641—37.11(136C) Standards for protection against radiation. The provisions in this rule pertaining to radioactive materials are consistent with the requirements of 10 CFR Parts 19 and 20, as incorporated by reference in 641—Chapter 39. Accordingly, the provisions of 641—Chapter 39 apply to corresponding rules and subrules of this chapter. The requirements of this chapter are in addition to, and not in substitution for, any applicable provisions of 641—Chapter 39.

37.11(1) *Implementation of standards for protection against radiation.*

a. Any existing license or registration condition that is more restrictive than this chapter remains in force until there is an amendment or renewal of the license or registration.

b. If a license or registration condition exempts a licensee or registrant from a provision of this chapter in effect on or before January 1, 1994, it also exempts the licensee or registrant from the corresponding provision of this chapter.

c. If a license or registration condition cites provisions of this chapter in effect prior to January 1, 1994, that do not correspond to any provisions of this chapter, the license or registration condition remains in force until there is an amendment or renewal of the license or registration that modifies or removes this condition.

37.11(2) *Radiation protection programs.*

a. Each licensee or registrant shall develop, document, and implement a radiation protection program sufficient to ensure compliance with the provisions of this chapter. Subrule 37.12(3) contains recordkeeping requirements relating to these programs.

b. The licensee or registrant shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and public doses that are ALARA.

c. The licensee or registrant shall, at intervals not to exceed 12 months, review the radiation protection program content and implementation.

d. To implement the ALARA requirements of 641—paragraph 40.4(9)*"b,"* and notwithstanding the requirements in subrule 37.11(12), a constraint on air emissions of radioactive material to the environment, excluding radon-222 and its daughters, shall be established by licensees such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 mSv) per year from these emissions. If a licensee subject to this requirement exceeds this dose constraint, the licensee shall report the exceedance as provided in subrule 37.13(4) and promptly take appropriate corrective action to ensure against recurrence.

e. The licensee or registrant shall, upon discovery of a reportable radiation incident or medical event, as described in this chapter, promptly take appropriate action in accordance with the rules within this chapter.

37.11(3) *Occupational dose limits for adults.*

a. The licensee or registrant shall control the occupational dose to individual adults, except for planned special exposures pursuant to subrule 37.11(8), to the following dose limits:

(1) An annual limit, which is the more limiting of:

1. The total effective dose equivalent being equal to 5 rem (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 being equal to 50 rem (0.5 Sv).

(2) The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities that are:

1. A lens dose equivalent of 15 rem (0.15 Sv), and

2. A shallow dose equivalent of 50 rem (0.5 Sv) to the skin of the whole body or to the skin of any extremity.

b. Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, shall be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime.

c. When the 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 department. The assigned deep

dose equivalent must be for the part of the body receiving the highest exposure. The assigned shallow dose equivalent must be the dose averaged over the contiguous 10 square centimeters of skin receiving the highest exposure. The deep dose equivalent, lens dose equivalent, and shallow dose equivalent may be assessed from surveys or other radiation measurements for the purpose of demonstrating compliance with the occupational dose limits if the individual monitoring device was not in the region of highest potential exposure or the results of individual monitoring are unavailable.

d. Derived air concentration (DAC) and annual limit on intake (ALI) values are presented in Table I of 10 CFR Part 20, Appendix B, and may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits set forth in this chapter.

e. Notwithstanding 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 (footnote 3 of 10 CFR Part 20, Appendix B, contains more information).

f. The licensee or registrant 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 as set forth in this chapter.

37.11(4) *Compliance with requirements for summation of external and internal doses.*

a. Monitor. If the licensee or registrant is required to monitor pursuant to subrule 37.11(14) the licensee or registrant shall demonstrate compliance with the dose limits by summing external and internal doses. If the licensee or registrant is required to monitor only pursuant to subparagraph 37.11(14)*"a"*(1), or only pursuant to subparagraph 37.11(14)*"a"*(2), then summation is not required to demonstrate compliance with the dose limits. The licensee or registrant may demonstrate compliance with the requirements for summation of external and internal doses pursuant to subrule 37.11(4). 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.

b. 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:

(1) The sum of the fractions of the inhalation ALI for each radionuclide, or

(2) The total number of derived air concentration-hours (DAC-hours) for all radionuclides divided by 2,000; or

