

TITLE 180 CONTROL OF RADIATION

CHAPTER 4 STANDARDS FOR PROTECTION AGAINST RADIATION

Effective Date: 6/7/2021

001. SCOPE AND AUTHORITY. 180 Nebraska Administrative Code (NAC) 4 establishes standards for protection against ionizing radiation resulting from activities conducted according to licenses or registrations issued by the Department. The regulations are authorized by and implement the Nebraska Radiation Control Act, Nebraska Revised Statute (Neb. Rev. Stat.) §§ 71-3501 to 71-3520.

001.01 SOURCE CONTROL. The requirements of 180 NAC 4 are designed to control the receipt, possession, use, transfer, and disposal of sources of radiation by any licensee or registrant so the total dose to an individual, including doses resulting from all sources of radiation other than background radiation, does not exceed the standards for protection against radiation prescribed in 180 NAC 4. However, nothing in 180 NAC 4 will be construed as limiting actions that may be necessary to protect health and safety.

001.02 EXCEPTIONS. Except as specifically provided in other Chapters of Title 180, 180 NAC 4 applies to persons licensed or registered by the Department to receive, possess, use, transfer, or dispose of sources of radiation. The limits in 180 NAC 4 do not apply to doses due to background radiation, to exposure of patients to radiation for the purpose of medical diagnosis or therapy, to exposure from individuals administered radioactive material and released in accordance with 180 NAC 7-037 or to voluntary participation in medical research programs.

001.03 CODE OF FEDERAL REGULATIONS. 40 Code of Federal Regulations (CFR) as published on July 1, 2013 and 49 CFR as published October 1, 2013 and referred throughout this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Radiological Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

001.04 INCORPORATION BY REFERENCE. National Council on Radiation Protection and Measurement (NCRP) 116, International Commission on Radiological Protection (ICRP) 23 and Compressed Gas Association Publication G7.1 as referred to in this Chapter are herein incorporated by reference and available for viewing at the Nebraska Department of Health and Human Services, Radiological Health, 301 Centennial Mall South, 3rd Floor, Lincoln, Nebraska 68509.

002. DEFINITIONS. The following definitions apply:

002.01 AIR-PURIFYING RESPIRATOR. An air-purifying respirator is a respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

002.02 ANNUAL LIMIT ON INTAKE (ALI). The annual limit on intake (ALI) is the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. Annual limit on intake (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 0.05 Sievert (Sv) (5 roentgen equivalent man (rem)) or a committed dose equivalent of 0.5 Sv (50 rem) to any individual organ or tissue. Annual limit on intake (ALI) values for intake by ingestion and by inhalation of selected radionuclides are given in Table I, Columns 1 and 2, of Appendix 4-B of 180 NAC 4.

002.03 ASSIGNED PROTECTION FACTOR (APF). The assigned protection factor (APF) is 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 assigned protection factor (APF).

002.04 ATMOSPHERE-SUPPLYING RESPIRATOR. An atmosphere-supplying respirator is 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.

002.05 CLASS. Class is the 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. For purposes of these regulations, "lung class" and "inhalation class" are equivalent terms.

002.06 DECLARED PREGNANT WOMAN. A declared pregnant woman is a woman who has voluntarily informed the licensee, 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.

002.07 DEMAND RESPIRATOR. A demand respirator is an atmosphere-supplying respirator that admits breathing air to the face piece only when a negative pressure is created inside the face piece by inhalation.

002.08 DERIVED AIR CONCENTRATION (DAC). The derived air concentration (DAC) is the concentration of a given radionuclide in air which, if breathed by the reference man for 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 annual limit on intake (ALI). Derived air concentration (DAC) values are given in Table I, Column 3, of Appendix 4-B of 180 NAC 4.

002.09 DERIVED AIR CONCENTRATION-HOUR (DAC-HOUR). A 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 or registrant may take 2,000 derived air concentration (DAC)-hours to represent one annual limit on intake (ALI), equivalent to a committed effective dose equivalent of 0.05 Sv (5 rem).

002.10 DISPOSABLE RESPIRATOR. A disposable respirator is 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).

002.11 DOSE OR RADIATION DOSE. 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 section.

002.12 DOSIMETRY PROCESSOR. A dosimetry processor is an individual or an organization that processes and evaluates individual monitoring devices in order to determine the radiation dose delivered to the monitoring devices.

002.13 FILTERING FACEPIECE. A filtering facepiece is 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. Dust mask is another term for filtering facepiece.

002.14 FIT FACTOR. The fit factor is the 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.

002.15 FIT TEST. A fit test is the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

002.16 HELMET. A helmet is a rigid respiratory inlet covering that also provides head protection against impact and penetration.

002.17 HOOD. A hood is a respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.

002.19 INHALATION CLASS. Inhalation class has the same meaning as class.

002.20 LOOSE-FITTING FACEPIECE. A loose-fitting facepiece is a respiratory inlet covering that is designed to form a partial seal with the face.

002.21 LUNG CLASS. Lung class has the same meaning as class.

002.22 NEGATIVE PRESSURE RESPIRATOR. A negative pressure respirator is a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator. A tight fitting respirator is another term for a negative pressure respirator.

002.23 NONSTOCHASTIC EFFECT. A nonstochastic effect is a health effect, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is a nonstochastic effect. For purposes of Title 180, a deterministic effect is an equivalent term.

002.24 PLANNED SPECIAL EXPOSURE. A planned special exposure is an infrequent exposure to radiation, separate from and in addition to the annual occupational dose limits.

002.25 POSITIVE PRESSURE RESPIRATOR. A positive pressure respirator is a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

002.26 POWERED AIR-PURIFYING RESPIRATOR (PAPR). A powered air-purifying respirator (PAPR) is an air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

002.27 PRESSURE DEMAND RESPIRATOR. A pressure demand respirator is a positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

002.28 QUALITATIVE FIT TEST (QLFT). A qualitative fit test (QLFT) is a pass or fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

002.29 QUANTITATIVE FIT TEST (QNFT). A quantitative fit test (QNFT) is an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

002.29 QUARTER. A quarter is the 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.

002.30 REFERENCE MAN. Reference man is the hypothetical aggregation of human physical and physiological characteristics determined by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base. A description of the reference man is contained in the International Commission on Radiological Protection Report, ICRP Publication 23, "Report of the Task Group on Reference Man."

002.31 RESPIRATORY PROTECTIVE EQUIPMENT. Respiratory protective equipment is an apparatus, such as a respirator, used to reduce an

individual's intake of airborne radioactive materials.

002.32 SANITARY SEWERAGE. Sanitary sewerage is 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.

002.33 SELF-CONTAINED BREATHING APPARATUS (SCBA). Self-contained breathing apparatus (SCBA) is an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

002.34 STOCHASTIC EFFECT. A stochastic effect is a health effect that occurs 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 stochastic effects.

002.35 SUPPLIED-AIR RESPIRATOR (SAR). A supplied-air respirator (SAR) is an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user. Airline respirator is another term for a supplied-air respirator.

002.36 TIGHT-FITTING FACEPIECE. A tight-fitting facepiece is a respiratory inlet covering that forms a complete seal with the face.

002.37 USER SEAL CHECK. A user seal check is 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. Fit check is another term for user seal check.

002.38 VERY HIGH RADIATION AREA. A very high radiation area is 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 5 Gy (500 rad) in 1 hour at 1 meter from a radiation source or 1 meter from any surface that the radiation penetrates. Note: For the very high doses received at high dose rates, the units of absorbed dose, gray and rad, are appropriate, rather than units of dose equivalent, sieverts and rem.

002.39 WEIGHTING FACTOR (WT). The weighting factor (WT) for an organ or tissue (T) means the proportion of the risk of stochastic effects resulting from irradiation of that 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 WT are:

ORGAN DOSE WEIGHTING FACTORS	
Organ or Tissue	w_T
Gonads	0.25
Breast	0.15

Red Bone Marrow	0.12
Lung	0.12
Thyroid	0.03
Bone Surfaces	0.03
Remainder	0.30 ^a
Whole Body	1.00 ^b

^a 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.

^b 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.

003. IMPLEMENTATION. Conditions on licenses are implemented as follows.

003.01 MORE RESTRICTIVE. Any existing license condition that is more restrictive than 180 NAC 4 remains in force until there is an amendment or renewal of the license.

003.02 EXEMPTIONS. If a license condition exempts a licensee from a provision of 180 NAC 4 in effect on or before May 30, 1994, it also exempts the licensee from the corresponding provision of 180 NAC 4.

003.03 PRIOR REGULATIONS. If a license condition cites provisions of 180 NAC 4 in effect prior to May 30, 1994, which do not correspond to any provisions of 180 NAC 4, the license condition remains in force until there is an amendment or renewal of the license that modifies or removes this condition.

004. RADIATION PROTECTION PROGRAMS. Each licensee or registrant must have and follow a radiation protection program as follows.

004.01 RADIATION PROTECTION PROGRAM COMPLIANCE. Each licensee or registrant must develop, document, and implement a radiation protection program sufficient to ensure compliance with the provisions of 180 NAC 4. See 180 NAC 4-047 for recordkeeping requirements relating to these programs.

004.02 AS LOW AS REASONABLY ACHIEVABLE (ALARA). The licensee or registrant must use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and public doses that are as low as reasonably achievable (ALARA).

004.03 RADIATION PROTECTION PROGRAM REVIEW. The licensee or registrant must, at intervals not to exceed 12 months, review the radiation protection program content and implementation.

004.04 CONSTRAINT ON AIR EMISSIONS. To implement the as low as reasonably achievable (ALARA) requirements of 180 NAC 4-004.02 and despite of the requirements in 180 NAC 4-013, a constraint on air emissions of radioactive material to the environment, excluding radon-222 and its daughters must 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 0.1 mSv (10 mrem) per year from these emissions. If a licensee subject to this requirement exceeds this dose constraint, the licensee must report the exceedance as provided in 180 NAC 4-059 and promptly take appropriate corrective action to ensure against a recurrence.

005. OCCUPATIONAL DOSE LIMITS FOR ADULTS. Occupational dose limits for adults are as follows.

005.01 OCCUPATIONAL DOSE CONTROL. The licensee or registrant must control the occupational dose to individual adults, except for planned special exposures according to 180 NAC 4-010, to the following dose limits:

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

- (i) The total effective dose equivalent being equal to 0.05 Sv (5 rem); or
- (ii) 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 0.5 Sv (50 rem).

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

- (i) A lens dose equivalent of 0.15 Sv (15 rem), and
- (ii) A shallow dose equivalent of 0.5 Sv (50 rem) to the skin of the whole body or to the skin of any extremity.

005.02 DOSES RECEIVED IN EXCESS OF THE ANNUAL LIMITS. Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, must be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime. See 180 NAC 4-010(E) (i) and (ii).

005.03 EXTERNAL EXPOSURE. Licensees and registrants must determine external exposure so that:

(A) 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 U.S. Nuclear Regulatory Commission (NRC). 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.

