the product of the concentration of radioactive material in air (expressed as a fraction or multiple of the derived air concentration for each radionuclide) and the time of exposure to that radionuclide, in hours. A licensee may take 2,000 DAC-hours to represent one ALI, equivalent to a committed effective dose equivalent of 5 rems (0.05 Sv).

~~(85)~~(26) "Disposable respirator" means a respirator for which maintenance is not intended and that is designed to be discarded after excessive breathing resistance, sorbent exhaustion, physical damage, or end-of-service-life renders it unsuitable for use. Examples of this type of respirator are a disposable half-mask respirator or a disposable escape-only self-contained breathing apparatus (SCBA).

~~(24)~~(27) "Division" means the Division of Radiological Health of the Tennessee Department of Environment and Conservation.

~~(22)~~(28) "Dose or radiation dose" is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as defined in other paragraphs of this rule.

~~(23)~~(29) "Dose equivalent" ( $H_T$ ) means the product of the absorbed dose in tissue, the quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the rem and sievert (Sv).

~~(24)~~(30) "Dosimetry processor" means an individual or an organization that processes and evaluates individual monitoring equipment in order to determine the radiation dose delivered to the equipment ( $\sum H_E, 50 = (\sum W_T H_T, 50)$ ).

~~(25)~~(31) "Effective dose equivalent" (EDE) ( $H_E$ ) is the sum of the products of the dose equivalent to the organ or tissue ( $H_T$ ) and the weighting factors ( $W_T$ ) applicable to each of the body organs or tissues that are irradiated ( $H_E = (\sum W_T H_T)$ ).

~~(26)~~(32) "Embryo/fetus" means the developing human organism from conception until the time of birth.

~~(27)~~(33) "Entrance or access point" means any location through which an individual could gain access to radiation areas or to sources of radiation. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.

~~(28)~~(34) "Exposure" means being exposed to ionizing radiation or to radioactive material.

~~(29)~~(35) "External dose" means that portion of the dose equivalent received from sources of radiation outside the body.

~~(30)~~(36) "Extremity" means hand, elbow, arm below the elbow, foot, knee, or leg below the knee.

~~(86)~~(37) "Filtering facepiece" ('dust mask') means a negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium, not equipped with elastomeric sealing surfaces and adjustable straps.

~~(87)~~(38) "Fit factor" means a quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

~~(88)~~(39) "Fit test" means the use of a protocol to evaluate qualitatively or quantitatively the fit of a respirator on an individual.

~~(34)~~(40) "Generally applicable environmental radiation standards" means standards issued by the Environmental Protection Agency (EPA) under the authority of the Atomic Energy Act of 1954, as amended, that impose limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment outside the boundaries of locations under the control of persons possessing or using sources of radiation.

~~(32)~~(41) "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.

~~(33)~~(42) "Gray" (See ~~1200-02-05-.33(1)(a)~~ subparagraph (1)(a) of Rule 0400-20-05-.33).

~~(89)~~(43) "Helmet" means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

~~(34)~~(44) "High radiation area" means an area, accessible to individuals, in which radiation levels from radiation sources external to the body could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

- ~~(90)~~~~(45)~~ "Hood" means a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.
- ~~(35)~~~~(46)~~ "Individual" means any human being.
- ~~(36)~~~~(47)~~ "Individual monitoring" means:
- (a) The assessment of dose equivalent by the use of devices designed to be worn by an individual;
  - (b) The assessment of committed effective dose equivalent by bioassay (see Bioassay) or by determination of the time-weighted air concentrations to which an individual has been exposed, i.e., DAC-hours; or
  - (c) The assessment of dose equivalent by the use of survey data.
- ~~(37)~~~~(48)~~ "Individual monitoring devices" ("individual monitoring equipment") means devices designed to be worn by a single individual for the assessment of dose equivalent, such as film badges, thermoluminescence dosimeters (TLDs), pocket ionization chambers, and personal ("lapel") air sampling devices.
- ~~(38)~~~~(49)~~ "Internal dose" means that portion of the dose equivalent received from radioactive material taken into the body.
- ~~(39)~~~~(50)~~ "Lens dose equivalent" applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter (300 mg/cm<sup>2</sup>).
- ~~(40)~~~~(51)~~ "License" means a license issued under the regulations in Chapter ~~4200-02-10~~ 0400-20-10.
- ~~(41)~~~~(52)~~ "Licensed material" means radioactive material received, possessed, used, transferred or disposed of under a general or specific license issued by the Division.
- ~~(42)~~~~(53)~~ "Licensee" means the holder of a license.
- ~~(43)~~~~(54)~~ "Limits" ("dose limits") means the permissible upper bounds of radiation doses.
- ~~(94)~~~~(55)~~ "Loose-fitting facepiece" means a respiratory inlet covering that is designed to form a partial seal with the face.
- ~~(44)~~~~(56)~~ "Lost" or "missing radioactive material" means radioactive material whose location is unknown. It includes material that has been shipped but has not reached its destination and whose location cannot be readily traced in the transportation system.
- ~~(45)~~~~(57)~~ "Member of the public" means any individual except when that individual is receiving an occupational dose.
- ~~(46)~~~~(58)~~ "Minor" means an individual less than 18 years of age.
- ~~(79)~~~~(59)~~ "Misadministration" means an event that meets the criteria in ~~4200-02-05-145~~ Rule 0400-20-05-145.
- ~~(47)~~~~(60)~~ "Monitoring" ("radiation monitoring", "radiation protection monitoring") means the measurement of radiation levels, concentrations, surface area concentrations or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses.
- ~~(402)~~~~(61)~~ "Nationally tracked sources" means a sealed source containing a quantity equal to or greater than Category 1 or Category 2 levels of any radioactive material listed in Rule 4200-02-05-164 ~~0400-20-05-164~~. In this context a sealed source is defined as radioactive material that is sealed in a capsule or closely bonded, in a solid form and which is not exempt from regulatory control. It does not mean material encapsulated solely for disposal or nuclear material contained in any fuel assembly, subassembly, fuel rod, or fuel pellet. Category 1 nationally tracked sources are those containing radioactive material at a quantity equal to or greater than the Category 1 threshold. Category 2 nationally tracked sources are those containing radioactive material at a quantity equal to or greater than the Category 2 threshold but

less than the Category 1 threshold.

~~(92)~~(62) "Negative pressure respirator" ("tight fitting") means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

~~(48)~~(63) "Nonstochastic effect" means health effects, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect (also called a deterministic effect).

~~(49)~~(64) "NRC" means the Nuclear Regulatory Commission or its duly authorized representatives.

~~(50)~~(65) "Occupational dose" means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation or to radioactive material from registered, unregistered, licensed and unlicensed sources of radiation, whether in the possession of the licensee, registrant or other person. Occupational dose does not include dose received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with ~~4200-02-07-.35~~ Rule 0400-20-07-.35, from voluntary participation in medical research programs, or as a member of the public.

~~(54)~~(66) "Person" means an individual, trust, firm, joint stock company, corporation (including a government corporation), partnership, association, state, municipality, commission, political subdivision of a state, any interstate body, any governmental agency of this state and any department, agency or instrumentality of the federal government.

~~(52)~~(67) "Planned special exposure" (PSE) means an infrequent exposure to radiation, separate from and in addition to the annual dose limits.

~~(93)~~(68) "Positive pressure respirator" means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

~~(94)~~(69) "Powered air-purifying respirator" (PAPR) means an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

~~(95)~~(70) "Pressure demand respirator" means a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

~~(53)~~(71) "Public dose" means the dose received by a member of the public from exposure to radiation or to radioactive material released by a licensee, or to any other source of radiation under the control of a licensee or registrant. Public Dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with Rule 1200-02-07-.35 ~~0400-20-07-.35~~, or from voluntary participation in medical research programs.

~~(96)~~(72) "Qualitative fit test" (QLFT) means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

~~(54)~~(73) "Quality factor" (Q) means the modifying factor (see Tables RHS 5-1 and RHS 5-2) that is used to derive dose equivalent from absorbed dose.

~~(97)~~(74) "Quantitative fit test" (QNFT) means an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

~~(55)~~(75) "Quarter" means a period of time equal to one-fourth of the year observed by the licensee or registrant (approximately 13 consecutive weeks), providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

~~(56)~~(76) "Rad" (See ~~4200-02-05-.33~~ Rule 0400-20-05-.33(1)(b)).

~~(57)~~(77) "Radiation" includes all ionizing electromagnetic waves and corpuscular emissions such as, but not necessarily limited to, gamma rays and x-rays, alpha and beta particles, electrons, neutrons, and protons, and other nuclear particles, but not radio waves or visible, infrared, or ultraviolet light.

- ~~(58)~~(78) "Radiation area" means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.
- ~~(59)~~(79) "Reference man" means a hypothetical aggregation of human physical and physiological characteristics arrived at by the Division after considering among others data and information published by the International Commission on Radiation Protection and the National Council on Radiation Protection and Measurements.
- ~~(60)~~(80) "Rem" (See ~~4200-02-05-33~~ Rule 0400-20-05-.33(1)(c)).
- ~~(64)~~(81) "Respiratory protective device" means an apparatus, such as a respirator, used to reduce the individual's intake of airborne radioactive materials.
- ~~(62)~~(82) "Restricted area" means an area, access to which is limited by the licensee or registrant for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.
- ~~(63)~~(83) "Sanitary sewerage" means a system of public sewers for carrying off waste water and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the licensee.
- ~~(98)~~(84) "Self-contained breathing apparatus" (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.
- ~~(64)~~(85) "Shallow-dose equivalent (Hs)", which applies to the external exposure of the skin of the whole body or the skin of an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter ( $7 \text{ mg/cm}^2$ ).
- ~~(65)~~(86) "Sievert" (See ~~4200-02-05-33~~ Rule 0400-20-05-.33(1)(d)).
- ~~(66)~~(87) "Site boundary" means that line beyond which the land or property is not owned, leased or otherwise controlled by the licensee or registrant.
- ~~(67)~~(88) "Source material" refers to:
- (a) Uranium or thorium, or any combination thereof, in any physical or chemical form; or
  - (b) Ores which contain by weight, one-twentieth of one percent (0.05%) or more of: uranium, thorium or any combinations thereof. Source material does not include special nuclear material.
- ~~(68)~~(89) "Stochastic effects" means health effects that occur randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects.
- ~~(99)~~(90) "Supplied-air respirator" (SAR) or "airline respirator" means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.
- ~~(69)~~(91) "Survey" means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of a source of radiation and measurements or calculations of levels of radiation or concentrations or quantities of radioactive material present.
- ~~(100)~~(92) "Tight-fitting facepiece" means a respiratory inlet covering that forms a complete seal with the face.
- ~~(70)~~(93) "Total effective dose equivalent" (TEDE) means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).
- ~~(74)~~(94) "Unrestricted area" means an area, access to which is neither limited nor controlled by the licensee or registrant.

(104)(95) "User seal check" ("fit check") means an action conducted by the respirator user to determine if the respirator is properly seated to the face. Examples include negative pressure check, positive pressure check, irritant smoke check or isoamyl acetate check.

(72)(96) "Very high radiation area" means an area accessible to individuals in which radiation levels from radiation sources external to the body could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from a source of radiation or 1 meter from any surface that the radiation penetrates.

(Note: At very high doses received at high dose rates, units of absorbed dose (e.g., rads and grays) are appropriate, rather than units of dose equivalent (e.g., rems and sieverts)).

(73)(97) "Week" means 7 consecutive days starting on Sunday.

(74)(98) "Weighting factor ( $W_T$ ), for an organ or tissue (T)" is the proportion of the risk of stochastic effects resulting from irradiation of the organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. For calculating the effective dose equivalent, the values of  $W_T$  are:

#### ORGAN DOSE WEIGHTING FACTORS

Organ or Tissue	$W_T$
Gonads	0.25
Breasts	0.15
Red Bone Marrow	0.12
Lung	0.12
Thyroid	0.03
Bone Surfaces	0.03
Remainder	<sup>1</sup> 0.30
Whole Body	<sup>2</sup> 1.00

<sup>1</sup> 0.30 results from 0.06 for each of 5 "remainder" organs (excluding the skin and the lens of the eye) that receive the highest doses.