(3) The sum of the calculated committed effective dose equivalents to all significantly irradiated organs or tissues (T) calculated from bioassay data using appropriate biological models and expressed as a fraction of the annual limit. For purposes of this requirement, an organ or tissue is deemed to be significantly irradiated if, for that organ or tissue, the product of the weighting factors (wT) and the committed dose equivalent (HT,50) per unit intake is greater than 10 percent of the maximum weighted value of H50 (wTHT,50) per unit intake for any organ or tissue.

c. Intake by oral ingestion. If the occupationally exposed individual also receives an intake of radionuclides by oral ingestion greater than 10 percent of the applicable oral ALI, the licensee shall account for this intake and include it in demonstrating compliance with the limits.

d. Intake through wounds or absorption through skin. The licensee shall evaluate and, to the extent practical, account for intakes through wounds or skin absorption. The intake through intact skin has been included in the calculation of DAC for hydrogen-3 and does not need to be evaluated or accounted for pursuant to subrule 37.11(4).

37.11(5) *Determination of external dose from airborne radioactive material.*

a. Licensees shall, when determining the dose from airborne radioactive material, include the contribution to the deep dose equivalent, lens dose equivalent, and shallow dose equivalent from external exposure to the radioactive cloud (footnotes 1 and 2 of 10 CFR Part 20, Appendix B, contain more information).

b. Airborne radioactivity measurements and DAC values cannot 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 shall be based upon measurements using instruments or individual monitoring devices.

37.11(6) *Determination of internal exposure.*

a. For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee shall, when required pursuant to subrule 37.11(14), take suitable and timely measurements of:

(1) Concentrations of radioactive materials in air in work areas; or

(2) Quantities of radionuclides in the body; or

(3) Quantities of radionuclides excreted from the body; or

(4) Combinations of these measurements.

b. Unless respiratory protective equipment is used, or the assessment of intake is based on bioassays, the licensee shall assume that an individual inhales radioactive material at the airborne concentration in which the individual is present.

c. When specific information on the physical and biochemical properties of the radionuclides taken into the body or the behavior of the material in an individual is known, the licensee may:

(1) 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

(2) Upon prior approval of the department, adjust the DAC or ALI values to reflect the actual physical and chemical characteristics of airborne radioactive material, for example, aerosol size distribution or density; and

(3) Separately assess the contribution of fractional intakes of Class D, W, or Y compounds of a given radionuclide to the committed effective dose equivalent (10 CFR Part 20, Appendix B, contains more information).

d. If the licensee chooses to assess intakes of Class Y material, the licensee may delay the recording and reporting of the assessments for periods up to seven months unless otherwise required by 641—Chapter 39. This delay permits the licensee to make additional measurements basic to the assessments.

e. 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 shall be either:

(1) The sum of the ratios of the concentration to the appropriate DAC value, that is, D, W, or Y, from 10 CFR Part 20, Appendix B, for each radionuclide in the mixture; or

(2) The ratio of the total concentration for all radionuclides in the mixture to the most restrictive DAC value for any radionuclide in the mixture.

f. If the identity of each radionuclide in a mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture shall be the most restrictive DAC of any radionuclide in the mixture.

g. When a mixture of radionuclides in air exists, a licensee may disregard certain radionuclides in the mixture if:

(1) The licensee uses the total activity of the mixture in demonstrating compliance with the dose limits in subrule 37.11(11) and in complying with the monitoring requirements in subrule 37.11(13), and

(2) The concentration of any radionuclide disregarded is less than 10 percent of its DAC, and

(3) The sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 30 percent.

h. When determining the committed effective dose equivalent, the following information may be considered:

(1) In order to calculate the committed effective dose equivalent, the licensee or registrant 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 rem (0.05 Sv) for radionuclides that have their ALIs or DACs based on the committed effective dose equivalent.

(2) For an ALI and the associated DAC determined by the nonstochastic organ dose limit of 50 rem (0.5 Sv), the intake of radionuclides that would result in a committed effective dose equivalent of 5 rem (0.05 Sv), that is, the stochastic ALI, is listed in parentheses in Table I of 10 CFR Part 20, Appendix B. The licensee or registrant may, as a simplifying assumption, use the stochastic ALI to determine committed

effective dose equivalent. However, if the licensee or registrant uses the stochastic ALI, the licensee or registrant shall also demonstrate that the limit in subparagraph 37.11(3)*"a"*(2) is met.