(B) If an individual is required to be monitored by 180 NAC 4-022, when a protective apron is worn while working with medical fluoroscopic equipment and monitoring is conducted as specified in 180 NAC 4-022.01(E), the effective dose equivalent for external radiation must be determined as follows:

- (i) When only one individual monitoring device is used and it is located at the neck (collar) outside the protective apron, the reported deep dose equivalent must be the effective dose equivalent for external radiation; or
- (ii) When only one individual monitoring device is used and it is located at the neck (collar) outside the protective apron, and the reported dose exceeds 25% of the limit specified in 180 NAC 4-005.01, the reported deep dose equivalent value multiplied by 0.3 must be the effective dose equivalent for external radiation; or
- (iii) When individual monitoring devices are worn, both under the protective apron at the waist and outside the protective apron at the neck, the effective dose equivalent for external radiation must be assigned the value of the sum of the deep dose equivalent reported for the individual monitoring device located at the waist under the protective apron multiplied by 1.5 and the deep dose equivalent reported for the individual monitoring device located at the neck outside the protective apron multiplied by 0.04.

005.04 DERIVED AIR CONCENTRATION (DAC) AND ANNUAL LIMIT ON INTAKE (ALI) VALUES. Derived air concentration (DAC) and annual limit on intake (ALI) values are presented in Table I of Appendix 4-B of 180 NAC 4 and may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits. See 180 NAC 4-052.

005.05 SOLUBLE URANIUM INTAKE. In addition to the annual dose limits, the licensee must limit the soluble uranium intake by an individual to 10 milligrams in a week in consideration of chemical toxicity. See Appendix 4-B of 180 NAC 4.

005.06 DOSE REDUCTION. The licensee or registrant must 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.

006. COMPLIANCE WITH REQUIREMENTS FOR SUMMATION OF EXTERNAL AND INTERNAL DOSES. Requirements for addressing external and internal doses are as follows.

006.01 SUMMING EXTERNAL AND INTERNAL DOSES. If the licensee is required to monitor according to both 180 NAC 4-022.01 and 4-022.02, the

licensee must demonstrate compliance with the dose limits by summing external and internal doses. If the licensee or registrant is required to monitor only according to 180 NAC 4-022.01 or only according to 180 NAC 4-022.02 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 according to 180 NAC 4-006.02 through 4-006.04. 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.

006.02 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 annual limit on intake (ALI) for each radionuclide;
- (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) 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% of the maximum weighted value of HT,50 (WTH,50) per unit intake for any organ or tissue.

006.03 INTAKE BY ORAL INGESTION. If the occupationally exposed individual also receives an intake of radionuclides by oral ingestion greater than 10% of the applicable oral annual limit on intake (ALI), the licensee or registrant must account for this intake and include it in demonstrating compliance with the limits.

006.04 INTAKE THROUGH WOUNDS OR ABSORPTION THROUGH SKIN. The licensee or registrant must 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 derived air concentration (DAC) for hydrogen-3 and does not need to be evaluated or accounted for according to 180 NAC 4-006.04.

007. DETERMINATION OF EXTERNAL DOSE FROM AIRBORNE

RADIOACTIVE MATERIAL. Licensees must determine dose from airborne radioactive material as follows.

007.01 DEEP DOSE EQUIVALENT, LENS DOSE EQUIVALENT AND SHALLOW DOSE EQUIVALENT. Licensees must, 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. See Appendix 4-B of 180 NAC 4.

007.02 RADIONUCLIDES OTHER THAN NOBLE GASES OR NONUNIFORM DISTRIBUTION. Airborne radioactivity measurements and derived air concentration (DAC) values must 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 must be based upon measurements using instruments or individual monitoring devices.

008. DETERMINATION OF INTERNAL DOSE. Licensees must determine the internal dose as follows.

008.01 TIMELY MEASUREMENTS. For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee must, when required under 180 NAC 4-022 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.

008.02 INHALATION CONCENTRATION. Unless respiratory protective equipment is used, as provided in 180 NAC 4-028 or the assessment of intake is based on bioassays, the licensee must assume that an individual inhales radioactive material at the airborne concentration in which the individual is present.

008.03 ADDITIONAL CONSIDERATIONS. 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:

- (A) Use that information to calculate the committed effective dose equivalent, and, if used, the licensee must document that information in the individual's record; and
- (B) Upon prior approval of the Department, adjust the derived air concentration (DAC) or annual limit on intake (ALI) values to reflect the actual physical and chemical characteristics of airborne radioactive material, for example, 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 to the committed effective dose equivalent. See Appendix 4-B of 180 NAC 4.

008.04 CLASS Y MATERIAL INTAKE ASSESSMENT. If the licensee chooses to assess intakes of Class Y material using the measurements given in 180 NAC 4-008.01(B) or (C), the licensee may delay the recording and reporting of the assessments for periods up to seven months, unless otherwise required by 180 NAC 4-058 or 4-059. This delay permits the licensee to make additional measurements basic to the assessments.

008.05 KNOWN NUCLIDES AND CONCENTRATION. If the identity and concentration of each radionuclide in a mixture are known, the fraction of the derived air concentration (DAC) applicable to the mixture for use in calculating derived air concentration (DAC)-hours must be either:

- (A) The sum of the ratios of the concentration to the appropriate derived air concentration (DAC) value, D, W, or Y, from Appendix 4-B of 180 NAC 4 for each radionuclide in the mixture; or
- (B) The ratio of the total concentration for all radionuclides in the mixture to the most restrictive derived air concentration (DAC) value for any radionuclide in the mixture.

008.06 KNOWN NUCLIDES. 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 derived air concentration (DAC) for the mixture must be the most restrictive derived air concentration (DAC) of any radionuclide in the mixture.

008.07 MIXTURE OF NUCLIDES. When a mixture of radionuclides in air exists, a licensee 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 180 NAC 4-005 and in complying with the monitoring requirements in 180 NAC 4-022;
- (B) The concentration of any radionuclide disregarded is less than 10% of its derived air concentration (DAC); and
- (C) The sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 30%.

008.08 DETERMINING COMMITTED EFFECTIVE DOSE EQUIVALENT.
Committed effective dose equivalent must be determined as follows:

- (A) In order to calculate the committed effective dose equivalent, the licensee may assume that the inhalation of one annual limit on intake (ALI), or an exposure of 2,000 derived air concentration (DAC)-hours, results in a committed effective dose equivalent of 0.05 Sv (5 rem) for radionuclides that have their annual limit on intake (ALI)s or derived air concentration (DAC)s based on the committed effective dose equivalent; and
- (B) For an annual limit on intake (ALI), and the associated derived air concentration (DAC) determined by the nonstochastic organ dose limit of 0.5 Sv (50 rem), the intake of radionuclides that would result in a committed effective dose equivalent of 0.05 Sv (5 rem), the stochastic annual limit on intake (ALI) is listed in parentheses in Table I of Appendix 4-B of 180 NAC 4. The licensee may, as a simplifying assumption, use the stochastic annual limit on intake (ALI) to determine committed effective dose equivalent. However, if the licensee uses the stochastic annual limit on intake (ALI), the licensee must also demonstrate that the limit in 180 NAC 4-005.01(A)(ii) is met.

009. DETERMINATION OF PRIOR OCCUPATIONAL DOSE. Prior occupational dose must be determined as follows.

009.01 PRIOR OCCUPATIONAL DOSE. For each individual who may enter the licensee's or registrant's restricted area and is likely to receive, in a year, an occupational dose requiring monitoring according to 180 NAC 4-022, the licensee or registrant must:

- (A) Determine the occupational radiation dose received during the current year; and
- (B) Attempt to obtain the records of cumulative occupational radiation dose.

009.02 PRIOR PLANNED SPECIAL EXPOSURE AND DOSES IN EXCESS OF THE LIMITS. Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant must 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.

009.03 RECORDS OF PRIOR OCCUPATIONAL DOSE. In complying with the requirements of 180 NAC 4-009.01, a licensee or registrant may:

- (A) 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;
- (B) Accept, as the record of cumulative radiation dose, an up-to-date Department Form NRH-1, or equivalent, 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; or
- (C) 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, telegram, electronic media, or letter. The licensee or registrant must request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

009.04 EXPOSURE HISTORY. The licensee or registrant must record the exposure history, as required by 180 NAC 4-009.01, on Department Form NRH-1, or other clear and legible record, including all of the information required on that form.

(A) The form or record must show each period in which the individual received occupational exposure to radiation or radioactive material and must be signed by the individual who received the exposure. For each period for which the licensee or registrant obtains reports, the licensee or registrant must use the dose shown in the report in preparing Department Form NRH-1 or equivalent. For any period in which the licensee or registrant does not obtain a report, the licensee or registrant must place a notation on Department Form NRH-1 indicating the periods of time for which data are not available.

(B) Licensees or registrants are not required to partition historical dose between external dose equivalent(s) and internal committed dose equivalent(s). Further, occupational exposure histories obtained and recorded on Department Form NRH-1 before the May 30, 1994, might not have included effective dose equivalent, but may be used in the absence of specific information on the intake of radionuclides by the individual.

009.05 ASSUMPTIONS. 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 must assume:

(A) In establishing administrative controls under 180 NAC 4-005.06 for the current year, that the allowable dose limit for the individual is reduced by 12.5 mSv (1.25 rem) for each quarter for which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure; and

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

009.06 RECORDS RETENTION. The licensee or registrant must retain the records on Department Form NRH-1 or equivalent until the Department terminates each pertinent license or registration requiring this record. The licensee or registrant must retain records used in preparing Department Form NRH-1 or equivalent for three years after the record is made. This includes records required under the standards for protection against radiation in effect prior to May 30, 1994.

010. 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 180 NAC 4-005 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:

- (i) Informed of the purpose of the planned operation; and
- (ii) 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
- (iii) Instructed in the measures to be taken to keep the dose as low as reasonably achievable (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 180 NAC 4-009.02 during the lifetime of the individual for each individual involved;

(E) Subject to 180 NAC 4-005.02, the licensee or registrant must 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:

- (i) The numerical values of any of the dose limits in 180 NAC 4-005.01 in any year; and
- (ii) Five times the annual dose limits in 180 NAC 4-005.01 during the individual's lifetime;

(F) The licensee or registrant maintains records of the conduct of a planned special exposure in accordance with 180 NAC 4-051 and submits a written report in accordance with 180 NAC 4-060; and

(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 must not be considered in controlling future occupational dose of the individual according to 180 NAC 4-005.01 but must be included in evaluations required by 180 NAC 4-010.04 and 4-010.05.

011. OCCUPATIONAL DOSE LIMITS FOR MINORS. The annual occupational dose limits for minors are 10% of the annual occupational dose limits specified for adult workers in 180 NAC 4-005.

012. DOSE EQUIVALENT TO AN EMBRYO/FETUS. Licensees and registrants must control doses to embryo/fetus as follows.

012.01 DOSE LIMIT. The licensee or registrant must 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 5 mSv (0.5 rem). See 180 NAC 4-052 for record keeping requirements.