<sup>2</sup> For the purpose of weighting the external whole body dose (for adding it to the internal dose), a single weighting factor,  $W_T=1.0$ , has been specified. The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued.

(75)(99) "Whole body" means, for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knee.

(76)(100) "Working level" (WL) is any combination of short-lived radon daughters (for radon-222: polonium-218, lead-214, bismuth-214, and polonium-214; and for radon-220: polonium-216, lead-212, bismuth-212, and polonium-212) in 1 liter of air that will result in the ultimate emission of  $1.3 \times 10^5$  MeV of potential alpha particle energy.

(77)(101) "Working level month" (WLM) means an exposure to 1 working level for 170 hours (2,000 working hours per year/12 months per year = approximately 170 hours per month).

(78)(102) "Year" means the period of time beginning in January used to determine compliance with the provisions of these standards. The licensee or registrant may change the starting date of the year used to determine compliance by the licensee or registrant provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.33~~ 0400-20-05-.33 Units of Radiation Dose.

(1) Definitions. As used in these standards the units of radiation dose are:

- (a) Gray (Gy) is the SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram (100 rads).
- (b) Rad is the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs/gram or 0.01 joule/kilogram (0.01 gray).
- (c) Rem is the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 sievert).
- (d) Sievert is the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv = 100 rems).
- (2) As used in these standards the quality factors for converting absorbed dose to dose equivalent are shown in Table RHS 5-1.

TABLE RHS 5-1 QUALITY FACTORS AND ABSORBED DOSE EQUIVALENCIES

Type of Radiation	Quality Factor (Q)	Absorbed dose equal to a unit dose equivalent <sup>1</sup>
X-, gamma, or beta radiation	1	1
Alpha particles, multiple charged particles, fission fragments and heavy particles of unknown charge	20	0.05
Neutrons of unknown energy	10	0.1
High-energy protons	10	0.1

<sup>1</sup> Absorbed dose in rad equal to 1 rem or the absorbed dose in gray equal to 1 sievert.

If measuring the neutron fluence rate is more convenient than determining the neutron dose equivalent rate as provided in this paragraph, 1 rem (0.01 Sv) of neutron radiation of unknown energies may be assumed to result from a total fluence of 25 million neutrons per square centimeter incident upon the body. If sufficient information exists to estimate the approximate energy distribution of the neutrons, the licensee or registrant may use the fluence rate per unit dose equivalent or the appropriate Q value from Table RHS 5-2 to convert a measured tissue dose in rads to dose equivalent in rems.

TABLE RHS 5-2 MEAN QUALITY FACTORS, Q, AND FLUENCE PER UNIT DOSE EQUIVALENT FOR MONOENERGETIC NEUTRONS

	Neutron Energy (MeV)	Quality Factor <sup>a</sup> (Q)	Fluence per unit dose equivalent <sup>b</sup> (neutrons cm <sup>-2</sup> rem <sup>-1</sup> )
(Thermal).	2.5 x 10 <sup>-8</sup>	2	980x10 <sup>6</sup>
	1 x 10 <sup>-7</sup>	2	980x10 <sup>6</sup>
	1 x 10 <sup>-6</sup>	2	810x10 <sup>6</sup>
	1 x 10 <sup>-5</sup>	2	810x10 <sup>6</sup>
	1 x 10 <sup>-4</sup>	2	840x10 <sup>6</sup>
	1 x 10 <sup>-3</sup>	2	980x10 <sup>6</sup>
	1 x 10 <sup>-2</sup>	2.5	1010x10 <sup>6</sup>
	1 x 10 <sup>-1</sup>	7.5	170x10 <sup>6</sup>
	5 x 10 <sup>-1</sup>	11	39x10 <sup>6</sup>
	1	11	27x10 <sup>6</sup>
	2.5	9	29x10 <sup>6</sup>
	5	8	23x10 <sup>6</sup>
	7	7	24x10 <sup>6</sup>

10	6.5	24x10 <sup>6</sup>
14	7.5	17x10 <sup>6</sup>
20	8	16x10 <sup>6</sup>
40	7	14x10 <sup>6</sup>
60	5.5	16x10 <sup>6</sup>
1 x 10 <sup>2</sup>	4	20x10 <sup>6</sup>
2 x 10 <sup>2</sup>	3.5	19x10 <sup>6</sup>
3 x 10 <sup>2</sup>	3.5	16x10 <sup>6</sup>
4 x 10 <sup>2</sup>	3.5	14x10 <sup>6</sup>

<sup>a</sup> Value of quality factor (Q) at the point where the dose equivalent is maximum in a 30-cm diameter cylinder tissue-equivalent phantom.

<sup>b</sup> Monoenergetic neutrons incident normally on a 30-cm diameter cylinder tissue-equivalent phantom.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-34~~ 0400-20-05-34 Units of Radioactivity.

- (1) For the purposes of these standards, activity is expressed in the special unit of curies (Ci) or in the SI unit of becquerels (Bq), or their multiples, or disintegrations (transformations) per unit of time.
  - (a) One becquerel = 1 disintegration per second (s<sup>-1</sup>).
  - (b) One curie = 3.7 x 10<sup>10</sup> disintegrations per second = 3.7 x 10<sup>10</sup> becquerels = 2.22 x 10<sup>12</sup> disintegrations per minute.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-35~~ 0400-20-05-35 Communications.

Unless otherwise specified, communications or reports concerning the regulations should be addressed to the Director, Division of Radiological Health, L&C Annex, 3rd Floor, 401 Church Street, Nashville, TN 37243-1523 and mailed to the address given in Rule 0400-20-04-07.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-36~~ 0400-20-05-36 Through ~~1200-02-05-39~~ 0400-20-05-39 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-40~~ 0400-20-05-40 Radiation Protection Programs.

- (1) Each licensee and registrant shall develop, document and implement a radiation protection program for a licensee's or registrant's activities that ensures compliance with these standards. See Rule ~~1200-02-05-134~~ 0400-20-05-131 for recordkeeping requirements relating to these programs.
- (2) The licensee's or registrant's procedures and engineering controls shall be based on sound radiation protection principles and shall achieve occupational doses and doses to members of the public that are ALARA.
- (3) The licensee or registrant shall periodically (at least annually) review radiation protection program content and implementation.
- (4) To implement the ALARA requirements of paragraph (2) of ~~1200-02-05-40(2)~~ this rule and notwithstanding the requirements in Rule ~~1200-02-05-70~~ 0400-20-05-70, licensees shall establish a constraint on air emissions of radioactive material to the environment, excluding radon-222 and its daughters. The constraint shall ensure that the individual member of the public likely to receive the highest dose shall not be expected to receive a total effective dose equivalent in excess of 10 millirems (0.1 millisievert) per year from these emissions. If a licensee exceeds this dose constraint, the licensee shall report the occurrence as provided in Rule ~~1200-02-05-143~~ 0400-20-05-143 and take prompt, appropriate corrective action to ensure against recurrence.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-41~~ 0400-20-05-41 through ~~1200-02-05-49~~ 0400-20-05-49 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-50~~ 0400-20-05-50 Occupational Dose Limits for Adults.

- (1) Except for planned special exposures under ~~1200-02-05-54~~ Rule 0400-20-05-54, the licensee or registrant shall limit the occupational dose to individual adults to the following annual dose limits:
  - (a) An annual limit that is the lesser of:
    1. A total effective dose equivalent of 5 rems (0.05 Sv) or
    2. The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye equal to 50 rems (0.5 Sv).
  - (b) The annual limits to the lens of the eye, to the skin of the whole body and to the skin of the extremities:
    1. A lens-dose equivalent to 15 rems (0.15 Sv), and
    2. A shallow-dose equivalent of 50 rems (0.50 Sv) to the skin of the whole body or to the skin of any extremity.
- (2) The amount by which occupational dose from all sources exceeds an individual's annual limits shall be subtracted from the individual's limits for planned special exposures for the current year and for lifetime exposure. See ~~1200-02-05-54~~ parts (1)(f)1 and 2 of Rule 0400-20-05-54.
- (3) When external exposure is determined by measurement with an external personal monitoring device, the deep-dose equivalent must be used in place of the effective dose equivalent, unless the effective dose equivalent is determined by a dosimetry method approved by the Division or by the Nuclear Regulatory Commission. The assigned deep-dose equivalent shall be for the part of the body receiving the highest exposure. The assigned shallow-dose equivalent shall be the dose averaged over the contiguous 10 cm<sup>2</sup> of skin receiving the highest exposure. Deep-dose, lens-dose and shallow-dose equivalents may be assessed from surveys or other radiation measurements to demonstrate compliance with occupational dose limits. However, this may be done only if the individual monitoring device was not subject to the highest potential exposure, or the individual monitoring results are unavailable.
- (4) Derived air concentration (DAC) and annual limit on intake (ALI) values are presented in Schedule RHS 8-30 and may be used to determine the individual's dose and demonstrate compliance with the occupational dose limits.
- (5) In addition to the annual dose limits, the licensee shall limit the soluble uranium intake by an individual to 10 milligrams in a week in consideration of chemical toxicity (see footnote 3 of Schedule RHS 8-30).
- (6) The licensee shall reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-54~~ 0400-20-05-51 Compliance with Requirements for Summation of External and Internal Doses.

- (1) If the licensee is required to monitor under ~~both 1200-02-05-74 subparagraphs (1)(a) and (b) of Rule 0400-20-05-71~~, the licensee shall demonstrate compliance with the dose limits by summing external and internal doses. If the licensee or registrant is required to monitor only under ~~1200-02-05-74 subparagraph (1)(a) of Rule 0400-20-05-71~~ or only under ~~1200-02-05-74 subparagraph (1)(b) of Rule 0400-20-05-71~~ then summation is not required to demonstrate compliance with the dose limits. The licensee may demonstrate compliance with the requirements for summation of external and internal doses by meeting one of the conditions specified in paragraph (2) of this rule and the conditions in

paragraphs (3) and (4) of this rule.

(Note: The dose equivalents for the lens of the eye, the skin, and the extremities are not included in the summation, but are subject to separate limits.)

- (2) Intake by inhalation. If the only intake of radionuclides is by inhalation, the total effective dose equivalent limit is not exceeded if the sum of the deep-dose equivalent divided by the total effective dose equivalent limit, and one of the following, does not exceed unity:
  - (a) The sum of the fractions of the inhalation ALI for each radionuclide; or
  - (b) The total number of derived air concentration-hours (DAC-hours) for all radionuclides divided by 2,000; or
  - (c) The sum of the calculated committed effective dose equivalents to all significantly irradiated organs or tissues (T)<sup>1</sup> where the organ dose is expressed as a fraction of the annual limit. This sum shall be calculated from bioassay data using appropriate biological models.
- (3) Intake by oral ingestion. The licensee shall account for oral ingestion of radionuclides and include it in demonstrating compliance with the limits when:
  - (a) The occupationally exposed individual intakes radionuclides by ingestion; and
  - (b) The oral ingestion exceeds 10 percent of the applicable oral ALI.
- (4) Intake through wounds or absorption through skin. The licensee shall evaluate and, to the extent practical, account for intakes through wounds or skin absorption.

(Note: The intake through intact skin has been included in the calculation of DAC for hydrogen-3 and does not need to be further evaluated.)

~~4200-02-05-.52~~ 0400-20-05-.52 Determination of External Dose from Airborne Radioactive Material.

In determining the dose from airborne radioactive material, the licensee shall include the contribution to the deep-dose equivalent, lens-dose equivalent, and shallow-dose equivalent from external exposure to the radioactive cloud (see Schedule RHS 8-30 footnotes 1 and 2).