37.11(7) *Determination of prior occupational dose.*

a. For each individual who is likely to receive, in a year, an occupational dose requiring monitoring pursuant to this rule, the licensee or registrant shall:

(1) Determine the occupational radiation dose received during the current year; and

(2) Attempt to obtain the records of lifetime cumulative occupational radiation dose.

b. Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant shall determine:

(1) The internal and external doses from all previous planned special exposures;

(2) All doses in excess of the limits, including doses received during accidents and emergencies, received during the lifetime of the individual; and

(3) All lifetime cumulative occupational radiation dose.

c. In complying with the requirements of subrule 37.11(7), a licensee or registrant may:

(1) Accept, as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's most recent employer for work involving radiation exposure, that discloses the nature and the amount of any occupational dose that the individual received during the current year;

(2) Accept, as the record of lifetime cumulative radiation dose, a form signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant; and

(3) Obtain reports of the individual's dose equivalent from the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant, by telephone, 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.

d. The licensee or registrant shall record the exposure history as required by subrule 37.11(14).

(1) The form or record shall show each period in which the individual received occupational exposure to radiation or radioactive material and shall be signed by the individual who received 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 the exposure history. For any period in which the licensee or registrant does not obtain a report, the licensee or registrant shall place a notation on the report indicating the periods of time for which data are not available.

(2) Licensees or registrants are not required to reevaluate the separate external dose equivalents and internal committed dose equivalents or intakes of radionuclides assessed pursuant to the rules in this chapter in effect on or before January 1, 1994. Further, occupational exposure histories obtained and recorded on or 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.

e. 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 assume:

(1) In establishing administrative controls pursuant to subrule 37.11(3) for the current year, that the allowable dose limit for the individual is reduced by 1.25 rem (12.5 mSv) for each quarter for which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure; and

(2) That the individual is not available for planned special exposures.

f. The licensee or registrant shall retain the records in subrule 37.11(6) until the department terminates each pertinent license or registration requiring this record. The licensee or registrant shall retain records used in preparing any record for subrule 37.11(7) for three years after the record is made.

37.11(8) *Planned special exposures.* A licensee or registrant may authorize an adult worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in subrule 37.11(8) provided that each of the following conditions is satisfied:

a. 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.

b. The licensee or registrant, and employer if the employer is not the licensee or registrant, specifically authorizes the planned special exposure, in writing, before the exposure occurs.

c. Before a planned special exposure, the licensee or registrant ensures that each individual involved is:

(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.

d. Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant ascertains prior doses as required by subrule 37.11(7) during the lifetime of the individual for each individual involved.

e. Subject to subrule 37.11(3), the licensee or registrant cannot 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 subrule 37.11(3) in any year; and

(2) Five times the annual dose limits in subrule 37.11(3) during the individual's lifetime.

f. The licensee or registrant maintains records of the conduct of a planned special exposure in accordance with subrule 37.12(7) and submits a written report in accordance with subrule 37.13(8).

g. The licensee or registrant records the best estimate of the dose resulting from the planned special exposure in the individual's record and informs the individual, in writing, of the dose within 30 days from the date of the planned special exposure. The dose from planned special exposures cannot be considered in controlling future occupational dose of the individual.

37.11(9) *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 subrule 37.11(3).

37.11(10) *Dose equivalent to an embryo or fetus.* The licensee or registrant shall ensure that the dose equivalent to an embryo or fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv). Subrule 37.12(8) contains recordkeeping requirements.

a. The licensee or registrant shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in subrule 37.12(8).

b. The dose equivalent to an embryo or fetus shall be taken as the sum of:

(1) The deep dose equivalent to the declared pregnant woman; and

(2) The dose equivalent to the embryo or fetus from radionuclides in the embryo or fetus and radionuclides in the declared pregnant woman.

c. If by the time the woman declares pregnancy to the licensee or registrant, the dose equivalent to the embryo or fetus has exceeded 0.5 rem (5 mSv), or is within 0.05 rem (0.5 mSv) of this dose, the licensee or registrant shall be deemed to be in compliance with subrule 37.11(10) if the additional dose equivalent to the embryo or fetus does not exceed 0.05 rem (0.5 mSv) during the remainder of the pregnancy.

d. The National Council on Radiation Protection and Measurements recommended in NCRP Report No. 91 "Recommendations on Limits for Exposure to Ionizing Radiation" (June 1, 1987) that no more than 0.05 rem (0.5 mSv) to the embryo or fetus be received in any one month.