012.02 UNIFORM EXPOSURE RATE. The licensee or registrant must make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in 180 NAC 4-012.01.

012.03 DOSE EQUIVALENT. The dose equivalent to an embryo/fetus is the sum of:

- (A) The deep dose equivalent to the declared pregnant woman; and
- (B) The equivalent dose to the embryo/fetus resulting from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman.

012.04 REMAINDER OF PREGNANCY. If the dose equivalent to the embryo/fetus is found to have exceeded 5 mSv (0.5 rem), or is within 0.5 mSv (0.05 rem) of this dose, by the time the woman declares the pregnancy to the licensee, the licensee or registrant must be deemed to be in compliance with 180 NAC 4-012.01 if the additional dose to the embryo/fetus does not exceed 0.5 mSv (0.05 rem) during the remainder of the pregnancy.

013. DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC. Licensees and registrants must control doses to individual members of the public as follows.

013.01 DOSE LIMITS. Each licensee or registrant must conduct operations so that:

- (A) The total effective dose equivalent to individual members of the public from the licensed or registered operation does not exceed 1 mSv (0.1 rem) 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 in accordance with 180 NAC 7-037, from voluntary participation in medical research programs, and from the licensee's or registrant's disposal of radioactive material into sanitary sewerage in accordance with 180 NAC 4-04; 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 180 NAC 7-037, does not exceed 0.02 mSv (0.002 rem) in any one hour.

013.02 MEMBERS OF THE PUBLIC IN RESTRICTED AREAS. If the licensee or registrant permits members of the public to have access to restricted areas, the limits for members of the public continue to apply to those individuals.

013.03 VISITORS. Despite the requirements of 180 NAC 4-013.01(A), a licensee may permit visitors to an individual who cannot be released, under 180 NAC 7-037, to receive a radiation dose greater than 1 mSv (0.1 rem) if:

- (A) The radiation dose received does not exceed 5 mSv (0.5 rem); and
- (B) The authorized user, as defined in 180 NAC 7, has determined before the visit that it is appropriate.

013.04 PRIOR AUTHORIZATION. A licensee, 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

5 mSv (0.5 rem). This application must include the following information:

- (A) Demonstration of the need for and the expected duration of operations in excess of the limit in 180 NAC 4-013.01; and
- (B) The licensee's or registrant's program to assess and control dose within the 5 mSv (0.5 rem) annual limit; and
- (C) The procedures to be followed to maintain the dose as low as reasonably achievable (ALARA).

013.05 ADDITIONAL REQUIREMENTS. In addition to the requirements of 180 NAC 4, 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 must comply with those standards.

013.06 ADDITIONAL RESTRICTIONS. In order to restrict the collective dose, licensees and registrants may be required to further restrict radiation levels in unrestricted areas or on the total quantity of radionuclides that may be released in effluents.

014. COMPLIANCE WITH DOSE LIMITS FOR INDIVIDUAL MEMBERS OF THE PUBLIC. Licensees and registrants must demonstrate compliance with dose limits for individual members of the public as follows.

014.01 SURVEYS. The licensee or registrant must make or cause to be made surveys of radiation levels in unrestricted areas and radioactive materials in effluents released to unrestricted areas to demonstrate compliance with the dose limits for individual members of the public in 180 NAC 4-013.

014.02 DEMONSTRATING COMPLIANCE. A licensee or registrant must show compliance with the annual dose limit in 180 NAC 4-013 by:

- (A) 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
- (B) Demonstrating that:
 - (i) 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 Appendix 4-B of 180 NAC 4; and
 - (ii) If an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.02 mSv (0.002 rem) in an hour and 0.5 mSv (0.05 rem) in a year.

014.03 ADJUSTMENT OF EFFLUENT CONCENTRATION VALUES. Upon approval from the Department, the licensee or registrant may adjust the effluent concentration values in Appendix 4-B, Table II, of 180 NAC 4 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.

015. RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION. The radiological criteria for termination of a license are as follows.

015.01 GENERAL PROVISIONS AND SCOPE. The criteria in 180 NAC 4 apply to the decommissioning of facilities licensed under 180 NAC 3. The criteria do not apply to uranium and thorium recovery facilities or to uranium solution extraction facilities.

015.02 LIMITATIONS. The criteria in 180 NAC 4 do not apply to sites which:

- (A) Were decommissioned prior to May 27, 2000 in accordance criteria identified in the Site Decommissioning Management Plan Action Plan of April 16, 1992 (57 FR 13389); or
- (B) Previously submitted and received Department approval on a decommissioning plan that is compatible with the Site Decommissioning Management Plan Action Plan criteria.

015.03 ADDITIONAL CLEANUP. After a site has been decommissioned and the license terminated in accordance with the criteria in 180 NAC 4, a former licensee must conduct additional cleanup only if, based on new information, the Department determines that the criteria of 180 NAC 4 were not met and residual radioactivity remaining at the site could result in significant threat to public health and safety.

015.04 PEAK TOTAL EFFECTIVE DOSE EQUIVALENT. When calculating total effective dose equivalent (TEDE) to the average member of the critical group the license must determine the peak annual total effective dose equivalent (TEDE) dose expected within the first 1000 years after decommissioning.

016. RADIOLOGICAL CRITERIA FOR UNRESTRICTED USE. A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a total effective dose equivalent (TEDE) to an average member of the critical group that does not exceed 0.25 mSv (25 mrem) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are as low as reasonably achievable (ALARA) must take into account consideration of any detriments expected to potentially result from decontamination and waste disposal.

017. CRITERIA FOR LICENSE TERMINATION UNDER RESTRICTED CONDITIONS. The criteria for license termination under restricted conditions are as follows.

017.01 CRITERIA. A site will be considered acceptable for license termination under restricted conditions if:

- (A) The licensee can demonstrate that further reductions in residual radioactivity necessary to comply with the provisions of 180 NAC 4-016 would result in net public or environmental harm or were not being

made because the residual levels associated with restricted conditions are as low as reasonably achievable (ALARA). Determination of the levels which are as low as reasonably achievable (ALARA) must take into account consideration of any detriments, such as traffic accidents, expected to potentially result from decontamination and waste disposal;

(B) The licensee has made provisions for legally enforceable institutional controls that provide reasonable assurance that the total effective dose equivalent (TEDE) from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 0.25 mSv (25 mrem) per year;

(C) The licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site. Acceptable financial assurance mechanisms are:

- (i) Funds placed into an account segregated from the licensee's assets and outside the licensee's administrative control, and in which the adequacy of the trust funds is to be assessed based on an assumed annual one percent real rate of return on investment.
- (ii) A statement of intent in the case of Federal, State or local Government licensees, as described in 180 NAC 3-018.06, (D); or
- (iii) When a governmental entity is assuming custody and ownership of a site, an arrangement that is deemed acceptable by such governmental entity.

(D) The licensee has submitted a decommissioning plan to the Department indicating the licensee's intent to decommission in accordance with 180 NAC 3-018.01, and specifying that the licensee intends to decommission by restricting use of the site. The licensee must document in the decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and incorporated, as appropriate, following analysis of that advice.

(i) Licensees proposing to decommission by restricting use of the site must seek advice from such affected parties regarding the following matters concerning the proposed decommissioning:

(1) Whether provisions for institutional controls proposed by the licensee:

- (a) Will provide reasonable assurance that the total effective dose equivalent (TEDE) from residual radioactivity distinguishable from background to the average member of the critical group will not exceed 0.25 mSv (25 mrem) total effective dose equivalent (TEDE) per year;
- (b) Will be enforceable; and
- (c) Will not impose undue burdens on the local community or other affected parties.

(2) Whether the licensee has provided sufficient financial assurance to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site.

(ii) In seeking advice on the issues identified in 180 NAC 4-017.01, (D)(i), the licensee must provide for:

(1) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;

(2) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

(3) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues; and

(E) Residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the total effective dose equivalent (TEDE) from residual radioactivity distinguishable from background to the average member of the critical group is as low as reasonably achievable and would not exceed either;

(i) 1 mSv (100 mrem) per year; or (1 mSv) per year; or

(ii) 5 mSv (500 mrem) per year provided the licensee;

(1) Demonstrates that further reductions in residual radioactivity necessary to comply with the 1 mSv/y (100 mrem/y) value of 180 NAC 4-017.01, (E)(i), are not technically achievable, would be prohibitively expensive, or would result in net public or environmental harm;

(2) Makes provisions for durable institutional controls;

(3) Provides sufficient financial assurance to enable a responsible government entity or independent third party, including a governmental custodian of a site both to carry out periodic rechecks of the site, no less frequently than every five years to assure that the institutional controls necessary to meet the criteria of 180 NAC 4-017.01, (B) and to assume and carry out responsibilities for any necessary control and, maintenance of those controls. Acceptable financial assurance mechanisms are those in 180 NAC 4-017.01, (C).

018. ALTERNATE CRITERIA FOR LICENSE TERMINATION. Alternate criteria for license termination are as follows.

018.01 CRITERIA. For the Department to consider terminating a license using alternate criteria greater than the dose criterion of 180 NAC 4-016, 4-017.01(B), and 4-017.01(D)(i)(1)(a), the licensee must:

(A) Provide assurance that public health and safety would continue to be protected, and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the 1 mSv per year (100 mrem per year) limit of 180 NAC 4-013.01(A) by submitting an analysis of possible sources of exposure;

(B) Employ to the extent practical restrictions on site use according to the provisions of 180 NAC 4-017 in minimizing exposures at the site;

(C) Reduce doses to as low as reasonably achievable (ALARA) levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal;

(D) Have submitted a decommissioning plan to the Department indicating the licensee's intent to decommission in accordance with 180 NAC 3-019.04 and specifying that the licensee proposes to decommission by use of alternate criteria. The licensee must document in the decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee must provide for:

- (i) Participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;
- (ii) An opportunity for a comprehensive, collective discussion on the issues by the participants represented; and
- (iii) A publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues; and

(E) Have provided sufficient financial assurance in the form of a trust fund to enable an independent third party, including a governmental custodian of a site, to assume and carry out responsibilities for any necessary control and maintenance of the site.

018.02 ALTERNATE CRITERIA. The use of alternate criteria to terminate a license requires the approval of the Department and will consider any comments provided by the Environmental Protection Agency and any public comments submitted according to 180 NAC 4-019.

019. PUBLIC NOTIFICATION AND PUBLIC PARTICIPATION. The process for public notification and participation in the Department's consideration of license termination under restricted and alternate conditions is as follows.

019.01 COMMENTS. Upon the receipt of the decommissioning plan from the licensee, or a proposal by the licensee for release of a site according to 180 NAC 4-017 and 4-018, or whenever the Department deems such notice to be in the public interest, the Department may:

(A) Notify and solicit comments from:

- (i) Local and State governments in the vicinity of the site and any Indian Nation or other indigenous people that have treaty or statutory rights that could be affected by the decommissioning; and
- (ii) The Environmental Protection Agency for cases where the licensee proposes to release a site according to 180 NAC 4-018.