(Note: Airborne radioactivity measurements and DAC values should not be used as the primary means to assess the deep-dose equivalent when the airborne radioactive material includes radionuclides other than noble gases or if the cloud of airborne radioactive material is not relatively uniform. The determination of the deep-dose equivalent to an individual should be based upon measurements using instruments or individual monitoring devices.)

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.53~~ 0400-20-05-.53 Determination of Internal Exposure.

- (1) To assess the dose used to determine compliance with occupational dose equivalent limits, and when required by ~~4200-02-05-.74~~ Rule 0400-20-05-.71, the licensee shall take suitable and timely measurements of:
  - (a) Concentrations of radioactive materials in air in work areas; or
  - (b) Quantities of radionuclides in the body; or
  - (c) Quantities of radionuclides excreted from the body; or
  - (d) Combinations of these measurements.

<sup>1</sup> An organ or tissue is considered significantly irradiated if the product of the weighting factors,  $W_T$ , and the committed dose equivalent,  $H_{T50}$ , per unit intake for that organ or tissue is greater than 10 percent of the maximum weighted value of  $H_{T50}$  (i.e.,  $W_T H_{T50}$ ) per unit intake for any organ or tissue.

- (2) The licensee shall assume that the concentration of airborne radioactive material inhaled by an individual is equal to the concentration in the individual's ambient air unless:
  - (a) Respiratory protective equipment is used, as provided in Rule ~~4200-02-05-.92~~ 0400-20-05-.92; or
  - (b) The assessment of intake is based on bioassays.
- (3) When specific information is known about the physical and biochemical properties of the radionuclides taken into the body or the behavior of the material in an individual, the licensee may:
  - (a) Use that information to calculate the committed effective dose equivalent, and if used, the licensee shall document that information in the individual's record; and
  - (b) Upon prior approval of the Division adjust the DAC or ALI values to reflect the actual physical and chemical characteristics of airborne radioactive material (e.g., aerosol size distribution or density); and
  - (c) Separately assess the contribution of fractional intakes of Class D, W or Y compounds of a given radionuclide (see Schedule RHS 8-30) to the committed effective dose equivalent.
- (4) If the licensee uses the measurements in ~~4200-02-05-.53~~ subparagraph (1)(b) or (c) of this rule to assess intakes of Class Y material, the licensee may delay recording and reporting the assessments for up to 7 months. This delay is allowed only if:
  - (a) It is necessary to make additional measurements basic to the assessments;
  - (b) Recording and reporting are not otherwise required by Rule ~~4200-02-05-.141~~ 0400-20-05-.141 or ~~4200-02-05-.143~~ 0400-20-05-.143.
- (5) If the identity and concentration of each radionuclide in a mixture are known, the fraction of the DAC applicable to the mixture for use in calculating DAC-hours must be either:
  - (a) The sum of the ratios of the concentration to the appropriate DAC value (e.g., D, W, Y) from Schedule RHS 8-30 for each radionuclide in the mixture; or
  - (b) The ratio of the total concentration for all radionuclides in the mixture to the most restrictive DAC value for any radionuclide in the mixture.
- (6) If the identity of each radionuclide in the mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture must be the most restrictive DAC of any radionuclide in the mixture.
- (7) When a mixture of radionuclides in air exists, licensees may disregard certain radionuclides in the mixture if:
  - (a) The licensee uses the total activity of the mixture in demonstrating compliance with the dose limits in Rule ~~4200-02-05-.50~~ 0400-20-05-.50 and in complying with the monitoring requirements in ~~4200-02-05-.74~~ subparagraph (1)(b) of Rule 0400-20-05-.71;
  - (b) The concentration of any radionuclide disregarded is less than 10 percent of its DAC; and
  - (c) The sum of the percentages for all disregarded radionuclides does not exceed 30 percent.
- (8) To calculate the committed effective dose equivalent, the licensee may assume that the inhalation of one ALI, or an exposure of 2,000 DAC-hours, results in a committed effective dose equivalent of 5 rems (0.05 Sv). This assumption may only be made for radionuclides that have their ALIs or DACs based on the committed effective dose equivalent.
- (9) When the ALI (and the associated DAC) is determined by the nonstochastic organ dose limit of 50 rems (0.5 Sv), the intake of radionuclides that would result in a committed effective dose equivalent of 5 rems

(0.05 Sv) (the stochastic ALI) is listed in parentheses in Table 1 of Schedule RHS 8-30. In this case, the licensee may, as a simplifying assumption, use the stochastic ALIs to determine committed effective dose equivalent. However, if the licensee uses the stochastic ALIs, the licensee must also demonstrate that the limit in ~~4200-02-05-50~~ subparagraph (1)(a) of Rule 0400-20-05-50 is met.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-54~~ 0400-20-05-54 Planned Special Exposures.

- (1) A licensee or registrant may authorize an adult worker to receive doses in addition to the doses received under the limits specified in ~~Rule 4200-02-05-50~~ 0400-20-05-50. Additional doses are allowed only if the following conditions are satisfied:
- (a) The additional doses are accounted for separately from the doses received under the limits in ~~Rule 4200-02-05-50~~ 0400-20-05-50.
  - (b) The licensee or registrant authorizes a planned special exposure only in an exceptional situation when alternatives that might avoid the dose estimated to result from the planned special exposure are unavailable or impractical.
  - (c) The licensee or registrant (and employer if different from the licensee or registrant) gives specific written authorization before the planned special exposure occurs.
  - (d) Before a planned special exposure, the licensee or registrant ensures that the individuals involved are:
    - 1. Informed of the purpose of the planned operation;
    - 2. Informed of the estimated doses and associated potential risks and specific radiation levels or other conditions that might be involved in performing the task; and
    - 3. Instructed in the measures to be taken to keep the dose ALARA considering other risks that may be present.
  - (e) Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant ascertains prior doses during the lifetime of the individual for each individual involved, as required by ~~4200-02-05-133~~ paragraph (2) of Rule 0400-20-05-133.
  - (f) Subject to ~~4200-02-05-50~~ paragraph (2) of Rule 0400-20-05-50 the licensee or registrant does not authorize a planned special exposure that would cause an individual to receive a dose from all planned special exposures and all doses in excess of the limits to exceed:
    - 1. The numerical values of any of the dose limits in ~~4200-02-05-50~~ paragraph (1) of Rule 0400-20-05-50 in any year; and
    - 2. Five times the annual dose limits in ~~4200-02-05-50~~ paragraph (1) of Rule 0400-20-05-50 during the individual's lifetime.
  - (g) The licensee or registrant maintains records of the conduct of a planned special exposure in accordance with ~~Rule 4200-02-05-134~~ 0400-20-05-134 and submits a written report in accordance with ~~4200-02-05-144~~ Rule 0400-20-05-144.
  - (h) The licensee or registrant records in the individual's record the best estimate of the dose resulting from the planned special exposure. The dose from planned special exposures is not to be considered in controlling future occupational dose of the individual under ~~4200-02-05-50~~ paragraph (1) of Rule 0400-20-05-50 but is to be included in evaluations required by ~~(5) and (6)~~ subparagraphs (1)(e) and (f) of this rule.
  - (i) The licensee or registrant gives the individual written notice of the estimated dose within 30 days after the date of the planned special exposure.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-55~~ 0400-20-05-55 Occupational Dose Limits for Minors.

The annual occupational dose limits for minors are 10 percent of the annual dose limits specified for adult workers in Rule ~~1200-02-05-50~~ 0400-20-05-50.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-56~~ 0400-20-05-56 Dose to an Embryo/Fetus.

- (1) The licensee or registrant shall ensure that the dose equivalent to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv). (For recordkeeping requirements see Rule ~~1200-02-05-135~~ 0400-20-05-135).
- (2) Using ALARA the licensee or registrant shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman.
- (3) The dose equivalent to an embryo/fetus shall be taken as the sum of:
  - (a) The deep-dose equivalent to the declared pregnant woman; and
  - (b) The dose equivalent to the embryo/fetus from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman.
- (4) If when a woman declares her pregnancy to the licensee or registrant the dose equivalent to the embryo/fetus is found to be 0.45 rem (4.5 mSv) or greater, the embryo/fetus is permitted an additional dose equivalent not exceeding 0.05 rem (0.5 mSv) during the remainder of the pregnancy.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-57~~ 0400-20-05-57 through ~~1200-02-05-58~~ 0400-20-05-58 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-59~~ 0400-20-05-59 Order Requiring Furnishing of Bioassay Services.

Where necessary to ascertain the extent of an individual's exposure to concentrations of radioactive material, the Division may require a licensee to make available to the individual bioassay services and to furnish a copy of the reports of such services to the Division.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-60~~ 0400-20-05-60 Dose Limits for Individual Members of the Public.

- (1) Each licensee and registrant shall conduct operations so that:
  - (a) The total effective dose equivalent received by any individual member of the public from the licensed or registered operation does not exceed 0.1 rem (1 mSv) in a year. This limit is exclusive of the dose contribution from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with ~~1200-02-07-35~~ Rule 0400-20-07-35, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with ~~1200-02-05-122~~ Rule 0400-20-05-122; and
  - (b) The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with ~~1200-02-07-35~~ Rule 0400-20-07-35, does not exceed 0.002 rem (0.02 mSv) in any one hour.
- (2) If a licensee or registrant permits members of the public to have access to controlled areas, the limit for members of the public continues to apply to those individuals.

- (3) Notwithstanding paragraph (1)(a) of this rule, a licensee or registrant may permit visitors to an individual who cannot be released, under ~~1200-02-07-.35~~ Rule 0400-20-07-.35, to receive a radiation dose greater than 0.1 rem (1mSv) if:
- (a) The radiation dose received does not exceed 0.5 rem (5 mSv); and
  - (b) The authorized user, as defined in ~~1200-02-07-.05(5)~~ Rule 0400-20-07-.05, has determined before the visit that it is appropriate.
- (4) A licensee, registrant or applicant may apply for prior authorization to operate up to an annual dose limit for an individual member of the public of 0.5 rem (5 mSv). This application by the licensee, registrant or applicant shall include the following:
- (a) Demonstration of the need for and the expected duration of operations in excess of the limit in paragraph (1) of this rule;
  - (b) The licensee's or registrant's program to assess and control dose within the 0.5 rem (5 mSv) annual limit; and
  - (c) The procedures to be followed to maintain the dose as low as is reasonably achievable (ALARA).
- (5) In addition to the requirements of this chapter, a licensee or registrant subject to the provisions of EPA's generally applicable environmental radiation standards in 40 CFR Part 190 shall comply with those standards.
- (6) The Division may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that a licensee or registrant may release in effluents in order to restrict the collective dose.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.64~~ 0400-20-05-.61 Compliance with Dose Limits for Individual Members of the Public.

- (1) The licensee or registrant shall demonstrate compliance with the dose limits in ~~1200-02-05-.60~~ Rule 0400-20-05-.60 by making or causing to be made surveys of:
- (a) Radiation levels in unrestricted and restricted areas; and
  - (b) Radiation levels and radioactive materials in effluents released to unrestricted areas.
- (2) A licensee or registrant shall show compliance with the annual dose limit in ~~1200-02-05-.60~~ Rule 0400-20-05-.60 by:
- (a) Demonstrating by measurement or calculation that the individual likely to receive the highest dose from the licensee's or registrant's operation does not receive a total effective dose equivalent exceeding the annual dose limit; or
  - (b) Demonstrating that:
    - 1. The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in Table 2 of Schedule RHS 8-30; and
    - 2. If an individual were continually present in an unrestricted area, the dose from external sources would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year.
- (3) Upon approval from the Division, the licensee may adjust the effluent concentration values in Schedule RHS 8-30, Table 2, for members of the public, to take into account the actual physical and chemical characteristics of the effluents (e.g., aerosol size distribution, solubility, density, radioactive decay

equilibrium, chemical form).

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-62~~ 0400-20-05-62 through ~~1200-02-05-69~~ 0400-20-05-69 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-70~~ 0400-20-05-70 General Survey and Monitoring Requirements.