37.11(11) *Radiation dose limits for individual members of the public.*

a. Each licensee or registrant shall conduct operations so that:

(1) The total effective dose equivalent to individual members of the public from the licensed or registered operation does not exceed 0.1 rem (1 millisievert) in a year, exclusive of the dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released from voluntary participation in medical research

programs, and from the licensee's or registrant's disposal of radioactive material into sanitary sewerage, and

(2) The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released, does not exceed 0.002 rem (0.02 millisievert) in any one hour.

b. If the licensee or registrant permits members of the public to have access to controlled areas, the limits for members of the public continue to apply to those individuals.

c. A licensee, a registrant, or an applicant for a license or registration may apply for prior department authorization to operate up to an annual dose limit for an individual member of the public of 0.5 rem (5 mSv). This application shall include the following information:

(1) Demonstration of the need for and the expected duration of operations in excess of the limit in this subrule;

(2) The licensee's or registrant's program to assess and control dose within the 0.5 rem (5 mSv) annual limit; and

(3) The procedures to be followed to maintain the dose ALARA.

d. In addition to the requirements of this chapter, a licensee or registrant subject to the provisions of the U.S. Environmental Protection Agency's generally applicable environmental radiation standards in 40 CFR 190 as amended to August 1, 2025, shall comply with those standards.

e. The department 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.

f. Notwithstanding the requirements of this subrule a licensee may permit visitors to an individual who cannot be released under rule 641—39.11(136C) to receive a radiation dose greater than 0.1 rem (1 mSv) if:

(1) The radiation dose received does not exceed 0.5 rem (5 mSv); and

(2) The authorized user, as defined in rule 641—38.1(136C), has determined before the visit that it is appropriate.

37.11(12) *Compliance with dose limits for individual members of the public.*

a. The licensee or registrant shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in subrule 37.11(11).

b. A licensee or registrant shall show compliance with the annual dose limit in subrule 37.11(11) by:

(1) Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed or registered operation does not exceed the annual dose limit; or

(2) 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 II of 10 CFR Part 20, Appendix B; 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.

c. Upon approval from the department, the licensee or registrant may adjust the effluent concentration values in Table II of 10 CFR Part 20, Appendix B, for members of the public to take into account the actual physical and chemical characteristics of the effluents, such as aerosol size distribution, solubility, density, radioactive decay equilibrium, and chemical form.

37.11(13) *Surveys and monitoring—general.*

a. Each licensee or registrant shall make, or cause to be made, surveys of areas, including the subsurface, that:

(1) Are necessary for the licensee or registrant to comply with this chapter; and

(2) Are necessary under the circumstances to evaluate:

1. The magnitude and extent of radiation levels;

2. Concentrations or quantities of residual radioactivity; and

3. The potential radiological hazards of the radiation levels and residual radioactivity detected.

b. Notwithstanding subrule 37.12(4), records from surveys describing the location and amount of subsurface residual radioactivity identified at the site must be kept with records important for decommissioning, and such records must be retained. The licensee or registrant shall ensure that instruments and equipment used for quantitative radiation measurements, for example, dose rate and effluent monitoring, are calibrated at intervals not to exceed 12 months for the radiation measured, except when a more frequent interval is specified in another applicable part of these rules or a license condition.

c. All personnel dosimeters, except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees and registrants to comply with subrule 37.11(3) with other applicable provisions of these rules or with conditions specified in a license or registration shall be processed and evaluated by a dosimetry processor:

(1) Holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology; and

(2) Approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

d. The licensee or registrant shall ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.

e. After replacement, each personnel dosimeter must be sent for processing as soon as possible.