019.02 PUBLICATION. A notice may be posted in local newspapers, letters to the State or local organizations, or other appropriate forum, that is readily accessible to individuals in the vicinity of the site, and comments may be solicited from affected parties.

020. MINIMIZATION OF CONTAMINATION. Contamination must be minimized as follows.

020.01 APPLICANTS. Applicants for licenses, other than renewals, must describe in the application how the facility design and the procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

020.02 LICENSEES. Licensees must, to the extent practical, conduct operations to minimize the introduction of residual radioactivity into the site, including the subsurface, in accordance with the existing radiation protection requirements in 180 NAC 4-004 and radiological criteria for license termination in 180 NAC 4-015 through 4-020.

021. SURVEYS AND MONITORING. Licensees and registrants must conduct surveys and monitor for radiation as follows.

021.01 AREA SURVEYS. Each licensee or registrant must make, or cause to be made, surveys of areas, including the subsurface, that:

- (A) Are necessary for the licensee or registrant to comply with 180 NAC 4; and
- (B) Are necessary under the circumstances to evaluate:
 - (i) The magnitude and extent of radiation levels; and
 - (ii) Concentrations or quantities of residual radioactivity; and
 - (iii) The potential radiological hazards of the radiation levels and residual radioactivity detected.

021.02 SUBSURFACE RESIDUAL RADIOACTIVITY. Despite the requirements of 180 NAC 4-048.01, 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 those records must be retained in accordance with 180 NAC 3-018.07, as applicable.

021.03 SURVEY INSTRUMENT AND EQUIPMENT CALIBRATION. The licensee or registrant must ensure that instruments and equipment used for quantitative radiation measurements, including 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 chapter or a license condition.

021.04 PERSONNEL DOSIMETERS. 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 180 NAC 4-005, with other applicable provisions of these regulations, or with conditions specified in a license or registration must 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 in this accreditation process for the type of radiation or radiations included in the National Voluntary Laboratory Accreditation Program (NVLAP) program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.

021.05 DECEPTIVE EXPOSURE OF AN INDIVIDUAL MONITORING DEVICE. The licensee or registrant must ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.

022. CONDITIONS REQUIRING INDIVIDUAL MONITORING OF EXTERNAL AND INTERNAL OCCUPATIONAL DOSE. Each licensee or registrant must monitor exposures to radiation and radioactive material at levels sufficient to demonstrate compliance with the occupational dose limits of 180 NAC 4 as follows.

022.01 OCCUPATIONAL EXPOSURE MONITORING. Each licensee or registrant must monitor occupational exposures to radiation from registered, licensed and unlicensed radiation sources under the control of the licensee or registrant and must supply and require the use of individual monitoring devices by:

- (A) Adults likely to receive, in one year from sources external to the body, a dose in excess of 10% of the limits in 180 NAC 4-005.01; and
- (B) Minors likely to receive, in one year, from sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem), a lens dose equivalent in excess of 1.5 mSv (0.15 rem), or a shallow dose equivalent to the skin or to the extremities in excess of 5 mSv (0.5 rem);
- (C) Declared pregnant women likely to receive during the entire pregnancy, from radiation sources external to the body, a deep dose equivalent in excess of 1 mSv (0.1 rem). All of the occupational doses in 180 NAC 4-005 continue to be applicable to the declared pregnant worker as long as the embryo/fetus dose limit is not exceeded;
- (D) Individuals entering a high or very high radiation area; and
- (E) Individuals working with medical fluoroscopic equipment:

- (i) An individual monitoring device used for the dose to an embryo/fetus of a declared pregnant woman, according to 180 NAC

4-012.01, must be located under the protective apron at the waist;
(ii) An individual monitoring device used for lens dose equivalent must be located at the neck or collar, or an unshielded location closer to the eye, outside the protective apron; and
(iii) When only one individual monitoring device is used to determine the effective dose equivalent for external radiation according to 180 NAC 4-005.03, it must be located at the neck or collar outside the protective apron. When a second individual monitoring device is used for the same purpose, it must be located under the protective apron at the waist. The second individual monitoring device is required for a declared pregnant woman.

022.02 OCCUPATIONAL INTAKE OF RADIOACTIVE MATERIAL. Each licensee or registrant must monitor, to determine compliance with 180 NAC 4-008, the occupational intake of radioactive material by and assess the committed effective dose equivalent to:

- (A) Adults likely to receive, in one year, an intake in excess of 10% of the applicable annual limit on intake (ALI) in Table I, Columns 1 and 2, of Appendix of 180 NAC 4;
- (B) Minors likely to receive, in one year, a committed effective dose equivalent in excess of 1 mSv (0.1 rem); and
- (C) Declared pregnant women likely to receive, during the entire pregnancy, a committed effective dose equivalent in excess of 1 mSv (0.1 rem).

023. CONTROL OF ACCESS TO HIGH RADIATION AREAS. The requirements for control of access to high radiation areas are as follows.

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

- (A) 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 1 mSv (0.1 rem) in one hour at 30 centimeters from the source of radiation from any surface that the radiation penetrates;
- (B) 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
- (C) Entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.

023.02 CONTINUOUS DIRECT OR ELECTRONIC SURVEILLANCE. In place of the controls required by 180 NAC 4-023.01 for a high radiation area, the licensee or registrant may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

023.03 APPLICATION FOR APPROVAL OF ALTERNATIVE METHODS. The licensee or registrant may apply to the Department for approval of alternative methods for controlling access to high radiation areas.

023.04 EGRESS. The licensee or registrant must establish the controls required by 180 NAC 4-023.01 and 4-023.03 in a way that does not prevent individuals from leaving a high radiation area.

023.05 RADIOACTIVE MATERIALS PACKAGED AND LABELED FOR TRANSPORT.

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 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 0.1 mSv (0.01 rem) per hour.

023.06 PATIENTS CONTAINING RADIOACTIVE MATERIAL. 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 180 NAC 4 and to operate within the as low as reasonably achievable (ALARA) provisions of the licensee's radiation protection program.

023.07 EXCEPTION. The 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 180 NAC 4-023 if the registrant has met all the specific requirements for access and control specified applicable chapters of Title 180, 180 NAC 5 for industrial radiography, 180 NAC 6 for x-rays in the healing arts, or 180 NAC 9 for particle accelerators.

024. CONTROL OF ACCESS TO VERY HIGH RADIATION AREAS. The requirements for control of access to very high radiation areas are as follows.

024.01 UNAUTHORIZED OR INADVERTENT ACCESS. In addition to the requirements in 180 NAC 4-023, the licensee or registrant must 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 5 Gy (500 rad) or more in 1 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.

024.02 EXCEPTION. 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 as described in 180 NAC 4-024.01 if the registrant has met all the specific requirements for access and control specified in applicable chapters of Title 180, 180 NAC 5 for industrial radiography, 180 NAC 6 for x-rays in the healing arts, or 180 NAC 9 for particle accelerators.

025. CONTROL OF ACCESS TO VERY HIGH RADIATION AREAS—IRRADIATORS.

The requirements for control of access to very high radiation areas at non-self-shielded irradiators are as follows.

025.01 NON-SELF-SHIELDED IRRADIATORS. 180 NAC 4-025 applies to licensees or registrants with sources of radiation in non-self-shielded irradiators. 180 NAC 4-025 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.

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

025.02(A) ENTRANCE OR ACCESS POINT. Each entrance or access point must be equipped with entry control devices that:

- (i) Function automatically to prevent any individual from inadvertently entering a very high radiation area;
- (ii) 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 1 mSv (0.1 rem) in 1 hour; and
- (iii) 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 1 mSv (0.1 rem) in 1 hour.

025.02(B) ADDITIONAL CONTROL DEVICES. Be provided with additional control devices upon failure of the entry control devices to function as required by 180 NAC 4-025.02(A):

- (i) 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 1 mSv (0.1 rem) in 1 hour; and
- (ii) 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.

025.02(C) FAILURE OR REMOVAL OF PHYSICAL RADIATION BARRIERS. The licensee or registrant must provide control devices so that, upon failure or removal of physical radiation barriers:

- (i) 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 1 mSv (0.1 rem) in 1 hour; and
- (ii) Conspicuous visible and audible alarm signals are generated to make potentially affected individuals aware of the hazard and the licensee or registrant 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.

025.02(D) PERMANENT STRUCTURAL COMPONENTS. Physical radiation barriers that comprise permanent structural components or walls that have no credible probability of failure or removal in ordinary circumstances need not meet the requirements of 180 NAC 4-025.02(C).

025.02(E) VISIBLE AND AUDIBLE ALARMS. Each area must 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.

025.02(F) AREA CONTROLS. Each area must 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.

025.02(G) RADIATION MEASUREMENT. Each area must 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 1 mSv (0.1 rem) in 1 hour.

025.02(H) ENTRY CONTROL DEVICE TESTING. The entry control devices required in 180 NAC 4-025.02(A), must have been tested for proper functioning:

- (i) Testing must be conducted prior to initial operation with the source of radiation on any day, unless operations were continued uninterrupted from the previous day;
- (ii) Testing must be conducted prior to resumption of operation of the source of radiation after any unintentional interruption; and
- (iii) The licensee or registrant must submit and adhere to a schedule for periodic tests of the entry control and warning systems.

025.02(I) FUNCTIONING CONTROL DEVICES. The licensee or registrant must not 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.

025.02(J) ENTRY AND EXIT PORTALS. 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, must 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.

025.03 ALTERNATIVE SAFETY MEASURES. Registrants or applicants for registrations for sources of radiation within the scope of 180 NAC 4-025.02 that will be used in a variety of positions or in locations that make it impracticable to comply with certain requirements of 180 NAC 4-025.02, may apply to the Department for approval of alternative safety measures. Alternative safety measures must provide personnel protection at least equivalent to those specified in 180 NAC 4-025.02. At least one of the alternative measures must 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.

025.04 ENTRY CONTROL DEVICES. The entry control devices required by 180 NAC 4-025.02 and 4-025.03 must be established in such a way that no individual will be prevented from leaving the area.

026. CONTROL OF CONCENTRATIONS OF RADIOACTIVE MATERIAL IN AIR. The licensee or registrant must use, to the extent practical, process or other engineering controls, containment, decontamination or ventilation to control the concentrations of radioactive material in air.

027. USE OF OTHER CONTROLS. The licensee may consider the following in limiting the concentrations of radioactive material in air.

027.01 INCREASED MONITORING AND LIMIT INTAKES. When it is not practical to apply process or other engineering controls to control the concentrations of radioactive material in air to values below those that define an airborne radioactivity area, the licensee or registrant must, consistent with maintaining the total effective dose equivalent as low as reasonably achievable (ALARA), increase monitoring and limit intakes 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 controls.

027.02 SAFETY FACTORS. If the licensee performs an as low as reasonably achievable (ALARA) analysis to determine whether or not respirators should be used, the licensee may consider safety factors other than radiological factors. The licensee may also consider the impact of respirator use on workers' industrial health and safety.

028. USE OF INDIVIDUAL RESPIRATORY PROTECTION EQUIPMENT. This section addresses the use of respiratory protection equipment.