- (1) Each licensee and registrant shall make or cause to be made, surveys that:
  - (a) May be necessary for the licensee or registrant to comply with the standards in this chapter; and
  - (b) Are reasonable under the circumstances to evaluate:
    1. The magnitude and extent of radiation levels;
    2. Concentrations or quantities of radioactive material; and
    3. The potential radiological hazards.
- (2) The licensee or registrant shall ensure that instruments and equipment used for quantitative radiation measurements (e.g., dose rate and effluent monitoring) are calibrated periodically for the radiation measured.
- (3) Except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to the extremities, all personnel dosimeters for determining the dose and used to comply with these standards or with conditions specified in a license or registration shall be processed and evaluated by a dosimetry processor:
  - (a) Holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and
  - (b) Approved for processing and evaluating dosimeters exposed to the type of radiation(s) included in the NVLAP program that most closely approximates the type of radiation(s) being monitored by the dosimeter.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-74~~ 0400-20-05-74 Conditions Requiring Individual Monitoring of External and Internal Occupational Dose.

- (1) Each licensee and registrant shall monitor exposures to radiation and radioactive material at levels sufficient to demonstrate compliance with the occupational dose limits of this chapter:
  - (a) Each licensee and registrant shall monitor occupational exposure to radiation from licensed or unlicensed and registered or unregistered radiation sources under the control of the licensee and registrant and shall supply and require the use of individual monitoring devices by:
    1. Adults likely to receive, in ~~one~~ 1 year from sources external to the body, a dose in excess of 10 percent ~~(10%)~~ of the limits in ~~1200-02-05-50~~ Rule 0400-20-05-50;
    2. Minors likely to receive, in ~~one~~ 1 year from radiation sources external to the body, a deep dose equivalent in excess of 0.1 rem (1 mSv), a lens dose equivalent in excess of 0.15 rem (1.5 mSv), or a shallow dose equivalent to the skin or to the extremities in excess of 0.5 rem (5 mSv);
    3. Declared pregnant women likely to receive during the entire pregnancy, from radiation

sources external to the body, a deep dose equivalent in excess of 0.1 rem (1 mSv)<sup>2</sup>; and

4. Individuals entering a high or very high radiation area.
- (2) Each licensee shall monitor (see ~~4200-02-05-53~~ Rule 0400-20-05-53) the occupational intake of radioactive material by, and assess the committed effective dose equivalent to:
    - (a) Adults likely to receive, in ~~one~~ 1 year, an intake in excess of ten percent (~~10%~~) of the applicable ALI(s) in Table 1, Columns 1 and 2, of Schedule RHS 8-30;
    - (b) Minors likely to receive, in ~~one~~ 1 year, a committed effective dose equivalent in excess of 0.1 rem (1 mSv); and
    - (c) Declared pregnant women likely to receive, during the entire pregnancy, a committed effective dose equivalent in excess of 0.1 rem (1 mSv).

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-72~~ 0400-20-05-72 through ~~4200-02-05-79~~ 0400-20-05-79 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-80~~ 0400-20-05-80 Control of Access to High Radiation Area Requirements.

- (1) The licensee or registrant shall ensure that each access to a high radiation area has one or more of the following control features:
  - (a) A device that, upon an attempt at entry and before any opening into the area occurs, reduces the level of radiation. Before an opening occurs the level of radiation shall be below that at which an individual could receive a deep-dose equivalent of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the source of radiation or any surface that the radiation penetrates;
  - (b) A device that emits a conspicuously visible or audible alarm so the individual entering the high radiation area and the supervisor of the activity are made aware of the entry; or
  - (c) Locked entryways, except when access to the area is required, with positive control over each individual entry.
- (2) In the case of a high radiation area established for a period of 30 days or less, the licensee or registrant may substitute continuous direct or electronic surveillance to prevent unauthorized entry for the controls required in paragraph (1) of this rule.
- (3) A licensee or registrant may apply to the Division for approval of alternative methods for controlling access to high radiation areas.
- (4) No control required by paragraphs (1) through (3) of this rule shall prevent individuals from leaving a high radiation area.
- (5) Control is not required for each entrance or access point to a room or other area that is a high radiation area solely because of the presence of radioactive materials prepared for transport and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation provided that:
  - (a) The packages do not remain in the area longer than 3 days; and
  - (b) The dose rate at 1 meter from the external surface of any package does not exceed 0.01 rem (0.1 mSv) per hour.
- (6) Control of areas in hospitals is not required solely because of the presence of patients containing

<sup>2</sup> All of the occupational doses in ~~4200-02-05-50~~ Rule 0400-20-05-50 continue to be applicable to the declared pregnant woman as long as the embryo/fetus dose equivalent limit is not exceeded.

radioactive material, provided:

- (a) There are personnel in attendance who will take necessary precautions to prevent exposure of individuals to radiation or radioactive material in excess of the limits in these standards; and
- (b) The licensee operates within the ALARA provisions of its radiation protection program.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.84~~ 0400-20-05-.81 Control of Access to Very High Radiation Areas.

In addition to the requirements in ~~4200-02-05-.80~~ Rule 0400-20-05-.80, the licensee or registrant shall institute additional measures to ensure that an individual is not able to gain unauthorized or inadvertent access to areas in which radiation levels could be encountered at 500 rads (5 grays) or more in 1 hour at 1 meter from a source of radiation or any surface through which the radiation penetrates.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.82~~ 0400-20-05-.82 Control of Access to Very High Radiation Areas - Irradiators.

- (1) Each area in which there may exist radiation levels in excess of 500 rads (5 grays) in 1 hour at 1 meter from a radiation source<sup>3</sup> that is used to irradiate materials shall meet the following requirements:
  - (a) At least one authorized person who is familiar with the activity of the facility and is prepared to render or summon assistance shall be physically present when radiation is produced.
  - (b) Each installation shall have primary barriers and/or secondary barriers sufficient to assure compliance with Rules ~~4200-02-05-.50~~ 0400-20-05-.50, ~~4200-02-05-.55~~ 0400-20-05-.55, ~~4200-02-05-.56~~ 0400-20-05-.56 and ~~4200-02-05-.60~~ 0400-20-05-.60 of these standards.
  - (c) Each irradiation area shall be constructed so that persons within the area shall at all times be able to leave. Access control devices required by ~~4200-02-05-.82(1)~~ parts (h)2 through 4 of this paragraph shall not prevent an individual from leaving the area.
  - (d) Devices and administrative procedures shall control each area to ensure that the area is clear of individuals prior to irradiation.
  - (e) After any use of the radiation source and prior to the first individual's entry into the area, the area shall be surveyed to ensure that the radiation level in the area from the radiation source is below that at which an individual could receive a deep-dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour.
  - (f) Control Panel:
    - 1. Only the operator at the control panel shall be able to activate an irradiator to create a radiation field in any area.
    - 2. The irradiator control panel shall be provided with a locking device to prevent unauthorized use. The locking device shall, when locked, make the irradiator incapable of creating a radiation field.
    - 3. The control panel and each entrance to an irradiation area shall have a device that gives a continuous indication of the radiation levels present in the area(s).
    - 4. All meters and controls on the irradiator control panel shall be identified and discernible.
    - 5. The operator shall have at the control panel a copy of operating and emergency

<sup>3</sup> This rule applies to radiation from radiation sources that are used in non-self-shielded configuration. This rule does not apply to sources of radiation 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 equipment, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual.

procedures specific for that facility.

(g) Warning Devices:

1. Each area shall have devices that automatically generate conspicuously visible and audible alarm signals for at least five (5) seconds before irradiation begins. Following activation of these warning devices, there shall be a delay of not less than thirty (30) seconds before the irradiation may begin. The alarm signals shall be discernible in all irradiation areas. The alarm signals shall be sufficient to alert personnel in the area and to allow any individual in the area to reach and to operate the clearly identified emergency shut-off switches required in ~~4200-02-05-82(1)~~ part (h)1 of this paragraph
2. Each area shall have visible flashing or rotating warning lights that operate when, and only when, radiation is being produced. Each entrance shall have a visible warning device that need not be flashing or rotating, but which operates when, and only when, radiation is being produced.

(h) Control Devices:

1. Each area shall contain accessible emergency shut-off switches. Operation of an emergency shut-off switch shall prevent irradiation from occurring. These switches and their mode of operation shall be identified by a conspicuously posted sign adjacent to each switch. Shut-off switches shall include a manual reset at each switch that must be reset at the switch before the irradiator may be reactivated by the operator at the control panel.
2. Each entrance or access point shall be equipped with interlocks. When any interlock is interrupted, broken, or tripped and before any opening into the area occurs, either:
  - (i) The irradiator shall shut off automatically; or
  - (ii) The radiation level within the area from the radiation source shall be reduced below that at which an individual could receive a deep-dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour.

After shut-off or reduction in output, restoring the irradiator to full operation shall be possible only from the control panel.

3. Additional control devices shall be provided so that, upon failure of the interlocks to function as required by ~~4200-02-05-82(1)(h)~~ part 2 of this subparagraph:
  - (i) The radiation level within the area from the radiation source shall be reduced below that at which an individual could receive a deep-dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour; and
  - (ii) Conspicuously visible and audible alarm signals shall be generated that make the following persons aware of the hazard and of the failure of the interlocks:
    - (I) Any individual attempting to enter the area; and
    - (II) The individual required to be present in subparagraph (4)(a) of this rule paragraph.
4. Interlocks shall not be used to shut off the irradiator except in an emergency or during testing.
5. Interlocks shall be bypassed only to test, adjust, maintain, and/or rearrange equipment. A conspicuous indication of the bypassed condition shall be made at the control panel. This subparagraph does not authorize the operation of an irradiator with warning devices, interlocks, emergency shut-off switches or other control devices that are incapable of proper operation.

6. Activities in which interlocks are bypassed as permitted under ~~1200-02-05-82(1)(h)~~ part 5 of this subparagraph shall be:
- (i) Authorized only by the radiation safety officer;
  - (ii) Performed only for a specified time;
  - (iii) Recorded, showing:
    - (I) Date,
    - (II) Length of time bypassed,
    - (III) Reason for bypassing, and
    - (IV) Signature of the individual installing and removing the bypass.

These records shall be maintained for inspection by the Division; and
  - (iv) Performed at low power and current, if possible.
7. No individual shall be permitted to enter an area, the access of which is controlled by interlocks, while such interlocks are bypassed as permitted in ~~1200-02-05-82(1)(h)~~ part 5 of this subparagraph, unless such individual is utilizing personnel monitoring equipment that shall give an audible indication when a dose rate of 0.015 rem (0.15 mSv) per hour is exceeded. The personnel monitoring equipment referred to in this ~~paragraph~~ part is in addition to that required elsewhere in these standards. Calibration requirements in ~~1200-02-05-70 paragraph (2)~~ of Rule 0400-20-05-70 shall also apply to such personnel monitoring equipment.
8. The licensee or registrant shall provide control devices so that, upon failure or removal of physical radiation barriers other than a sealed source's shielded storage container:
- (i) The radiation level within the area from the radiation source shall be reduced below that at which an individual could receive a deep-dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour; and
  - (ii) Conspicuously visible and audible alarm signals shall be generated that make the following persons aware of the hazard and of the failure or removal of the physical barrier:
    - (I) Any individual attempting to enter the area; and
    - (II) The individual required to be present in subparagraph (1)(a) of this ~~rule~~ paragraph.
9. When the shield for the stored sealed source(s) is a liquid, the licensee shall provide means to monitor the integrity of the shield and to signal, automatically, loss of adequate shielding.
10. Physical radiation barriers that comprise permanent structural components, such as walls, which have no credible probability of failure or removal in ordinary circumstances need not meet the requirements of ~~(1)(h)~~ part 8 of this ~~rule~~ subparagraph.
- (i) There shall be available at each facility portable radiation monitoring equipment that is operable and has been calibrated for the radiations being produced by the facility. Such equipment shall be tested for operation and calibrated at intervals not to exceed ~~three~~ 3 months and after each instrument servicing or repair. A note shall be attached to each instrument showing the latest calibration date. Records of calibration shall be maintained for inspection by the Division.