37.11(14) *Conditions requiring individual monitoring of external and internal occupational dose.* Each licensee or registrant shall monitor exposures from sources of radiation at levels sufficient to demonstrate compliance with the occupational dose limits of this chapter. As a minimum:

a. Each licensee or registrant shall monitor occupational exposure to radiation and shall supply and require the use of individual monitoring devices by:

(1) Adults likely to receive, in one year from sources external to the body, a dose in excess of 10 percent of the limits in subrule 37.11(3);

(2) Minors likely to receive, in one year from 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) Individuals entering a high or very high radiation area;

(4) Individuals working with medical fluoroscopic equipment; and

(5) 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).

b. Each licensee or registrant shall monitor, to determine compliance with subrule 37.11(6), the occupational intake of radioactive material by and assess the committed effective dose equivalent to:

(1) Adults likely to receive, in one year, an intake in excess of 10 percent of the applicable ALI in Table I, Columns 1 and 2, of Appendix B;

(2) Minors likely to receive, in one year, a committed effective dose equivalent in excess of 0.1 rem (1 mSv); and

(3) Declared pregnant women likely to receive, during the entire pregnancy, a committed effective dose equivalent in excess of 0.1 rem (1 mSv).

c. Location of individual monitoring devices. Each licensee or registrant shall ensure that individuals who are required to monitor occupational doses in accordance with subrule 37.11(14) wear individual monitoring devices in accordance with the dosimetry vendor specifications and processed in accordance with NVLAP-approved calculation methods. Additional requirements are as follows:

(1) An individual monitoring device used for monitoring the dose to an embryo or fetus of a declared pregnant woman shall be located at the waist under any protective apron being worn by the woman;

(2) An individual monitoring device used for monitoring the eye dose equivalent, to demonstrate compliance with subrule 37.11(3) shall be located at the neck (collar), outside any protective apron being worn by the monitored individual or at an unshielded location closer to the eye;

(3) An individual monitoring device used for monitoring the dose to the extremities, to demonstrate compliance with subrule 37.11(3), shall be worn on the extremity likely to receive the highest exposure. Each individual monitoring device shall be oriented to measure the highest dose to the extremity being monitored.

37.11(15) *Control of exposure from external sources in restricted areas; control of access to high radiation areas.*

a. The licensee or registrant shall ensure that each entrance or access point to a high radiation area has one or more of the following features:

(1) A control device that, upon entry into the area, causes the level of radiation to be reduced below that level at which an individual might receive a deep dose equivalent of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the source of radiation from any surface that the radiation penetrates; or

(2) A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry; or

(3) Entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.

b. In place of the controls required by subrule 37.11(15) for a high radiation area, the licensee or registrant may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

c. The licensee or registrant may apply to the department for approval of alternative methods for controlling access to high radiation areas.

d. The licensee or registrant shall establish the controls required by paragraph 37.11(15)*"a"* in a way that does not prevent individuals from leaving a high radiation area.

e. The licensee is not required to control 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 rules of the U.S. Department of Transportation provided that:

(1) The packages do not remain in the area longer than three days; and

(2) The dose rate at 1 meter from the external surface of any package does not exceed 0.01 rem (0.1 mSv) per hour.

f. The licensee is not required to control entrance or access to rooms or other areas in hospitals solely because of the presence of patients containing radioactive material provided that there are personnel in attendance who are taking the necessary precautions to prevent the exposure of individuals to radiation or radioactive material in excess of the established limits in this chapter and to operate within the ALARA provisions of the licensee's radiation protection program.

g. The licensee or registrant is not required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a high radiation area as described in subrule 37.11(15) if the registrant has met all the specific requirements for access and control specified in other applicable chapters.

37.11(16) *Control of exposure from external sources in restricted areas; control of access to very high radiation areas.*

a. In addition to the requirements in subrule 37.11(15), the licensee or registrant shall institute 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 rad (5 Gy) or more in one hour at 1 meter from a source of radiation or any surface through which the radiation penetrates. This requirement does not apply to rooms or areas in which diagnostic X-ray systems are the only source of radiation, or to non-self-shielded irradiators.

b. The registrant is not required to control entrance or access to rooms or other areas containing sources of radiation capable of producing a very high radiation area if the registrant has met all the specific requirements for access and control specified in other applicable chapters.