028.01 RESPIRATORY PROTECTION EQUIPMENT. If the licensee assigns or permits the use of respiratory protection equipment to limit the intake of radioactive material, according to 180 NAC 4-027 the licensee must:

(A) Use only respiratory protection equipment that is tested and certified by the National Institute for Occupational Safety and Health (NIOSH), except as provided in 180 NAC 4-028.01(B);

(B) Submit an application for authorized use if the licensee wishes to use equipment that has not been tested or certified by the National Institute for Occupational Safety and Health (NIOSH), or for which there is no schedule for testing or certification, except as provided in 180 NAC 4-028.01. The application must include evidence that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use. This must be demonstrated either by licensee testing or on the basis of reliable test information.

(C) Implement and maintain a respiratory protection program that includes:

- (i) Air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate doses;
- (ii) Surveys and bioassays, as necessary, to evaluate actual intakes;
- (iii) Testing of respirators for operability consisting of a user seal check for face sealing devices and functional check for each other immediately prior to each use; and
- (iv) Written procedures regarding:

- (1) Monitoring, including air sampling and bioassays;
- (2) Supervision and training of respiratory users;
- (3) Fit testing;
- (4) Respiratory selection;
- (5) Breathing air quality;
- (6) Inventory and control;
- (7) Storage, issuance, maintenance, repair, testing, and quality assurance of respiratory protection equipment;
- (8) Recordkeeping; and
- (9) Limitations on periods of respirator use and relief from respirator use; and

(v) A determination by a physician that the individual user is medically fit to use the respiratory protection equipment:

- (1) Before the initial fitting of a face sealing respiratory;
- (2) Before the first field use of non-face sealing respirators, and
- (3) Either every 12 months thereafter, or periodically at a frequency determined by a physician; and

(vi) Fit testing, with fit factor ≥ 10 times the assigned protection factor (APF) for negative pressure devices, and a fit factor ≥ 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 one year. Fit testing must be performed with the facepiece operating in the negative pressure mode; and

(D) 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; and

(E) Consider limitations appropriate to the type and mode of use. When selecting respiratory devices the licensee must provide for vision correction, adequate communication, low temperature work environments, and the concurrent use of other safety or radiological protection equipment. The licensee must use equipment in such a way as not to interfere with the proper operation of the respirator; and

(F) Have standby rescue persons 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 themselves. The standby persons must be equipped with respiratory protection devices or other apparatus appropriate for the potential hazards. The standby rescue persons must observe or otherwise maintain continuous communication with the workers through 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 must be immediately available to assist all users of this type of equipment and to provide effective emergency rescue if needed; and

(G) Supply atmosphere-supplying respirators with respirable air of grade D quality or better as specified in the regulations of the Occupational Safety and Health Administration at 29 CFR 1910.134(i)(1)(ii)(2016). Grade D quality air criteria include:

- (i) Oxygen content (v/v) of 19.5-23.5%;
- (ii) Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
- (iii) Carbon monoxide (CO) content of 10 ppm or less;
- (iv) Carbon dioxide content of 1,000 ppm or less; and
- (v) Lack of noticeable odor; and

(H) 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; and

(I) Initially assume the concentration of radioactive material in the air

that is inhaled when respirators are worn to be the ambient concentration in air without respiratory protection, divided by the assigned protection factor when estimating the dose to individuals from intake of airborne radioactive materials. If the dose is later found to be greater than the estimated dose, the corrected value must be used. If the dose is later found to be less than the estimated dose, the corrected value may be used.

029. FURTHER RESTRICTIONS ON THE USE OF RESPIRATORY PROTECTION EQUIPMENT.

Licensees must comply with restrictions imposed by the Department in addition to the provisions of 180 NAC 4-027, 4-028, and Appendix 4-A as follows.

029.01 AS LOW AS REASONABLY ACHIEVABLE (ALARA). Licensees must comply with further restrictions imposed by the Department to ensure that the respiratory protection program of the licensee is adequate to limit doses to individuals from intakes of airborne radioactive materials consistent with maintaining total effective dose equivalent as low as reasonably achievable (ALARA).

029.02 RELIANCE ON RESPIRATORY PROTECTION EQUIPMENT. Licensees must comply with any limits imposed by the Department on the extent to which a licensee may use respiratory protection equipment instead of process or other engineering controls.

030. APPLICATION FOR USE OF HIGHER ASSIGNED PROTECTION

FACTORS. The licensee must obtain authorization from the Department before using assigned protection factors in excess of those specified in Appendix 4-A.

030.01 DESCRIPTION OF THE SITUATION. An application to use protection factors in excess of those specified in Appendix 4-A must describe the situation for which a need exists for higher protection factors.

030.02 CONDITIONS OF USE. An application to use protection factors in excess of those specified in Appendix 4-A must demonstrate that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.

031. SECURITY AND CONTROL OF LICENSED OR REGISTERED SOURCES OF RADIATION.

Licensed or registered sources of radiation must be secured and controlled as follows.

031.01 UNAUTHORIZED REMOVAL OR ACCESS OF RADIOACTIVE MATERIAL. The licensee or registrant must secure licensed or registered radioactive material from unauthorized removal or access.

031.02 UNAUTHORIZED USE OF RADIOACTIVE MATERIAL. The licensee or registrant must maintain constant surveillance, use devices and administrative procedures to prevent unauthorized use of licensed or registered radioactive material that is in an unrestricted area and that is not in storage.

031.03 MOBILE AND PORTABLE RADIATION MACHINES. The registrant must secure mobile or portable radiation machines that are capable of producing a high radiation area as defined in 180 NAC 1 from unauthorized removal.

031.04 UNAUTHORIZED USE OF RADIATION MACHINES. The registrant must use devices or administrative procedures to prevent unauthorized use of registered radiation machines.

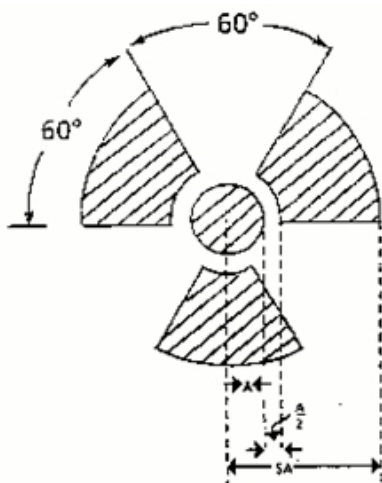
031.05 SECURITY REQUIREMENTS FOR PORTABLE GAUGES. Each portable gauge licensee must use a minimum of two independent physical controls that form tangible barriers to secure portable gauges from unauthorized removal, whenever portable gauges are not under the control and constant surveillance of the licensee.

032. RESERVED.

033. CAUTION SIGNS. This section addresses caution signs and their appearance.

033.01 STANDARD RADIATION SYMBOL. Unless otherwise authorized by the Department, the symbol prescribed by 180 NAC 4-033 must use the colors magenta, or purple, or black on yellow background. The symbol prescribed is the three-bladed design as follows:

- (A) Cross-hatched area is to be magenta, or purple, or black, and
- (B) The background is to be yellow.



033.02 EXCEPTION TO COLOR REQUIREMENTS FOR STANDARD RADIATION SYMBOL. Despite the requirements of 180 NAC 4-033.01, licensees or registrants 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.

033.03 ADDITIONAL INFORMATION ON SIGNS AND LABELS. In addition to the contents of signs and labels prescribed in 180 NAC 4, the licensee or

registrant must 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.

034. POSTING REQUIREMENTS. This section address posting requirements.

034.01 POSTING OF RADIATION AREAS. The licensee or registrant must post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA."

034.02 POSTING OF HIGH RADIATION AREAS. The licensee or registrant must 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."

034.03 POSTING OF VERY HIGH RADIATION AREAS. The licensee or registrant must post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA."

034.04 POSTING OF AIRBORNE RADIOACTIVITY AREAS. The licensee or registrant must 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."

034.05 POSTING OF AREAS OR ROOMS IN WHICH LICENSED OR REGISTERED MATERIAL IS USED OR STORED. The licensee or registrant must post each area or room in which there is used or stored an amount of licensed or registered material exceeding ten times the quantity of such material specified in Appendix 4-C of 180 NAC 4 with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."

035. EXCEPTIONS TO POSTING REQUIREMENTS. The exceptions to the posting requirements are as follows.

035.01 RADIATION FOR PERIODS OF LESS THAN EIGHT HOURS. 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:

- (A) 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 180 NAC 4; and
- (B) The area or room is subject to the licensee's or registrant's control.

035.02 PATIENT ROOMS AND AREAS. Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs according to 180 NAC 4-034 provided that the patient could be released from licensee control according to 180 NAC 7-037.

035.03 SEALED SOURCE. 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 0.05 mSv (0.005 rem) per hour.

035.04 TELETHERAPY. Rooms in hospitals or clinics that are used for teletherapy are exempt from the requirement to post caution signs in accordance with 180 NAC 4-034 if:

- (A) Access to the room is controlled in accordance with 180 NAC 7-071; and
- (B) Personnel in attendance take necessary precautions to prevent the inadvertent exposure of workers, other patients, and members of the public to radiation in excess of the limits established in 180 NAC 4-035.

036. LABELING CONTAINERS AND RADIATION MACHINES. The requirements for labeling containers and radiation machines are as follows.

036.01 RADIOACTIVE MATERIAL LABEL. The licensee or registrant must ensure that each container of licensed or registered material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL." The label must also provide information, such as the radionuclides present, an estimate of the quantity of radioactivity, the date for which the activity is estimated, radiation levels, kinds of materials, and mass enrichment, to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures.

036.02 RADIOACTIVE MATERIAL LABEL REMOVAL. Each licensee or registrant must, prior to removal or disposal of empty uncontaminated containers to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

036.03 RADIATION MACHINE LABEL. Each registrant must ensure that each radiation machine is labeled in a conspicuous manner which cautions individuals that radiation is produced when it is energized.

037. EXEMPTIONS TO LABELING REQUIREMENTS. A licensee or registrant is not required to label:

037.01 CONTAINERS HOLDING QUANTITIES LESS THAN APPENDIX 4-C. Containers holding licensed or registered material in quantities less than the quantities listed in Appendix 4-C of 180 NAC 4;

037.02 CONTAINERS HOLDING CONCENTRATIONS LESS THAN TABLE III OF APPENDIX 4-B. Containers holding licensed or registered material in concentrations less than those specified in Table III of Appendix B of 180 NAC 4;

037.03 CONTAINERS ATTENDED BY AN INDIVIDUAL. Containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by 180 NAC 4;

037.04 CONTAINERS IN TRANSPORT. Containers when they are in transport and packaged and labeled in accordance with the regulations of the U.S. Department of Transportation. Labeling of packages containing radioactive materials is required by the U.S. Department of Transportation if the amount and type of radioactive material exceeds the limits for an excepted quantity or article as defined and limited by U.S. Department of Transportation regulations 49 CFR 173.403(m) and (w) and 173.421-424;

037.05 LIMITED ACCESS CONTAINERS. Containers that are accessible only to individuals

authorized to handle or use them, or to work 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 must be retained as long as the containers are in use for the purpose indicated on the record; or

037.06 INSTALLED MANUFACTURING OR PROCESS EQUIPMENT. Installed manufacturing or process equipment, such as piping and tanks.