- (j) The interlock and emergency shut-off systems required in subparagraph (4)(h) of this ~~rule~~ paragraph shall be separate electrical circuits and/or mechanical systems.
- (k) Electrical circuit diagrams of the irradiator and the associated interlock and emergency shut-off systems shall be kept current and on file at each irradiator facility.
- (l) The access control and warning devices required in ~~4200-02-05-.82(4)~~ subparagraphs (g) and (h) of this paragraph shall have been tested for proper functioning (see ~~4200-02-05-.138~~ Rule 0400-20-05-.138 for recordkeeping requirements).
  - 1. Unless irradiation was continued uninterrupted from the previous day, testing shall be conducted prior to daily initiation of irradiation;
  - 2. After any unintended interruption, testing shall be conducted prior to resumption of irradiation; and
  - 3. The licensee or registrant shall submit and adhere to a schedule for periodic tests of the access control and warning systems.
- (m) The licensee or registrant shall not conduct operations, other than those necessary to place the radiation source in safe condition or to effect repairs on controls, unless control and warning devices are functioning properly.
- (n) Portals used in transporting only materials to and from the irradiation area shall be controlled by devices and administrative procedures that warn and physically protect individuals from inadvertent entry. Exit portals shall be equipped to:
  - 1. Detect and signal the presence of any loose radiation sources being carried toward such an exit; and
  - 2. Automatically prevent loose radiation sources from being carried out of the area.
- (o) Licensees, registrants or applicants may apply to the Division for approval of alternative safety measures for irradiators, provided:
  - 1. The irradiator is within the purview of this rule;
  - 2. The irradiator will be used in a variety of positions or locations (such as open fields or forests) that make it impractical to comply with certain requirements of subparagraph (4)(h) of this ~~rule~~ paragraph (such as automatic control of radiation levels);
  - 3. Any alternative safety measures shall provide a degree of personnel protection at least equivalent to those specified in this rule;
  - 4. At least one of the alternative measures shall include an access-preventing interlock control based on a measurement of the radiation. This interlock control shall ensure that no individual can gain access to the area in which an individual could receive a deep-dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or any surface that the radiation penetrates.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.83~~ 0400-20-05-.83 through ~~4200-02-05-.89~~ 0400-20-05-.89 Reserved.

~~4200-02-05-.90~~ 0400-20-05-.90 Use of Process or Other Engineering Controls.

The licensee shall use, to the extent practicable, process or other engineering controls (e.g., containment, decontamination or ventilation) to control the concentrations of radioactive material in air.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.91~~ 0400-20-05-.91 Use of Other Controls.

- (1) The licensee shall maintain the total effective dose equivalent ALARA by limiting intakes and increased monitoring if process or other engineering controls are not practical to control airborne radioactive materials concentration below those contained in the definition of airborne radioactivity area in ~~4200-02-05-.32~~ Rule 0400-20-05-.32. The limitation of intakes and increased monitoring shall be by one or more of the following means:
  - (a) Control of access;
  - (b) Limitation of exposure times;
  - (c) Use of respiratory protection equipment; or
  - (d) Other mechanisms specifically approved by the Division.
- (2) If the licensee performs an ALARA analysis to determine whether respirators should be used, the licensee may consider safety factors other than radiological factors. The licensee should also consider the impact of respirator use on workers' industrial health and safety.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.92~~ 0400-20-05-.92 Use of Individual Respiratory Protection Equipment.

- (1) If the licensee assigns or permits the use of respiratory protection equipment to limit intakes pursuant to ~~4200-02-05-.91~~ Rule 0400-20-05-.91:
  - (a) The licensee shall use only respiratory protection equipment that is tested and certified or had certification extended by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA), except as otherwise noted in this chapter.
  - (b) A licensee desiring to use equipment that has not been tested or certified by NIOSH, or for which there is no schedule for testing or certification, shall apply for authorization except as provided in this chapter. The application shall demonstrate by licensee testing or on the basis of reliable test information, that the equipment's material and performance characteristics provide protection equivalent to that of the equipment in subparagraph (1)(a) of this ~~rule~~ paragraph under anticipated conditions of use.
  - (c) The licensee shall implement and maintain a respiratory protection program that includes:
    1. Air sampling sufficient to identify the potential hazard, permit proper equipment selection and estimate doses;
    2. Surveys and bioassays, as appropriate, to evaluate actual intakes;
    3. Testing of respirators for operability (user seal check for face sealing devices and functional check for other) immediately before each use;
    4. Written procedures regarding:
      - (i) The routine, non-routine and emergency use of respirators,
      - (ii) Respirator selection,
      - (iii) Fit testing,
      - (iv) Limitations on periods of respirator use and relief from respirator use,
      - (v) Storage, issuance, maintenance, repair, testing and quality assurance of respiratory protection equipment, including testing for operability immediately before each use;

- (vi) Supervision and training of respirator users;
  - (vii) Monitoring, including air sampling and bioassays;
  - (viii) Breathing air quality;
  - (ix) Inventory and control;
  - (x) Record keeping; and
  - (xi) The use of process or other engineering controls, instead of respirators;
5. Determination by a physician that the individual user is medically fit to use the respiratory protection equipment before:
- (i) The initial fitting of a face-sealing respirator;
  - (ii) The first field use of non-face-sealing respirators; and
  - (iii) Either every 12 months thereafter or periodically at a frequency determined by a physician;
6. Fit testing, with fit factor  $\geq 10$  times the APF for negative pressure devices, and a fit factor  $\geq 500$  for any positive pressure, continuous flow, and pressure-demand devices, before the first field use of tight fitting, face-sealing respirators and periodically thereafter at a frequency not to exceed 1 year. Fit testing must be performed with the facepiece operating in the negative pressure mode.
- (d) The licensee shall advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions or any other conditions that might require such relief.
  - (e) The licensee's use of the equipment shall not exceed the equipment's specifications. The licensee shall provide proper visual, communication and other special capabilities (such as adequate skin protection) when needed.
  - (f) The licensee shall also consider limitations appropriate to the type and mode of use. When selecting respiratory devices the licensee shall provide for vision correction, adequate communication, low temperature work environments and the concurrent use of other safety or radiological protection equipment. The licensee shall use equipment in such a way as not to interfere with the proper operation of the respirator.
  - (g) Standby rescue persons are required whenever one-piece atmosphere-supplying suits, or any combination of supplied air respiratory protection device and personnel protective equipment are used from which an unaided individual would have difficulty extricating himself or herself. The standby persons shall be equipped with respiratory protection devices or other apparatus appropriate for the potential hazards. The standby rescue persons shall observe or otherwise maintain continuous communication with the workers (visual, voice, signal line, telephone, radio, or other suitable means), and be immediately available to assist them in case of a failure of the air supply or for any other reason that requires relief from distress. A sufficient number of standby rescue persons shall be immediately available to assist all users of this type of equipment and to provide effective emergency rescue if needed.
  - (h) Atmosphere-supplying respirators shall be supplied with respirable air of grade D quality or better as defined by the Compressed Gas Association in publication G-7.1, "Commodity Specification for Air," 1997 and included in the regulations of the Occupational Safety and Health Administration (29 CFR 1910.134(i)(1)(ii)(A) through (E). Grade D quality air criteria include:
    - 1. Oxygen content (v/v) of 19.5-23.5%;

2. Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
  3. Carbon monoxide (CO) content of 10 ppm or less;
  4. Carbon dioxide content of 1,000 ppm or less; and
  5. Lack of noticeable odor.
- (i) The licensee shall ensure that no objects, materials or substances, such as facial hair, or any conditions that interfere with the face -- facepiece seal or valve function, and that are under the control of the respirator wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator facepiece.
- (j) In estimating the dose to individuals from intake of airborne radioactive materials, the concentration of radioactive material in the air that is inhaled when respirators are worn is initially assumed to be the ambient concentration in air without respiratory protection, divided by the assigned protection factor. If the dose is later found to be greater than the estimated dose, the corrected value shall be used. If the dose is later found to be less than the estimated dose, the corrected value may be used.
- (2) In estimating an individual's exposure to airborne radioactive materials, the licensee may make allowance for respiratory protection equipment used to limit intakes pursuant to ~~4200-02-05-.94~~ Rule 0400-20-05-.91. To make such an allowance the following conditions, in addition to those in ~~4200-02-05-.92~~ paragraph (1) of this rule shall be satisfied:
- (a) The licensee selects respiratory protection equipment that provides a protection factor (see Schedule RHS 8-32) greater than the multiple by which peak concentrations of airborne radioactive materials in the working area are expected to exceed the values specified in Schedule RHS 8-30, Table 1, Column 3. If the selection of a respiratory protection device with a protection factor greater than the peak concentrations is inconsistent with the goal specified in ~~4200-02-05-.94~~ Rule 0400-20-05-.91 of keeping the total effective dose equivalent ALARA, the licensee may select respiratory protection equipment with a lower protection factor only if such a selection would result in keeping the total effective dose equivalent ALARA. The concentration of radioactive material inhaled when respirators are used may be initially estimated by dividing the average concentration in air, during each period of uninterrupted respirator use, by the protection factor. If the exposure is later found to exceed the estimate, the corrected value shall be used; if the exposure is later found to be less than the estimate, the corrected value may be used.
- (b) The licensee shall obtain authorization from the Division before assigning respiratory protection factors in excess of those specified in Schedule RHS 8-32. The Division may authorize a licensee to use higher protection factors on receipt of an application that:
1. Describes the situation for which a need exists for higher protection factors; and
  2. Demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.
- (c) The licensee shall use as emergency devices only respiratory protection equipment that has been specifically certified or had certification extended for emergency use by NIOSH/MSHA.
- (d) The licensee shall notify, in writing, the Division at least 30 days before the date that respiratory protection equipment is first used under the provisions of either ~~4200-02-05-.92~~ paragraph (1) or (2) of this rule.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.93~~ 0400-20-05-.93 Further Restrictions on the Use of Respiratory Protection Equipment.

- (1) The Division may impose restrictions in addition to those in ~~4200-02-05-.91, 4200-02-05-.92~~ Rules 0400-20-05-.91 and 0400-20-05-.92 and in Schedule RHS 8-32 to:

- (a) Ensure that the respiratory protection program of the licensee is adequate to limit doses of individuals from intakes of airborne radioactive materials consistent with maintaining total effective dose equivalent ALARA; and
- (b) Limit the extent to which a licensee may use respiratory protection equipment instead of process or other engineering controls.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.94~~ 0400-20-05-.94 Application for Use of Higher Assigned Protection Factors.

- (1) The licensee shall obtain authorization from the Division before using assigned respiratory protection factors in excess of those specified in Schedule RHS 8-32. The Division may authorize a licensee to use higher protection factors on receipt of an application that:
  - (a) Describes the situation for which a need exists for higher protection factors; and
  - (b) Demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.
- (2) Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.95~~ 0400-20-05-.95 through ~~1200-02-05-.99~~ 0400-20-05-.99 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.100~~ 0400-20-05-.100 Security of Stored Material.

The licensee or registrant shall secure stored radiation sources against unauthorized access or removal.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.104~~ 0400-20-05-.101 Control of Material Not in Storage.

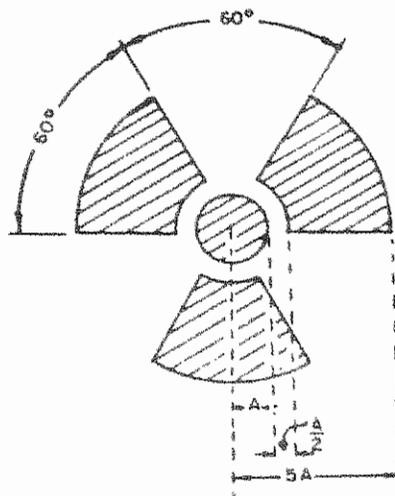
The licensee shall control and maintain constant surveillance of radioactive material that is not in storage.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.102~~ 0400-20-05-.102 through ~~1200-02-05-.109~~ 0400-20-05-.109 Reserved.