37.11(17) *Control of exposure from external sources in restricted areas; control of access to very high radiation areas—irradiators.*

a. This rule applies to licensees with sources of radiation in non-self-shielded irradiators. This rule does not apply to sources of radiation that are used in teletherapy, in industrial radiography, or in

completely self-shielded irradiators in which the source of radiation is both stored and operated within the same shielding radiation barrier and, in the designed configuration of the irradiator, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual.

b. Each area in which there may exist radiation levels in excess of 500 rad (5 Gy) in one hour at 1 meter from a source of radiation that is used to irradiate materials shall meet the following requirements:

(1) Each entrance or access point shall be equipped with entry control devices that:

1. Function automatically to prevent any individual from inadvertently entering a very high radiation area;

2. Permit deliberate entry into the area only after a control device is actuated that causes the radiation level within the area, from the source of radiation, to be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour; and

3. Prevent operation of the source of radiation if it would produce radiation levels in the area that could result in a deep dose equivalent to an individual in excess of 0.1 rem (1 mSv) in one hour.

(2) Additional control devices shall be provided so that, upon failure of the entry control devices to function as required by subrule 37.11(17):

1. The radiation level within the area, from the source of radiation, is reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour; and

2. Conspicuous visible and audible alarm signals are generated to make an individual attempting to enter the area aware of the hazard and at least one other authorized individual, who is physically present, familiar with the activity, and prepared to render or summon assistance, aware of the failure of the entry control devices.

(3) The licensee shall provide control devices so that, upon failure or removal of physical radiation barriers other than the sealed source's shielded storage container:

1. The radiation level from the source of radiation is reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour; and

2. Conspicuous visible and audible alarm signals are generated to make potentially affected individuals aware of the hazard and the licensee or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of the failure or removal of the physical barrier.

(4) When the shield for stored sealed sources is a liquid, the licensee shall provide means to monitor the integrity of the shield and to signal, automatically, loss of adequate shielding.

(5) Physical radiation barriers that comprise permanent structural components, such as walls, that have no credible probability of failure or removal in ordinary circumstances need not meet the requirements of subparagraph 37.11(17)*"b"*(2).

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

(7) Each area shall be controlled by use of such administrative procedures and such devices as are necessary to ensure that the area is cleared of personnel prior to each use of the source of radiation.

(8) Each area shall be checked by a radiation measurement to ensure that, prior to the first individual's entry into the area after any use of the source of radiation, the radiation level from the source of radiation in the area is below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour.

(9) The entry control devices required in subrule 37.11(17) shall be tested for proper functioning as set forth in subrule 37.12(11) for recordkeeping requirements.

1. Testing shall be conducted prior to initial operation with the source of radiation on any day unless operations were continued uninterrupted from the previous day;

2. Testing shall be conducted prior to resumption of operation of the source of radiation after any unintentional interruption; and

3. The licensee or registrant shall submit and adhere to a schedule for periodic tests of the entry control and warning systems. The licensee or registrant cannot conduct operations, other than those necessary to place the source of radiation in safe condition or to effect repairs on controls, unless control devices are functioning properly.

4. Entry and exit portals that are used in transporting materials to and from the irradiation area, and that are not intended for use by individuals, shall be controlled by such devices and administrative procedures as are necessary to physically protect and warn against inadvertent entry by any individual through these portals. Exit portals for irradiated materials shall be equipped to detect and signal the presence of any loose radioactive material that is carried toward such an exit and to automatically prevent loose radioactive material from being carried out of the area.

c. Licensees, registrants, or applicants for licenses or registrations for sources of radiation within the purview of subrule 37.11(17) that will be used in a variety of positions or in locations, such as open fields or forests, that make it impracticable to comply with certain requirements of subrule 37.11(17) such as those for the automatic control of radiation levels, may apply to the department for approval of alternative safety measures. Alternative safety measures shall provide personnel protection at least equivalent to those specified in subrule 37.11(17). At least one of the alternative measures shall include an entry-preventing interlock control based on a measurement of the radiation that ensures the absence of high radiation levels before an individual can gain access to the area where such sources of radiation are used.

d. The entry control devices required by subrule 37.11(16) shall be established in such a way that no individual will be prevented from leaving the area.