038. PROCEDURES FOR RECEIVING AND OPENING PACKAGES. This section addresses the procedures for opening packages containing radioactive materials.

038.01 RECEIPT. Each licensee who expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, as defined in 180 NAC 13-002 and Appendix A of 180 NAC 13, must make arrangements 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.

038.02 MONITORING. Each licensee must monitor:

- (A) The external surfaces of a labeled package for radioactive contamination unless the package contains only radioactive material in the form of a gas or in special form as defined in 180 NAC 1-002. A labeled package is a package labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U.S. Department of Transportation regulations, 49 CFR 172.403 and 172.436-440;
- (B) 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 180 NAC 13-002 and Appendix A to 180 NAC 13. A labeled package is a package labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in U.S.

Department of Transportation regulations, 49 CFR 172.403 and 172.436-440; and

(C) 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.

038.03 MONITORING. The licensee must perform the monitoring required by 180 NAC 4-038.02 as soon as practical after receipt of the package, but not later than three hours after the package is received at the licensee's or registrant's facility if it is received during the licensee's or registrant's normal working hours, or not later than three hours from the beginning of the next working day if it is received after working hours.

038.04 IMMEDIATE NOTIFICATION. The licensee must immediately notify the final delivery carrier and the Department by telephone and telegram, mailgram, or facsimile when:

(A) Removable radioactive surface contamination exceeds the limits of 180 NAC 13-015.09; or

(B) External radiation levels exceed the limits of 180 NAC 13-015.10 and 13-015.11.

038.05 WRITTEN PROCEDURES. Each licensee must:

(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.

038.06 EXEMPTION. Licensees transferring special form sources in vehicles owned or operated by the licensee to and from a work site are exempt from the contamination monitoring requirements of 180 NAC 4-038.02, but are not exempt from the monitoring requirement in 180 NAC 4-038.02 for measuring radiation levels that ensures that the source is still properly lodged in its shield.

039. WASTE DISPOSAL GENERAL REQUIREMENTS.

039.01 DISPOSAL. A licensee must dispose of licensed material only:

(A) By transfer to an authorized recipient as provided in 180 NAC 4-044 or in 180 NAC 3, 12 or 19, or to the U.S. Department of Energy; or

(B) By decay in storage in accordance with 180 NAC 4-039.03; or

(C) By release in effluents within the limits in 180 NAC 4-013; or

(D) As authorized according to 180 NAC 4-040 through 4-043 or 4-039.05 and 4-039.06.

039.02 RECEIVING WASTE. A person must be specifically licensed to receive waste containing licensed material from other persons for:

(A) Treatment prior to disposal; or

(B) Treatment or disposal by incineration; or

- (C) Decay in storage; or
- (D) Management at a facility licensed according to 180 NAC 12; or
- (E) Storage until transferred to a storage or disposal facility authorized to receive the waste.

039.03 DECAY IN STORAGE. A licensee may hold radioactive material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal without regard to its radioactivity if the licensee:

- (A) Holds radioactive material for decay a minimum of ten half-lives;
- (B) Monitors radioactive material at the container surface before disposal and determines that its radioactivity cannot be distinguished from the background radiation level with an appropriate radiation detection survey instrument set on its most sensitive scale and with no interposed shielding;
- (C) Removes or obliterates all radiation labels; except for materials that will be handled as biomedical waste after released; and
- (D) Separates and monitors each generator column individually with all radiation shielding removed to ensure that its contents have decayed to background radiation level before disposal.

039.04 DECAY IN STORAGE RECORDS. For radioactive material disposed in accordance with 180 NAC 4-039.03, the licensee must retain a record of each disposal in accordance with 180 NAC 4-054.03.

039.05 DISPOSAL AT A LICENSED LOW-LEVEL RADIOACTIVE WASTE FACILITY. Discrete sources of radium-226 and discrete sources of naturally occurring radioactive material may be disposed of at a facility licensed for land disposal of low-level radioactive waste, even though it is not defined as low-level radioactive waste. Therefore, any licensed radioactive material being disposed of at a facility, or transferred for ultimate disposal at a facility licensed for land disposal of low-level radioactive waste must meet the requirements of 180 NAC 4-044.02.

039.06 DISPOSAL AT SOLID OR HAZARDOUS WASTE FACILITY. A licensee may dispose of discrete sources of radium-226 and discrete sources of naturally occurring radioactive material, at a disposal facility authorized to dispose of such material in accordance with any Federal or State solid or hazardous waste law.

040. METHOD FOR OBTAINING APPROVAL OF PROPOSED DISPOSAL PROCEDURES.

A licensee or applicant for a license may apply to the Department for approval of proposed procedures, not otherwise authorized in these regulations, to dispose of licensed material generated in the licensee's operations. Each application must include:

- (A) A description of the waste containing licensed or registered material to be disposed of, including the physical and chemical properties that have an impact on risk evaluation, and the proposed manner and conditions of waste disposal; and
- (B) An analysis and evaluation of pertinent information on the nature of the environment; and

- (C) The nature and location of other potentially affected facilities; and
- (D) Analyses and procedures to ensure that doses are maintained as low as reasonably achievable (ALARA) and within the dose limits in 180 NAC 4.

041. DISPOSAL BY RELEASE INTO SANITARY SEWERAGE. This section addresses disposal of radioactive material by release into sanitary sewerage.

041.01 CONDITIONS FOR DISCHARGE OF LICENSED MATERIAL INTO SANITARY SEWAGE. A licensee may discharge licensed material into sanitary sewerage if each of the following conditions is satisfied:

- (A) The material is readily soluble, or is readily dispersible biological material, in water;
- (B) The quantity of licensed radioactive material that the licensee releases into the sewer in 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 Appendix 4-B of 180 NAC 4;
- (C) If more than one radionuclide is released, the following conditions must also be satisfied:
 - (i) The licensee must determine the fraction of the limit in Table III of Appendix 4-B of 180 NAC 4 represented by discharges into sanitary sewerage by dividing the actual monthly average concentration of each radionuclide released by the licensee or registrant into the sewer by the concentration of that radionuclide listed in Table III of Appendix 4-B of 180 NAC 4; and
 - (ii) The sum of the fractions for each radionuclide required by 180 NAC 4-041.01, (C)(i) does not exceed unity; and
- (D) The total quantity of licensed radioactive material that the licensee releases into the sanitary sewerage system in a year does not exceed 185 GBq (5 Ci) of hydrogen-3, 37 GBq (1 Ci) of carbon-14, and 37 GBq (1 Ci) of all other radioactive materials combined.

041.02 EXCRETA. Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limitations contained in 180 NAC 4-039.01.

042. TREATMENT OR DISPOSAL BY INCENERATION. A licensee may treat or dispose of licensed material by incineration only in the amounts and forms specified in 180 NAC 4-043 or as specifically approved by the Department according to 180 NAC 4-040.

043. DISPOSAL OF SPECIFIC WASTES. This section addresses the disposal of specific wastes.

043.01 DISPOSAL AS NOT RADIOACTIVE. A licensee may dispose of the following licensed material as if it were not radioactive:

- (A) 1.85 kBq (0.05 μ Ci), or less, of Hydrogen-3, Carbon-14 or Iodine-125 per gram of medium used for liquid scintillation counting; and

(B) 1.85 kBq (0.05 µCi), or less, of Hydrogen-3, or Carbon-14 or Iodine-125 per gram of animal tissue, averaged over the weight of the entire animal.

043.02 DISPOSAL OF TISSUE. A licensee must not dispose of tissue according to 180 NAC 4-041.01, (B) in a manner that would permit its use either as food for humans or as animal feed.

043.03 RECORD MAINTENANCE. The licensee must maintain records in accordance within 180 NAC 4-054.

043.04 CURIE AND CONCENTRATION LIMITS. Any licensee may, upon Department approval of procedures required in 180 NAC 4-043.06, dispose of radioactive material included in Appendix 4-G of 180 NAC 4, provided that it does not exceed the concentration and total curie limits contained there. Any radioactive material included in Appendix 4-G of 180 NAC 4 may be disposed of at a city or county landfill facility authorized to receive the radioactive material.

043.05 SURVEYS AND LABEL REMOVAL. Each licensee who disposes of radioactive material described in 180 NAC 4-043.01 or 4-043.04 must:

- (A) Make surveys adequate to assure that the limits of 180 NAC 4-043.01 or 4-043.04 are not exceeded; and
- (B) Remove or otherwise obliterate all labels, tags, or other markings which would indicate that the material or its contents is radioactive.

043.06 PROCEDURES. Prior to the initiation of disposals authorized by 180 NAC 4-043.04, a licensee must submit procedures to the Department for:

- (A) The physical delivery of the material to the disposal site, the physical placing of the material in the disposal location and that the material is properly covered;
- (B) Surveys to be performed for compliance with 180 NAC 4-043.05(A);
- (C) Maintaining secure packaging during transportation to the site;
- (D) Maintaining records of disposals made under 180 NAC 4-043.04; and
- (E) Written authorization by the landfill operator agreeing to such disposal.

043.07 MAINTAINING RECORDS. Nothing in 180 NAC 4, however, relieves the licensee of maintaining records showing the receipt, transfer, and disposal of such radioactive material as specified according to 180 NAC 1-004.

043.08 OTHER REGULATIONS. Nothing in 180 NAC 4 relieves the licensee from complying with other applicable federal, state or local regulations governing any other toxic or hazardous property of these materials.

043.09 EXCEPTION. Radioactive material disposed of under 180 NAC 4 is not subject to the requirements of 180 NAC 13.

044. TRANSFER FOR DISPOSAL AND WASTE MANIFESTS. This section addresses the requirements for transfer for disposal and waste manifests.

044.01 WASTE CONTROL AND WASTE MANIFEST TRACKING SYSTEM. The requirements of 180 NAC 4 and Appendix 4-D of 180 NAC 4 are designed to:

- (A) Control transfers of low-level radioactive waste by any waste generator, waste collector, or waste processor license, as defined in 180 NAC 4, who ships low-level waste either directly, or indirectly through a waste collector or waste processor, to a licensed low-level waste disposal facility;
- (B) Establish a manifest tracking system; and
- (C) Supplement existing requirements concerning transfers and recordkeeping for those wastes.

044.02 WASTE MANIFEST. Any licensee shipping radioactive waste intended for ultimate disposal at a licensed land disposal facility must:

- (A) Be accompanied by a shipment manifest as specified in Section I of Appendix 4-D OF 180 NAC 4; and
- (B) Transfer this recorded manifest information to the intended consignee in accordance with Appendix 4-D of 180 NAC 4.

044.03 CERTIFICATION BY WASTE GENERATOR. Each shipment manifest must include a certification by waste generator as specified in Section II of Appendix 4-D of 180 NAC 4.