~~1200-02-05-.110~~ 0400-20-05-.110 Caution Signs.

- (1) Unless otherwise authorized by the Division, the standard radiation symbol prescribed by this Chapter shall use the colors magenta, or purple, or black on yellow background. The symbol prescribed by this chapter is the three-bladed design:



RADIATION SYMBOL

- (a) Cross-hatched area is to be magenta, or purple, or black; and
  - (b) The background is to be yellow.
- (2) The color requirements of paragraph (1) of this rule do not apply to licensees and registrants who use conspicuously etched or stamped radiation symbols to label sources, source holders or device components containing sources of radiation that are subjected to high temperatures.
  - (3) On or near the required signs and labels, the licensee or registrant may provide additional information to make individuals aware of potential radiation exposures and to minimize the exposures.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.114~~ 0400-20-05-.111 Posting Requirements.

- (1) The licensee or registrant shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA."
- (2) The licensee or registrant shall post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA."
- (3) The licensee or registrant shall post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA."
- (4) The licensee shall post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA."
- (5) Each area where radioactive material is used or stored in amounts exceeding 10 times that specified in Schedule RHS 8-31 shall be posted by the licensee with conspicuous sign(s) bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."
- (6) A licensee is not required to post caution signs in areas or rooms containing radioactive materials for periods of less than 8 hours, if each of the following conditions is met:
  - (a) The materials are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to radiation or radioactive materials in excess of the limits established in this chapter; and
  - (b) The area or room is subject to the licensee's control.

- (7) Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs pursuant to ~~4200-02-05-.114~~ this rule provided that:
- (a) The patient is being treated with sealed sources or has been treated with unsealed radioactive material in quantities less than 30 millicuries (110 MBq) or the measured dose rate at 1 meter from the patient is less than 0.005 rem (0.05 mSv) per hour; and
  - (b) There are personnel in attendance who will take the necessary precautions to:
    1. Prevent the exposure of individuals to radiation and radioactive material in excess of these Basic Standards; and
    2. Operate within the ALARA provisions of the licensee's radiation protection program.
- (8) 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 at 30 centimeters from the surface of the source container or housing does not exceed 0.005 rem (0.05 mSv) per hour.
- (9) A room containing medical or dental diagnostic x-ray equipment, restricted to use within the room, need not be posted as noted in ~~4200-02-05-.114~~ paragraphs (1) and (2) of this rule provided:
- (a) The registrant exercises control to ensure the patient will be the only person exposed to radiation levels exceeding the limits in these standards; and
  - (b) Each room entrance is identified as an "X-ray Room".
- (10) Provided a room or area is not otherwise required to be posted under paragraphs (1) or (2) of this rule, a room or area will not have to be so posted because mobile or portable medical or dental diagnostic x-ray equipment is intermittently used between rooms and/or areas.
- (11) All radiation machines shall be clearly labeled at the control panel near the switch that energizes the apparatus, and at any remote switch that energize the apparatus, with the words "CAUTION - RADIATION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED" or "DANGER - RADIATION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED"

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.112~~ 0400-20-05-.112 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.113~~ 0400-20-05-.113 Labeling Containers.

- (1) The licensee shall ensure that each container of radioactive material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL." The label shall also provide sufficient information to permit individuals handling, using or in the vicinity of the containers to take precautions to avoid or minimize exposures. Such information may need to include, without limitation, the radionuclide(s) present, an estimate of the quantity of radioactivity, the date for which the activity is estimated, radiation levels, the kinds of material and the mass enrichment.
- (2) Prior to removal or disposal of empty uncontaminated containers to unrestricted areas, the licensee shall:
  - (a) Remove or deface the radioactive material label; or
  - (b) Otherwise clearly indicate that the container no longer contains radioactive materials.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.114~~ 0400-20-05-.114 Exemptions To Labeling Requirements.

- (1) A licensee is not required to label:
  - (a) Containers holding radioactive material in quantities less than the quantities listed in Schedule RHS 8-31;
  - (b) Containers holding radioactive material in concentrations less than those specified in Table 2 of Schedule RHS 8-30;
  - (c) Containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by this chapter;
  - (d) Containers when they are in transport and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation<sup>4</sup>;
  - (e) Containers that are accessible only to individuals authorized to handle, use or be in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record. Examples of containers of this type are containers in locations such as water-filled canals, storage vaults or hot cells. The record shall be retained as long as the containers are in use for the purpose indicated on the record; or
  - (f) Installed manufacturing or process equipment, such as reactor components, piping, and tanks.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.115~~ 0400-20-05-.115 Procedures for Receiving and Opening Packages.

- (1) Each licensee who expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, as defined in ~~subparagraph 1200-02-04-.04(1)(iii)~~ Rule 0400-20-04-.04, shall arrange to receive:
  - (a) The package when the carrier offers it for delivery; or
  - (b) Notification of the arrival of the package at the carrier's terminal and to take possession of the package expeditiously.
- (2) Each licensee shall:
  - (a) Monitor the external surfaces of a labeled<sup>5</sup> package for radioactive contamination unless the package contains only radioactive material in the form of a gas or in special form as defined in ~~subparagraph 1200-02-04-.04(1)(bbb)~~ Rule 0400-20-04-.04;
  - (b) Monitor the external surfaces of a labeled package for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity, as defined in ~~subparagraph 1200-02-04-.04(1)(iii)~~ Rule 0400-20-04-.04 and Rule ~~1200-02-10-.37~~ 0400-20-10-.37, Schedule RHS 10-6; and
  - (c) Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet or damaged.
- (3) The licensee shall monitor as soon as practical after receipt of the package. A package received at the licensee's facility during the licensee's normal working hours or showing evidence of package degradation shall be monitored within ~~three~~ 3 hours. A package not received during the licensee's normal working hours and not showing evidence of package degradation shall be monitored no later than ~~three~~ 3 hours after the beginning of the next working day.

<sup>4</sup> Labeling of packages containing radioactive materials is required by the U.S. Department of Transportation (DOT) if the amount and type of radioactive material exceeds the limits for an excepted quantity or article as defined and limited by DOT regulations 49 C.F.R. 173.403 (m) and (w) and 173.421-424.

<sup>5</sup> Labeled means labeled with a Radioactive White I, Yellow II or Yellow III label as specified in U.S. Department of Transportation (DOT) regulations in 49 CFR §§172.403 and 172.436-440, as published October 1, 1993.

(4) The licensee shall immediately notify the final delivery carrier and the Division by telephone, telegram, mailgram or facsimile when either removable radioactive surface contamination or external radiation levels exceed the following:

(a) Removable radioactive surface contamination limits:

1. The level of removable (non-fixed) radioactive contamination on the external surfaces of each package offered for transport shall be kept ALARA. The level of removable radioactive contamination may be determined by wiping an area of 300 square centimeters of the surface concerned with an absorbent material, using moderate pressure, and measuring the activity on the wiping material. Sufficient measurements shall be taken in the most appropriate locations to yield a representative assessment of the removable contamination levels. Except as provided in part ~~4200-02-05-115(4)(a)~~ 2 of this subparagraph, the amount of radioactivity measured on any single wiping material, when averaged over the surface wiped, shall not exceed the limits set forth in Table RHS 5-3 at any time during transport. Other methods of assessment of equal or greater efficiency may be used. When other methods are used, the detection efficiency of the method used shall be taken into account and in no case shall the removable contamination on the external surfaces of the package exceed ~~ten~~ 10 times the limits set forth in Table RHS 5-3.

Table RHS 5-3 REMOVABLE EXTERNAL RADIOACTIVE CONTAMINATION WIPE LIMITS

Contaminant	Maximum Permissible Limits		
	Bq/cm <sup>2</sup>	μCi/cm <sup>2</sup>	dpm/cm <sup>2</sup>
Beta and gamma emitters and low toxicity alpha emitters; all radionuclides with half-lives less than 10 days; natural uranium; natural thorium; uranium-235; uranium-238; thorium-232; thorium-228; and thorium-230 when contained in ores or physical concentrates	0.37	1 (E-5)	22
All other alpha emitting radionuclides	0.037	1 (E-6)	2.2

2. For packages transported as exclusive use shipments by rail or highway only, the removable contamination at any time during transport shall not exceed ~~ten~~ 10 times the levels prescribed in Table RHS 5-1. The levels at the beginning of transport shall not exceed the levels prescribed in Table RHS 5-1.

(b) External radiation limits:

1. The external radiation levels around the package and around the vehicle, if applicable, shall not exceed 200 millirems (2 millisieverts) per hour at any point on the external surface of the package at any time during transportation. The transport index shall not exceed 10.
2. A package that exceeds the radiation level limits specified in part ~~4200-02-05-115(4)(b)~~ 1 of this subparagraph shall be transported as exclusive use by rail, highway, or water, and the radiation levels external to the package shall not exceed the following during transportation:
  - (i) 200 millirems (2 millisieverts) per hour on the accessible external surface of the package, unless the following conditions are met, in which case the limit is 1,000 millirems (10 millisieverts) per hour:
    - (I) The shipment is made in a closed transport vehicle;
    - (II) The package is secured within the vehicle so that its position remains

fixed during transportation; and

- (III) There are no loading or unloading operations between the beginning and end of the transportation;
  - (ii) ~~Two hundred~~ 200 millirems (2 millisieverts) per hour at any point on the outer surface of the vehicle, including the top and underside of the vehicle, or in the case of a flat-bed style vehicle, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load, or enclosure, if used, and on the lower external surface of the vehicle; and
  - (iii) ~~Ten~~ 10 millirems (0.1 millisievert) per hour at any point 2 meters (6.6 feet) from the outer lateral surfaces of the vehicle (excluding the top and underside of the vehicle); or in the case of a flat-bed style vehicle, at any point 2 meters from the vertical planes projected from the outer edges of the vehicle (excluding the top and underside of the vehicle); and
  - (iv) ~~Two~~ 2 millirems (0.02 millisievert) per hour in any normally-occupied space of the vehicle, except that this provision does not apply to private motor carriers if persons occupying these spaces wear radiation monitoring devices in accordance with Rule ~~4200-02-05-.74~~ 0400-20-05-.71.
- (5) Each licensee shall:
- (a) Establish, maintain and retain written procedures for safely opening packages in which radioactive material is received; and
  - (b) Ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.
- (6) Licensees transferring special form sources to or from a work site in licensee owned or operated vehicles are exempt from the contamination monitoring requirements of paragraph (2) of this rule. Licensees are not exempt from the requirement in paragraph (2) of this rule for surveying radiation levels to ensure that the source is still properly secured in its shield.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.116~~ 0400-20-05-.116 through ~~4200-02-05-.119~~ 0400-20-05-.119 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.120~~ 0400-20-05-.120 General Disposal Requirements.

- (1) A licensee shall dispose of radioactive material only:
- (a) By transfer to an authorized recipient as provided in other chapters of these regulations;
  - (b) By decay in storage;
  - (c) By release in effluents within the limits in ~~4200-02-05-.60~~ Rule 0400-20-05-.60, or
  - (d) As authorized under ~~4200-02-05-.124~~ Rule 0400-20-05-.121, ~~4200-02-05-.122~~ 0400-20-05-.122, ~~4200-02-05-.123~~ 0400-20-05-.123, ~~4200-02-05-.124~~ 0400-20-05-.124 or ~~4200-02-05-.127~~ 0400-20-05-.127.
- (2) A person shall be specifically licensed to receive waste containing licensed material from other persons for:
- (a) Treatment prior to disposal;
  - (b) Treatment or disposal by incineration;

- (c) Decay in storage; or
- (d) Disposal at a land disposal facility licensed under Chapter ~~1200-02-11~~ 0400-20-11.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.121~~ 0400-20-05-.121 Method for Granting Approval of Alternative Disposal Procedures.