37.11(18) *Security and control of licensed or registered sources of radiation.*

a. The licensee or registrant shall secure licensed or registered radioactive material that is stored in controlled or unrestricted areas from unauthorized removal or access.

b. The licensee or registrant shall maintain constant surveillance and use devices or administrative procedures to prevent unauthorized use of licensed or registered radioactive material that is in an unrestricted area and that is not in storage.

c. The registrant shall secure registered radiation machines from unauthorized removal.

d. The registrant shall use devices or administrative procedures to prevent unauthorized use of registered radiation machines.

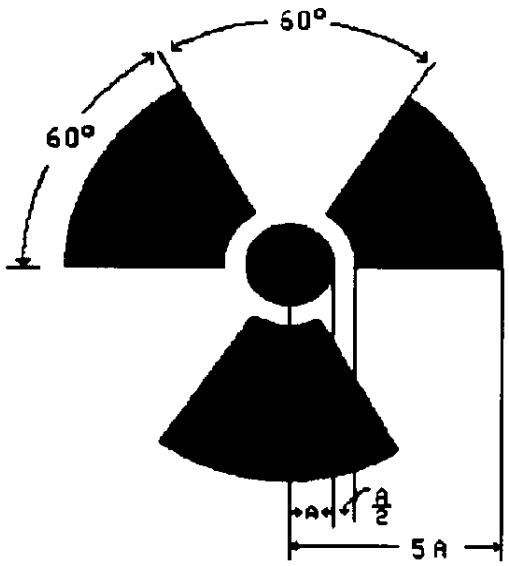
e. Each portable gauge licensee shall use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal whenever portable gauges are not under the control and constant surveillance of the licensee.

37.11(19) *Precautionary procedures; caution signs.* Unless otherwise authorized by the department, the symbol prescribed by this rule shall use the colors magenta, purple, or black on yellow background. The symbol prescribed is the three-bladed design as follows.

a. Radiation symbol.

(1) Cross-hatched area is to be magenta, purple, or black, and

(2) The background is to be yellow.



b. Exception to color requirements for standard radiation symbol. Notwithstanding the requirements of subrule 37.11(19), licensees are authorized to label sources, source holders, or device components containing sources of radiation that are subjected to high temperatures, with conspicuously etched or stamped radiation caution symbols and without a color requirement.

c. Additional information on signs and labels. In addition to the contents of signs and labels prescribed in this chapter, the licensee or registrant shall provide, on or near the required signs and labels, additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures.

d. Improper posting or labeling. The licensee or registrant shall ensure that adequate measures are taken to prevent improper posting or labeling.

37.11(20) *Precautionary procedures; posting requirements.*

a. Posting of radiation areas. 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".

b. Posting of high radiation areas. The licensee or registrant shall post in 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".

c. Posting of very high radiation areas. The licensee or registrant shall post in each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA".

d. Posting of airborne radioactivity areas. The licensee shall post in 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".

e. Posting of areas or rooms in which licensed or registered material is used or stored. The licensee shall post in each area or room in which there is used or stored an amount of licensed material exceeding ten times the quantity of such material specified in 10 CFR Part 20, Appendix C, with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)".

37.11(21) *Precautionary procedures; exceptions to posting requirements.*

a. A licensee or registrant is not required to post caution signs in areas or rooms containing sources of radiation for periods of less than eight hours if each of the following conditions is met:

(1) The sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in this chapter; and

(2) The area or room is subject to the licensee's or registrant's control.

b. Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs pursuant to subrule 37.11(21) provided that the patient could be released from licensee control.

c. 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 sealed source container or housing does not exceed 0.005 rem (0.05 mSv) per hour.

d. A room or area is not required to be posted with a caution sign because of the presence of radiation machines used solely for diagnosis or simulation in the healing arts.

e. Rooms in hospitals or clinics that are used for teletherapy are exempt from the requirement to post caution signs under subrule 37.11(21) if:

(1) Access to the room is controlled pursuant to subrule 37.11(17); and

(2) Personnel in attendance take necessary precautions to prevent an inadvertent exposure of workers, other patients, and members of the public to radiation in excess of the limits established in this chapter.

37.11(22) *Precautionary procedures; labeling radiation machines.* Each registrant shall ensure that each radiation machine is labeled in a conspicuous manner that cautions individuals that radiation is produced when it is energized.

[**ARC 0387D**, IAB 6/24/26, effective 7/29/26]