044.04 PERSONS INVOLVED IN THE TRANSFER. Each person involved in the transfer for disposal and disposal of waste, including the waste generator, waste collector, waste processor, and disposal facility operator, must comply with the requirements specified in Section III of Appendix 4-D of 180 NAC 4.

045. COMPLIANCE WITH ENVIRONMENTAL AND HEALTH PROTECTION REGULATIONS. Nothing in 180 NAC 4-039 through 4-044 relieves the licensee or registrant from complying with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of according to 180 NAC 4-039 through 4-044.

046. GENERAL PROVISIONS FOR RECORDS. This section addresses general provisions for records.

046.01 UNITS. Each licensee or registrant must use the International System of Units (SI) units becquerel, gray, sievert and coulomb per kilogram, or the special units curie, rad, rem, and roentgen, including multiples and subdivisions, and must clearly indicate the units of all quantities on records required by 180 NAC 4.

046.02 SHIPMENT MANIFESTS. Despite of the requirements of 180 NAC 4-046.01, when recording information on shipment manifests, as required in 180 NAC 4-044.02(A), information must be recorded in the International System of Units (SI) or in SI and units as specified in 180 NAC 4-046.01.

046.03 CLEAR DISTINCTION AMONG QUANTITIES. The licensee or registrant must make a clear distinction among the quantities entered on the records required by 180 NAC 4, including total effective dose equivalent, total organ dose equivalent, shallow dose equivalent, lens dose equivalent, deep dose equivalent, or committed effective dose equivalent.

047. RECORDS OF RADIATION PROTECTION PROGRAMS. This section addresses records of radiation protection programs.

047.01 RADIATION PROTECTION PROGRAM RECORDS. Each licensee or registrant must 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.

047.02 RECORD RETENTION. The licensee or registrant must retain the records required by 180 NAC 4-047.01(A) until the Department terminates each pertinent license or registration requiring the record. The licensee or registrant must retain the records required by 180 NAC 4-047.01(B) for three years after the record is made.

048. RECORDS OF SURVEYS. This section addresses records of surveys.

048.01 SURVEYS AND CALIBRATIONS. Each licensee or registrant must maintain records showing the results of surveys and calibrations required by 180 NAC 4-021 and 4-038.02. The licensee or registrant must retain these records for three years after the record is made.

048.02 RECORD RETENTION. The licensee or registrant must retain each of the following records until the Department terminates each pertinent license or registration requiring the record:

- (A) Records of the results of surveys to determine the dose from external sources of radiation used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents. This includes those records of results of surveys to determine the dose from external sources and used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents required under the standards for protection against radiation in effect prior to May 30, 1994;
- (B) Records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose. This includes those records of the results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose required under the standards for protection against radiation in effect prior to May 30, 1994.
- (C) Records showing the results of air sampling, surveys, and bioassays required according to 180 NAC 4-028.01(C)(i). This includes those records showing the results of air sampling, surveys and bioassays

required under the standards for protection against radiation in effect prior to May 30, 1994; and

(D) Records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment. This includes those records of the results of measurements and calculations used to evaluate the release of radioactive effluents to the environment required under the standards for protection against radiation in effect prior to May 30, 1994.

049. RECORDS OF TESTS FOR LEAKAGE OR CONTAMINATION OF SEALED SOURCES. Records of tests for leakage or contamination of sealed sources required by 180 NAC 1-011 must be kept in units of Becquerel or microcurie and maintained for inspection by the Department for five years after the records are made.

050. RECORDS OF PRIOR OCCUPATIONAL DOSE. For each individual who is likely to receive in a year, an occupational dose requiring monitoring according to 180 NAC 4-022 the licensee or registrant must retain records:

- (A) Of prior occupational dose and exposure history as specified in 180 NAC 4-009 on Department Form NRH-1 or equivalent until the Department terminates each pertinent license or registration requiring this record; and
- (B) Used in preparing Department Form NRH-1 for three years after the record is made.

051. RECORDS OF PLANNED SPECIAL EXPOSURES. This section addresses records of planned special exposures.

051.01 RECORD MAINTENANCE. For each use of the provisions of 180 NAC 4-010 for planned special exposures, the licensee or registrant must 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) What precautions were taken to assure that doses were maintained as low as reasonably achievable (ALARA);
- (F) What individual and collective doses were expected to result; and
- (G) The doses actually received in the planned special exposure.

051.02 PLANNED SPECIAL EXPOSURE RECORD RETENTION. The licensee or registrant must retain the records until the Department terminates each pertinent license or registration requiring these records.

052. RECORDS OF INDIVIDUAL MONITORING RESULTS. This section addresses records of individual monitoring results.

052.01 RECORDKEEPING REQUIREMENT. Each licensee or registrant must maintain records of doses received by all individuals for whom monitoring

was required according to 180 NAC 4-022 and records of doses received during planned special exposures, accidents, and emergency conditions. Assessments of dose equivalent and records made using units in effect before October 30, 1996 for 180 NAC 4 need not be changed. These records must include, 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 180 NAC 4-006;
- (C) The committed effective dose equivalent assigned to the intake of radionuclides;
- (D) The specific information used to calculate the committed effective dose equivalent according to 180 NAC 4-008.03;
- (E) The total effective dose equivalent when required by 180 NAC 4-006; and
- (F) The total of the deep dose equivalent and the committed dose to the organ receiving the highest total dose.

052.02 RECORDKEEPING FREQUENCY. The licensee or registrant must make entries of the records specified in 180 NAC 4-052.01 at intervals not to exceed one year.

052.03 RECORDKEEPING FORMAT. The licensee or registrant must maintain the records specified in 180 NAC 4-052.01 on Department Form NRH-2, in accordance with the instructions for Department Form NRH-2, or in clear and legible records containing all the information required by Department Form NRH-2.

052.04 RECORD MAINTENANCE. The licensee or registrant must maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman. The declaration of pregnancy, including the estimated date of conception, must also be kept on file, but may be maintained separately from the dose records.

052.05 RECORD RETENTION. The licensee or registrant must retain each required form or record until the Department terminates each pertinent license or registration requiring the record.

053. RECORDS OF DOSE TO INDIVIDUAL MEMBERS OF THE PUBLIC. This section addresses records of dose to individual members of the public.

053.01 RECORD MAINTENANCE. Each licensee or registrant must maintain records sufficient to demonstrate compliance with the dose limit for individual members of the public. See 180 NAC 4-013.

053.02 RECORD RETENTION. The licensee or registrant must retain the records required by 180 NAC 4-053 until the Department terminates each pertinent license or registration requiring the record.

054. RECORDS OF WASTE DISPOSAL. This section addresses records of waste disposal.

054.01 PRIOR DISPOSALS. Each licensee must maintain records of the disposal of licensed materials made according to 180 NAC 4-040 through 4-043 and 180 NAC 12, and disposal by burial in soil, including burials authorized before August 22, 1982.

054.02 RECORD RETENTION. The licensee must retain the records required by 180 NAC 4-054.01 until the Department terminates each pertinent license requiring the record. Requirements for disposition of these records, prior to license termination, are located in 180 NAC 3-030 for activities licensed under 180 NAC 4. This includes records required under the standards for protection against radiation in effect prior to May 30, 1994.

054.03 DISPOSAL RECORDS. A licensee must maintain records of the disposal of licensed materials, as required by 180 NAC 4-039.03 for three years. The record must include the date of the disposal, the date on which the radioactive material was placed in storage, the specific survey instrument used, the background radiation level, the radiation level measured at the surface of each waste container, and the name of the individual who performed the survey.

055. RECORDS OF TESTING ENTRY CONTROL DEVICES FOR VERY HIGH RADIATION AREAS. This section addresses records of testing entry control devices for very high radiation areas.

055.01 RECORDS OF TESTS. Each licensee or registrant must maintain records of tests made according to 180 NAC 4-025.02(H), on entry control devices for very high radiation areas. These records must include the date, time, and results of each such test of function.

055.02 RECORD RETENTION. The licensee or registrant must retain the records required by 180 NAC 4-055.01 for three years after the record is made.

056. FORM OF RECORDS. Each record required by 180 NAC 4 must be legible throughout the specified retention period. The record must be the original or a reproduced copy or a microform, provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials, and signatures. The licensee or registrant must maintain adequate safeguards against tampering with and loss of records.

057. REPORTS OF STOLEN, LOST, OR MISSING LICENSED OR REGISTERED SOURCES OF RADIATION. This section addresses reports of stolen, lost or missing sources of radiation.

057.01 TELEPHONE REPORTS. Each licensee or registrant must report to the Department by telephone as follows:

- (A) Immediately after its occurrence becomes known to the licensee or registrant, stolen, lost, or missing licensed radioactive material in an aggregate quantity equal to or greater than 1,000 times the quantity specified in Appendix 4-C of 180 NAC 4 under such circumstances that it appears to the licensee that an exposure could result to individuals in unrestricted areas;
- (B) Within 30 days after its occurrence becomes known to the licensee or registrant, lost, stolen, or missing licensed radioactive material in an aggregate quantity greater than 10 times the quantity specified in Appendix 4-C of 180 NAC 4 that is still missing; and
- (C) Immediately after its occurrence becomes known to the registrant, a stolen, lost, or missing radiation machine.

057.02 WRITTEN REPORTS. Each licensee or registrant required to make a report according to 180 NAC 4-057.01 must, within 30 days after making the telephone report, make a written report to the Department setting forth the following information:

- (A) A description of the licensed or registered source of radiation involved, including, for radioactive material, the kind, quantity, and chemical and physical form; and, for radiation machines, the manufacturer, model and serial number, type and maximum energy of radiation emitted;
- (B) A description of the circumstances under which the loss or theft occurred;
- (C) A statement of disposition, or probable disposition, of the licensed or registered source of radiation involved;
- (D) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas;
- (E) Actions that have been taken, or will be taken, to recover the source of radiation; and
- (F) Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed or registered sources of radiation.

057.03 ADDITIONAL SUBSTANTIVE INFORMATION. Subsequent to filing the written report, the licensee or registrant must also report additional substantive information on the loss or theft within 30 days after the licensee or registrant learns of such information.

057.04 NAMES OF INDIVIDUALS. The licensee or registrant must prepare any report filed with the Department according to 180 NAC 4-057 so that names of individuals who may have received exposure to radiation are stated in a separate and detachable portion of the report.

058. NOTIFICATION OF INCIDENTS. This section addresses notification requirements for incidents involving sources of radiation.