- (1) A licensee or applicant for a license may apply to the Division for approval of alternative procedures for disposal of radioactive material generated in the licensee's activities. Each application shall include:
  - (a) A description of the waste that contains the radioactive material to be disposed, including the physical and chemical properties important to risk evaluation;
  - (b) The proposed manner and conditions of waste disposal;
  - (c) An analysis and evaluation of pertinent information about the environment of the disposal site;
  - (d) The nature and location of other potentially affected licensed and unlicensed facilities; and
  - (e) Analyses and procedures to ensure that doses are maintained ALARA and within the dose limits in this chapter.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.122~~ 0400-20-05-.122 Disposal by Release into Sanitary Sewerage.

- (1) A licensee may release radioactive material into sanitary sewerage if each of the following conditions is satisfied:
  - (a) The material is readily soluble in water or is a readily dispersible biological material; and
  - (b) The quantity of radioactive material the licensee releases into the sewer in any one month divided by the average monthly volume of water released into the sewer by the licensee does not exceed the concentration listed in Table III of Schedule RHS 8-30; and
  - (c) If more than one radionuclide is released, the following conditions shall also be satisfied:
    - 1. The license shall determine the fraction of the limit in Table III of Schedule RHS 8-30 represented by its releases into sanitary sewerage. This shall be done by dividing the actual monthly average concentration of each radionuclide released by the licensee into the sewer by the concentration of that radionuclide listed in Table III of Schedule RHS 8-30; and
    - 2. The sum of the fractions for each radionuclide required by ~~(1)(c)~~ part 1 of this ~~rule~~ subparagraph does not exceed unity; and
  - (d) The total quantity of licensed and other radioactive material that the licensee releases into the sanitary sewerage system in a year does not exceed:
    - 1. 5 curies (185 GBq) of hydrogen-3;
    - 2. 1 curie (37 GBq) of carbon-14; and
    - 3. 1 curie (37 GBq) of all other radioactive materials combined.
- (2) Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limitations contained in paragraph (1) of this rule.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.123~~ 0400-20-05-.123 Treatment or Disposal by Incineration.

A licensee may treat or dispose of radioactive material by incineration only in the amounts and forms specified in ~~1200-02-05-.124~~ Rule 0400-20-05-.124 or as specifically approved by the Division pursuant to ~~1200-02-05-.124~~ Rule 0400-20-05-.121.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.124~~ 0400-20-05-.124 Disposal of Specific Wastes.

- (1) A licensee may dispose of the following radioactive material as if it were not radioactive:
  - (a) 0.05 microcurie (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting; and
  - (b) 0.05 microcurie (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of animal tissue, averaged over the weight of the entire animal.
- (2) A licensee may not dispose of tissue under subparagraph (1)(b) of this rule in a manner that would permit its use either as food for humans or as animal feed.
- (3) The licensee shall maintain records in accordance with ~~1200-02-05-.137~~ Rule 0400-20-05-.137.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.125~~ 0400-20-05-.125 Transfer for Disposal and Manifests.

- (1) This rule and Schedule RHS 8-33 concern low level radioactive waste and are to:
  - (a) Control transfers of low-level radioactive waste by any waste generator, waste collector or waste processor licensee, as defined in Schedule RHS 8-33 of Rule ~~1200-02-05-.161~~ 0400-20-05-.161, who ships low-level waste either directly, or indirectly through a waste collector or waste processor, to a licensed low-level waste land disposal facility as defined in Chapter ~~1200-02-11~~ 0400-20-11.
  - (b) Establish a manifest tracking system; and
  - (c) Supplement existing requirements concerning transfers and recordkeeping for those wastes.
- (2) Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility shall document the information required on U.S. NRC Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee as specified in Section I of Schedule RHS 8-33.
- (3) Each shipment manifest shall include a certification by the waste generator as specified in Section II of Schedule RHS 8-33.
- (4) The waste generator, collector, processor, disposal facility operator, and each person involved in the transfer and disposal shall comply with the requirements specified in Section III of Schedule RHS 8-33.
- (5) Any licensee shipping byproduct material as defined in subparagraphs (c) and (d) of the definition of Byproduct material set forth in Rule ~~1200-02-05-.32(11)~~ 0400-20-05-.32 intended for ultimate disposal at a land disposal facility licensed under Chapter ~~1200-02-11~~ 0400-20-11 shall document the information required on the NRC's Uniform Low-Level Radioactive Waste Manifest and transfer this recorded manifest information to the intended consignee as specified in Schedule RHS 8-33.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.126~~ 0400-20-05-.126 Compliance with Environmental and Health Protection Regulations.

Nothing in these standards relieves the licensee from complying with other federal, state, and local regulations governing toxic or hazardous properties of waste materials.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.127~~ 0400-20-05-.127 Disposal of Certain Byproduct Material

- (1) Licensed material as defined in subparagraphs (c) and (d) of the definition of Byproduct material set forth in Rule ~~4200-02-05-.32(11)~~ 0400-20-05-.32 may be disposed of in accordance with Chapter ~~4200-02-11~~ 0400-20-05, even though it is not defined as low-level radioactive waste. Therefore, any licensed byproduct material being disposed of at a facility, or transferred for ultimate disposal at a facility licensed under Chapter ~~4200-02-11~~ 0400-20-11, must meet the requirements of Rule ~~4200-02-05-.125~~ 0400-20-05-.125.
- (2) A licensee may dispose of byproduct material, as defined in subparagraphs (c) and (d) of the definition of Byproduct material set forth in Rule ~~4200-02-05-.32(11)~~ 0400-20-05-.32, at a disposal facility authorized to dispose of such material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.128~~ 0400-20-05-.128 through ~~4200-02-05-.129~~ 0400-20-05-.129 Reserved.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.130~~ 0400-20-05-.130 General Records Provisions.

- (1) Each licensee and registrant shall use the units: curie, rad, rem, including multiples and subdivisions, and shall clearly indicate the units of all quantities on records required by these standards.
- (2) In the records required by this ~~part~~ chapter, the licensee may record quantities in SI units in parentheses following each of the units specified in paragraph (1) of this rule. However, all quantities must be recorded as stated in paragraph (1) of this rule.
- (3) Notwithstanding the requirements ~~above~~ in paragraph (1) of this rule, when recording information on shipment manifests, as required in paragraph (2) of Rule 1200-02-05-.125 ~~(2)~~, information shall be recorded in the International System of Units (SI) or in SI and units as specified in paragraph (1) of this rule.
- (4) The licensee or registrant shall make a clear distinction among the quantities entered on the records required by this chapter (e.g., total effective dose equivalent, shallow-dose equivalent, lens dose equivalent, deep-dose equivalent, committed effective dose equivalent).

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.131~~ 0400-20-05-.131 Records of Radiation Protection Programs.

- (1) Each licensee and registrant shall maintain records of the radiation protection program, including:
  - (a) The provisions of the program; and
  - (b) Audits and other reviews of program content and implementation.
- (2) The licensee or registrant shall retain the records required by subparagraph (1)(a) of this rule until the Division terminates each pertinent license or registration requiring the record. The licensee or registrant shall retain the records required by subparagraph (1)(b) of this rule for 3 years after the record is made.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.132~~ 0400-20-05-.132 Records of Surveys.

- (1) Each licensee and registrant shall maintain records showing the results of surveys and calibrations required by ~~1200-02-05-70~~ Rule 0400-20-05-70 and ~~1200-02-05-115(2)~~ paragraph (2) of Rule 0400-20-05-115. The licensee or registrant shall retain these records for 3 years after the record is made.
- (2) The licensee or registrant shall retain each of the following records until the Division terminates each pertinent license or registration requiring the record:
  - (a) Survey results used to determine the dose from external sources and to assess individual dose equivalents with or without individual monitoring data;
  - (b) Results of measurements and calculations used to:
    1. Determine individual intakes of radioactive material;
    2. Assess internal intakes of radioactive material; and
    3. Assess internal dose;
  - (c) Results of air sampling, surveys and bioassays required pursuant to ~~1200-02-05-92~~ parts (1)(c)1 and 2 of Rule 0400-20-05-92; and
  - (d) Results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-133~~ 0400-20-05-133 Determination of Prior Occupational Dose.

- (1) For each individual who is likely to receive, in a year, an occupational dose requiring monitoring pursuant to ~~1200-02-05-71~~ Rule 0400-20-05-71, the licensee or registrant shall:
  - (a) Determine the occupational radiation dose received during the current year; and
  - (b) Attempt to obtain the records of lifetime cumulative occupational radiation dose.
- (2) Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant shall determine:
  - (a) The internal and external doses from all previous planned special exposures; and
  - (b) All doses in excess of the limits (including doses received during accidents and emergencies) received during the lifetime of the individual.
- (3) In complying with the requirements of paragraph (1) of this rule, a licensee or registrant may:
  - (a) Accept, as a record of the individual's occupational dose for the current year, a written statement disclosing the nature and the amount of any occupational dose the individual may have received during the current year. Such statement shall be signed by the individual or the individual's most recent employer for work involving radiation exposure.
  - (b) Accept, as the record of lifetime cumulative radiation dose, an up-to-date Form RHS 8-1H, or equivalent. Such form shall be signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure. If the individual is employed by a person other than the licensee or registrant, the countersignature shall be from the current employer.
  - (c) From the most recent employer obtain reports of the individual's dose equivalent(s) for work involving radiation exposure. If the individual is employed by a person other than the licensee or registrant the report shall be from the individual's current employer. Reports may be obtained by telephone, telegram, electronic media or letter. The licensee or registrant shall request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

- (4) The licensee or registrant shall record the exposure history together with all information required by paragraph (1) of this rule on Form RHS 8-1H<sup>6</sup>, or other clear and legible record. The form or record shall show each period in which the individual received occupational exposure and be signed by the individual receiving the exposure.

For each period for which the licensee or registrant obtains reports, the licensee or registrant shall use the dose shown in the report in preparing Form RHS 8-1H. For any period in which the licensee or registrant does not obtain a report, the licensee or registrant shall place a notation on Form RHS 8-1H indicating the periods of time for which data are not available.

- (5) If the licensee or registrant is unable to obtain a complete record of an individual's current and previously accumulated occupational dose, the licensee or registrant shall:
- (a) In establishing administrative controls under ~~1200-02-05-.50~~ paragraph (6) of Rule 0400-20-05-.50 for the current year, reduce the individual's allowable dose limit by 1.25 rems (12.5 mSv) for each quarter for which records were unavailable and the individual could have received occupational exposure; and
  - (b) Not allow the individual to be available for planned special exposures.
- (6) The licensee or registrant shall retain the records on Form RHS 8-1H or equivalent until the Division terminates each pertinent license or registration requiring this record. The licensee or registrant shall retain records used in preparing Form RHS 8-1H for three (3) years after the record is made.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.134~~ 0400-20-05-.134 Records of Planned Special Exposures.

- (1) For each use of the provisions of ~~1200-02-05-.54~~ Rule 0400-20-05-.54 for planned special exposures, the licensee or registrant shall maintain records that describe:
- (a) The exceptional circumstances requiring the use of a planned special exposure;
  - (b) The name of the management official who authorized the planned special exposure and a copy of the signed authorization;
  - (c) What actions were necessary;
  - (d) Why the actions were necessary;
  - (e) How doses were maintained ALARA; and
  - (f) What individual and collective doses were expected to result, and the doses actually received in the planned special exposure.
- (2) The licensee or registrant shall retain the records until the Division terminates each pertinent license or registration requiring these records.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.135~~ 0400-20-05-.135 Records of Individual Monitoring Results.

- (1) Each licensee and registrant shall maintain records of doses received:
- (a) By all individuals for whom monitoring was required pursuant to ~~1200-02-05-.71~~ Rule 0400-20-05-.71 and

---

<sup>6</sup> Licensees or registrants are not required to reevaluate the separate external dose equivalents and internal committed dose equivalents or intakes of radionuclides assessed under ~~1200-02-05-.01~~ through ~~1200-02-05-.28~~. Further, occupational exposure histories obtained and recorded on Form RHS 8-1 before January 1, 1994, would not have included effective dose equivalent, but may be used in the absence of specific information on the intake of radionuclides by the individual.