058.01 IMMEDIATE NOTIFICATION. In addition to other requirements for notification, each licensee or registrant must immediately report each event

involving a source of radiation possessed by the licensee or registrant that may have caused or threatens to cause:

(A) An individual to receive:

- (i) A total effective dose equivalent of 0.25 Sv (25 rem) or more;
- (ii) A lens dose equivalent of 0.75 Sv (75 rem) or more; or
- (iii) A shallow dose equivalent to the skin or extremities of 2.5 Gy (250 rad) or more; or

(B) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the occupational annual limit on intake (ALI). This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

058.02 TWENTY-FOUR HOUR NOTIFICATION. Each licensee or registrant must, within 24 hours of discovery of the event, report to the Department each event involving loss of control of a licensed or registered source of radiation possessed by the licensee or registrant that may have caused, or threatens to cause:

(A) An individual to receive, in a period of 24 hours:

- (i) A total effective dose equivalent exceeding 0.05 Sv (5 rem);
- (ii) A lens dose equivalent exceeding 0.15 Sv (15 rem); or
- (iii) A shallow dose equivalent to the skin or extremities exceeding 0.5 Sv (50 rem); or

(B) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational annual limit on intake (ALI). This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

058.03 NAMES OF INDIVIDUALS. The licensee or registrant must prepare each report filed with the Department according to 180 NAC 4-058 so that names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.

058.04 INITIAL CONTACT WITH THE DEPARTMENT. Licensees or registrants must make the reports required by 180 NAC 4-058.01 and 4-058.02 by initial contact by telephone to the Department and must confirm the initial contact by telegram, mailgram, or electronic media to the Department.

058.05 EXCEPTION. The provisions of 180 NAC 4-058 do not apply to doses that result from planned special exposures, provided such doses are within the limits for planned special exposures and are reported according to 180 NAC 4-060.

059. REPORTS OF EXPOSURES, RADIATION LEVELS, AND CONCENTRATIONS OF RADIOACTIVE MATERIAL EXCEEDING THE CONSTRAINTS OR LIMITS. This section addresses report of exposures, radiation levels and concentrations of radioactive material exceeding the constraints or limits.

059.01 REPORTABLE EVENTS. In addition to the notification required by 180 NAC 4-058, each licensee or registrant must submit a written report within 30 days after learning of any of:

- (A) Any incident for which notification is required by 180 NAC 4-058; or
- (B) Doses in excess of any of the following:

- (i) The occupational dose limits for adults in 180 NAC 4-005;
- (ii) The occupational dose limits for a minor in 180 NAC 4-011;
- (iii) The limits for an embryo/fetus of a declared pregnant woman in 180 NAC 4-012;
- (iv) The limits for an individual member of the public in 180 NAC 4-013;
- (v) Any applicable limit in the license or registrant; or
- (vi) The as low as reasonably achievable (ALARA) constraints for air emissions established under 180 NAC 4-004.04; or

- (C) Levels of radiation or concentrations of radioactive material in:

- (i) A restricted area in excess of applicable limits in the license; or
- (ii) An unrestricted area in excess of 10 times the applicable limit in 180 NAC 4 or in the license, whether or not involving exposure of any individual in excess of the limits in 180 NAC 4-013; or

- (D) Levels of radiation or releases of radioactive material in excess of U.S. Environmental Protection Agency's generally applicable environmental radiation standards in 40 CFR 190, or of license conditions related to those standards for licensees subject to the provisions.

059.02 CONTENTS OF REPORTS. Each report:

- (A) Required by 180 NAC 4-059 must describe the extent of exposure of individuals to radiation and radioactive material, including, as appropriate:

- (i) Estimates of each individual's dose; and
- (ii) The levels of radiation and concentrations of radioactive material involved; and
- (iii) The cause of the elevated exposures, dose rates, or concentrations; and
- (iv) Corrective steps taken or planned to ensure against a recurrence, including the schedule for achieving conformance with applicable limits, as low as reasonably achievable (ALARA) constraints, generally applicable environmental standards and

associated license conditions; and

(B) Filed according to 180 NAC 4-059.01 must include for each individual exposed: the name, identifying number, and date of birth. With respect to the limit for the embryo fetus in 180 NAC 4-012, the identifiers should be those of the declared pregnant woman. The report must be prepared so that this information is stated in a separate and detachable portion of the report.

059.03 WRITTEN REPORTS OF EVENTS. All licensees or registrants who make reports according to 180 NAC 4-059.01 must submit the report in writing to the Department.

060. REPORTS OF PLANNED SPECIAL EXPOSURES. The licensee or registrant must submit a written report to the Department within 30 days following any planned special exposure conducted in accordance with 180 NAC 4-010, informing the Department that a planned special exposure was conducted and indicating the date the planned special exposure occurred and the information required by 180 NAC 4-051.

061. RESERVED.

062. REPORTS OF INDIVIDUAL MONITORING. This section addresses reports of individual monitoring.

062.01 APPLICABILITY. 180 NAC 4 applies to each person:

(A) Licensed by the Department to possess or use sources of radiation for purposes of industrial radiography according to 180 NAC 3 or 180 NAC 5;

(B) Licensed by the Department to receive radioactive waste from other persons for disposal according to 180 NAC 12; or

(C) Licensed by the Department to possess or use at any time, for processing or manufacturing for distribution according to 180 NAC 3 or 180 NAC 7, radioactive material in quantities exceeding any one of the following quantities:

Radionuclide	Ci	Activity
		GBq
Cesium-137	1	37
Cobalt-60	1	37
Gold-198	100	3,700
Iodine-131	1	37
Iridium-192	10	370
Krypton-85	1,000	37,000
Promethium-147	10	370
Technetium-99m	1,000	37,000

(D) Licensees required by a license condition, rule, regulation, or order according to 180 NAC 1-007 who are licensed to use radionuclides not specified in 180 NAC 4-062.01(C) in quantities sufficient to cause comparable radiation levels.

062.02 ANNUAL REPORT. Each licensee in a category listed in 180 NAC 4-062.01 must submit an annual report of the results of individual monitoring carried out by the licensee for each individual for whom monitoring was required by 180 NAC 4-022 during that year. The licensee may include additional data for individuals for whom monitoring was provided but not required. The licensee must use Department Form NRH-2 or electronic media containing all the information required by Department Form NRH-2.

062.03 ANNUAL REPORT DEADLINE. The licensee submit to the Department the report required by 180 NAC 4-060.02, covering the preceding year, on or before April 30 of each year.

063. NOTIFICATIONS AND REPORTS TO INDIVIDUALS. This section addresses notifications and reports to individuals.

063.01 REPORTS. Requirements for notification and reports to individuals of exposure to radiation or radioactive material are specified in 180 NAC 10-004.

063.02 DEPARTMENT NOTIFICATION. When a licensee or registrant is required, according to the provisions of 180 NAC 4-059, 4-060, and 4-062, to report to the Department any exposure of identified occupationally exposed individual, or an identified member of the public, to radiation or radioactive material, the licensee or registrant must also provide a copy of the report submitted to the Department to the individual. This report must be transmitted at a time no later than the transmittal to the Department.

064. REPORTS OF LEAKING OR CONTAMINATED SEALED SOURCES. The licensee must file a report within 5 days with the Department if the test for leakage or contamination required according to 180 NAC 1-011 indicates a sealed source is leaking or contaminated. The report must include the equipment involved, the test results and the corrective action taken.

065. VACATING PREMISES. Each specific licensee must, no less than 30 days before vacating or relinquishing possession or control of premises which may have been contaminated with radioactive material as a result of their activities, notify the Department in writing of intent to vacate. When deemed necessary by the Department, the licensee must decontaminate the premises in such a manner as the Department may specify.

066. REPORTS OF TRANSACTIONS INVOLVING NATIONALLY TRACKED SOURCES. Each licensee who manufactures, transfers, receives, disassembles, or disposes of a nationally tracked source (Refer to Appendix 4-H) must complete and submit a National Source Tracking Transaction Report as specified in 180 NAC 4-066.01 through 4-066.05 for each type of transaction.

066.01 MANUFACTURE. Each licensee who manufactures a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

- (A) The name, address, and license number of the reporting licensee;
- (B) The name of the individual preparing the report;
- (C) The manufacturer, model, and serial number of the source;
- (D) The radioactive material in the source;
- (E) The initial source strength in becquerels (curies) at the time of manufacture; and
- (F) The manufacture date of the source.

066.02 TRANSFER. Each licensee that transfers a nationally tracked source to another person must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

- (A) The name, address, and license number of the reporting licensee;
- (B) The name of the individual preparing the report;
- (C) The name and license number of the recipient facility and the shipping address;
- (D) The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;
- (E) The radioactive material in the source;
- (F) The initial or current source strength in becquerels (curies);
- (G) The date for which the source strength is reported;
- (H) The shipping date;
- (I) The estimated arrival date; and
- (J) For nationally tracked sources transferred as waste under a Uniform Low-Level Radioactive Waste Manifest, the waste manifest number and the container identification of the container with the nationally tracked source.

066.03 RECEIVE. Each licensee that receives a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

- (A) The name, address, and license number of the reporting licensee;
- (B) The name of the individual preparing the report;
- (C) The name, address, and license number of the person that provided the source;
- (D) The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;
- (E) The radioactive material in the source;
- (F) The initial or current source strength in becquerels (curies);
- (G) The date for which the source strength is reported;
- (H) The date of receipt, and
- (I) For material received under a Uniform Low-Level Radioactive Waste Manifest, the waste manifest number and the container identification with the nationally tracked source.

066.04 DISASSEMBLE. Each licensee that disassembles a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

- (A) The name, address, and license number of the reporting licensee;
- (B) The name of the individual preparing the report;
- (C) The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source;
- (D) The radioactive material in the source;
- (E) The initial or current source strength in becquerels (curies);
- (F) The date for which the source strength is reported;
- (G) The disassemble date of the source.

066.05 DISPOSE. Each licensee who disposes of a nationally tracked source must complete and submit a National Source Tracking Transaction Report. The report must include the following information:

- (A) The name, address, and license number of the reporting licensee;
- (B) The name of the individual preparing the report;
- (C) The waste manifest number;
- (D) The container identification with the nationally tracked source;
- (E) The date of disposal; and
- (F) The method of disposal.

066.06 SUBMISSION DEADLINE. The reports discussed in 180 NAC 4-066.01 through 4-066.05 must be submitted by the close of the next business day after the transaction. A single report may be submitted for multiple sources and transactions. The reports must be submitted to the National Source Tracking System by using:

- (A) The on-line National Source Tracking System;
- (B) Electronically using a computer readable format;
- (C) By facsimile;
- (D) By mail to the address on the National Source Tracking Transaction Report Form (NRC Form 748); or
- (E) By telephone with follow-up by facsimile or mail.

066.07 ERROR CORRECTION. Each licensee must correct any error in previously filed reports or file a new report for any missed transaction within 5 business days of the discovery of the error or missed transaction. Such errors may be detected by a variety of methods such as administrative reviews or by physical inventories required by regulation. In addition, each licensee must reconcile the inventory of nationally tracked sources possessed by the licensee against that licensee's data in the National Source Tracking System. The reconciliation must be conducted during the month of January in each year. The reconciliation process must include resolving any discrepancies between the National Source Tracking System and the actual inventory by filing the reports identified in 180 NAC 4-066.01 through 4-066.05. By January 31 of each year, each licensee must submit to the National Source Tracking System confirmation that the data in the National Source Tracking System is correct.