- (b) During the planned special exposures, accidents and emergency conditions.
- (2) These records shall include,<sup>7</sup> when applicable:
- (a) The deep-dose equivalent to the whole body, lens-dose equivalent, shallow-dose equivalent to the skin and shallow-dose equivalent to the extremities;
  - (b) The estimated intake of radionuclides (see ~~1200-02-05-.51~~ Rule 0400-20-05-.51);
  - (c) The committed effective dose equivalent assigned to the intake of radionuclides;
  - (d) The specific information used to assess the committed effective dose equivalent pursuant to ~~1200-02-05-.53~~ paragraph (3) of Rule 0400-20-05-.53 and when required by ~~1200-02-05-.71~~ Rule 0400-20-05-.71;
  - (e) The total effective dose equivalent when required by ~~1200-02-05-.51~~ Rule 0400-20-05-.51; and
  - (f) The total of the deep-dose equivalent and the committed dose to the organ receiving the highest total dose.
- (3) The licensee or registrant shall make entries of the records specified in paragraph (1) of this rule at least annually.
- (4) The licensee or registrant shall maintain the records:
- (a) On Form RHS 8-2C and in accordance with its instructions, or
  - (b) In clear and legible form containing all information required by Form RHS 8-2C.
- (5) The records required under this rule should be protected from public disclosure because of their personal privacy nature. These records are protected when transferred to the Division under the regulations in ~~1200-02-04-.10~~ Rule 0400-20-04-.10.
- (6) The licensee or registrant shall maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman. The declaration of pregnancy shall also be kept on file, but may be maintained separately from the dose records.
- (7) The licensee or registrant shall retain each required form or record until the Division terminates each pertinent license or registration requiring the record.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.136~~ 0400-20-05-.136 Records of Dose to Individual Members of the Public.

- (1) Each licensee and registrant shall maintain records sufficient to demonstrate compliance with the dose limit for individual members of the public (see ~~1200-02-05-.60~~ Rule 0400-20-05-.60).
- (2) The licensee or registrant shall retain the records required by paragraph (1) of this rule until the Division terminates each pertinent license or registration requiring the record.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~1200-02-05-.137~~ 0400-20-05-.137 Records of Waste Disposal.

- (1) Each licensee shall maintain records of the disposal of radioactive materials made under ~~1200-02-05-.124~~ Rules 0400-20-05-.121, 1200-02-05-.122 0400-20-05-.122, 1200-02-05-.123 0400-20-05-.123, and 1200-02-05-.124 0400-20-05-.124, Chapter ~~1200-02-11~~ 0400-20-11 and disposal by burial in soil,

<sup>7</sup> Assessments of dose equivalent and records made using units in effect before the licensee's or registrant's adoption of ~~1200-02-05-.30~~ Rules 0400-20-05-.30 through ~~1200-02-05-.160~~ 0400-20-05-.160 need not be changed.

including burials authorized before May 12, 1986<sup>8</sup>.

- (2) The licensee shall retain the records required by paragraph (1) of this rule until the Division terminates each pertinent license requiring the record. Requirements for disposition of these records, prior to license termination, are located in ~~4200-02-10-.26~~ Rule 0400-20-10-.26 for activities licensed under these ~~parts~~ rules.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.138~~ 0400-20-05-.138 Records of Testing Entry Control Devices for Very High Radiation Areas.

- (1) Each licensee and registrant shall maintain records of tests made under ~~4200-02-05-.82~~ parts (1)(l)1, 2, and 3 of Rule 0400-20-05-.82 on entry control devices for very high radiation areas. These records shall include the date, time, and results of each such test of function.
- (2) The licensee or registrant shall retain the records required by paragraph (1) of this rule for ~~three~~ 3 years after the record is made.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.139~~ 0400-20-05-.139 Form of Records.

Each record required by this chapter shall remain legible throughout the retention period. The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel. The microform shall be capable of producing a clear copy throughout the retention period. The record may also be stored in electronic media capable of producing legible, accurate, and complete records during the retention period. Records such as letters, drawings, and specifications shall include all pertinent information, such as stamps, initials, and signatures. The licensee or registrant shall maintain adequate safeguards against tampering with and loss of records.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.140~~ 0400-20-05-.140 Reports of Theft or Loss of Licensed Material.

- (1) Telephone reports.
- (a) Each licensee shall report:
1. Immediately after learning of any lost, stolen or missing radioactive material:
    - (i) In an aggregate quantity equal to or greater than 1,000 times the quantity specified in Schedule RHS 8-31; and
    - (ii) Under such circumstances that it appears to the licensee that an exposure could result to persons in unrestricted areas; or
  2. Within 30 days after learning of any lost, stolen or missing radioactive material:
    - (i) In a quantity greater than 10 times the quantity specified in Schedule RHS 8-31; and
    - (ii) That is still missing at this time.
- (b) Reports shall be made to the Division, telephone (615) 532-0364, during the hours of 7:00 a.m. Central Time to 4:30 p.m. Central Time except weekends and holidays. At all other times, reports can be made through the Tennessee Emergency Management Agency (615) 741-0001.
- (2) Written reports

<sup>8</sup> A previous ~~4200-02-05-.19~~ Rule 0400-20-05-.19 permitted burial of small quantities of radioactive materials in soil before May 12, 1986 without specific Division Authorization.  
SS-7039 (July 2010)

- (a) Each licensee required to make a report under paragraph (1) of this rule shall, within 30 days after making the telephone report, make a written report setting forth the following information:
1. A description of the radioactive material involved, including kind, quantity and chemical and physical form;
  2. A description of the circumstances under which the loss, theft or misplacement occurred;
  3. A statement of disposition, or probable disposition, of the radioactive material involved;
  4. Exposures of individuals to radiation and the circumstances under which the exposures occurred;
  5. The possible total effective dose equivalent to persons in unrestricted areas;
  6. Actions that have been taken, or will be taken, to recover the material; and
  7. Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss, theft or misplacement of radioactive material.
- (b) Reports shall be made to the Division of Radiological Health, ~~L&C Annex, 3rd Floor, 401 Church Street, Nashville, TN 37243-1532~~ at the address given in Rule 0400-20-04-.07.
- (3) If after filing the written report, the licensee learns of additional substantive information the licensee shall report such additional information within 30 days.
- (4) Each report filed with the Division shall list for each individual exposed: the name, Social Security account number, and date of birth. The report shall be prepared so that this information is stated in a separate and detachable part.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.141~~ 0400-20-05-.141 Notification of Incidents.

- (1) Immediate notification. Notwithstanding other requirements for notification the requirements of this rule are controlling. Licensees and registrants shall notify the Division as soon as possible but not later than ~~four (4)~~ 4 hours after discovery that a source of radiation possessed by the licensee or registrant has caused, may have caused or threatens to cause any of the following:
- (a) An individual to receive:
1. A total effective dose equivalent of 25 rems (0.25 Sv) or more;
  2. A lens-dose equivalent of 75 rems (0.75 Sv) or more; or
  3. A shallow-dose equivalent to the skin or extremities of 250 rads (2.5 Gy) or more;
- (b) The release of radioactive material that could cause an individual present for 24 hours to receive ~~five (5)~~ 5 times or more the annual occupational limit on intake. This does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or specific process enclosures; or
- (c) Prevention of immediate protective actions necessary to avoid exposure to radiation or releases that could exceed regulatory limits (events may include fires, explosions, toxic gas releases, etc.).
- (2) Twenty-four hour notification. Licensees and registrants shall notify the Division within 24 hours after discovery that a source of radiation possessed by the licensee or registrant may have caused or threatens to cause any of the following:
- (a) An individual to receive, in a period of 24 hours:

1. A total effective dose equivalent exceeding 5 rems (0.05 Sv),
  2. A lens-dose equivalent exceeding 15 rems (0.15 Sv), or
  3. A shallow-dose equivalent to the skin or extremities exceeding 50 rems (0.5 Sv);
- (b) The release of radioactive material that could cause an individual present for 24 hours to receive an intake exceeding one annual occupational limit on intake. This does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or specific process enclosures; or
- (c) Any of the following events involving licensable material:
1. An unplanned contamination event that:
    - (i) Requires restricted access to the contaminated area for more than 24 hours. Restriction may be by imposing additional radiological controls or by prohibiting entry into the area;
    - (ii) Involves a quantity of material greater than five times the lowest annual limit on intake specified for the material in Schedule RHS 8-30 of ~~1200-02-05~~ Rule 0400-20-05-.161; and
    - (iii) Restricts access to the area for a reason other than to allow isotopes with a half-life of less than 24 hours to decay prior to decontamination.
  2. An event in which equipment is disabled or fails to function as designed when:
    - (i) The equipment is required by regulation or license condition to:
      - (I) Prevent releases exceeding regulatory limits,
      - (II) Prevent exposures to radiation exceeding regulatory limits, or
      - (III) Mitigate the consequences of an accident;
    - (ii) The equipment is required to be available and operable when it is disabled or fails to function; and
    - (iii) No equipment meeting the same performance standards is immediately available, operable and capable of performing the required safety function.
  3. An event that requires unplanned medical treatment at a medical facility of an individual with spreadable radioactive contamination on the individual's clothing or body.
  4. An unplanned fire or explosion damaging any licensable material or any device, container or equipment containing licensable material when:
    - (i) The quantity of material involved exceeds five times the lowest annual limit on intake specified for the material in Schedule RHS 8-30 ~~of 1200-02-05~~ in Rule 0400-20-05-.161, and
    - (ii) The damage affects the integrity of the licensable material or any device, container or equipment containing licensable material.
- (3) Preparation and submission of reports. Licensees and registrants shall make reports in response to the requirements of this ~~section~~ rule as follows:
- (a) Licensees and registrants shall make reports required by paragraphs (1) and (2) of this rule by telephone to the Division.

1. The telephone number for the Division is:  
  
(615) 532-0364 7:00 a.m. Central Time to 4:30 p.m. Central Time except weekends and holidays  
  
(615) 741-0001 Tennessee Emergency Management Agency at all other times.
2. To the extent that the information is available at the time of notification, the information provided in these reports shall include:
  - (i) The caller's name and call back telephone number;
  - (ii) A description of the event, including date and time;
  - (iii) The exact location of the event;
  - (iv) The isotopes, quantities, and chemical and physical form of the licensable material involved; and
  - (v) Any personnel radiation exposure data available.

(b) Written report. Licensees and registrants who make a report required by paragraph (1) or (2) of this rule shall submit a written follow-up report within 30 days of the initial report. This requirement may be satisfied by submitting written reports prepared under other regulations that contain all necessary information and are appropriately distributed. Licensees and registrants shall send these written reports to the Division at the address given in ~~4200-02-04-.07~~ Rule 0400-20-04-.07. The reports shall include the following:

1. A description of the event, including the probable cause and the manufacturer and model number (if applicable) of any equipment that failed or malfunctioned;
2. The exact location of the event;
3. The isotopes, quantities, and chemical and physical forms of the licensable material involved;
4. Date and time of the event;
5. Corrective actions taken or planned and the results of any evaluations or assessments; and
6. For each individual exposed:
  - (i) The name, Social Security number and date of birth. The report shall be prepared so that this information is stated in a separate and detachable part, and
  - (ii) The extent of exposure of each individual without identification of individuals by name.

(4) This rule does not include doses that result from, and are within the limits for, planned special exposures reported under ~~4200-02-05-.144~~ Rule 0400-20-05-.144.

Authority: T.C.A. §§ 68-202-201 et seq., and 4-5-201 et seq.

~~4200-02-05-.142~~ 0400-20-05-.142 Reports to Individuals of Exposure to Radiation.

(1) Licensees and registrants shall report radiation exposure data for an individual, including the results of any measurements, analyses and calculations of radioactive material deposited or retained in the body of an individual, as specified in this rule.