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TITLE 33
State Department of Health

DECEMBER 1994

CHAPTER 33-15-01

33-15-01-04. Definitions. As used in this article, except as otherwise specifically provided or where the context indicates otherwise, the following words shall have the meanings ascribed to them in this section:

1. "Act" means North Dakota Century Code chapter 23-25.
2. "Air contaminant" means any solid, liquid, gas, or odorous substance or any combination thereof.
3. "Air pollution" means the presence in the outdoor atmosphere of one or more air contaminants in such quantities and duration as is or may be injurious to human health, welfare, or property, animal or plant life, or which unreasonably interferes with the enjoyment of life or property.
4. "Ambient air" means the surrounding outside air.
5. "ASME" means the American society of mechanical engineers.
6. "Control equipment" means any device or contrivance which prevents or reduces emissions.
7. "Department" means the North Dakota state department of health and consolidated laboratories.
8. "Emission" means a release of air contaminants into the ambient air.

9. "Existing" means equipment, machines, devices, articles, contrivances, or installations which are in being on or before July 1, 1970, unless specifically designated within this article; except that any existing equipment, machine, device, contrivance, or installation which is altered, repaired, or rebuilt after July 1, 1970, must be reclassified as "new" if such alternation, rebuilding, or repair results in the emission of an additional or greater amount of air contaminants.
10. "Federally enforceable" means all limitations and conditions which are enforceable by the administrator of the United States environmental protection agency including those requirements developed pursuant to title 40 CFR, Code of Federal Regulations, parts 60 and 61, requirements within any applicable state implementation plan, any permit requirements established pursuant to title 40 CFR, Code of Federal Regulations, 52.21 or under regulations approved pursuant to title 40 CFR, Code of Federal Regulations, part 51, subpart I, including operating permits issued under a United States environmental protection agency-approved program that is incorporated into the state implementation plan and expressly requires adherence to any permit issued under such program.
11. "Fuel burning equipment" means any furnace, boiler apparatus, stack, or appurtenances thereto used in the process of burning fuel or other combustible material for the primary purpose of producing heat or power by indirect heat transfer.
12. "Fugitive emissions" means solid airborne particulate matter, fumes, gases, mist, smoke, odorous matter, vapors, or any combination thereof generated incidental to an operation process procedure or emitted from any source other than through a well-defined stack or chimney.
13. "Garbage" means putrescible animal and vegetable wastes resulting from the handling, preparation, cooking, and consumption of food, including wastes from markets, storage facilities, handling, and sale of produce and other food products.
14. "Heat input" means the aggregate heat content of all fuels whose products of combustion pass through a stack or stacks. The heat input value to be used shall be the equipment manufacturer's or designer's guaranteed maximum input, whichever is greater.
15. "Incinerator" means any article, machine, equipment, device, contrivance, structure, or part of a structure used for the destruction of garbage, rubbish, or other wastes by burning or to process salvageable material by burning.

16. "Inhalable particulate matter" means particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers. Also known as PM₁₀.
17. "Installation" means any property, real or personal, including, but not limited to, processing equipment, manufacturing equipment, fuel burning equipment, incinerators, or any other equipment, or construction, capable of creating or causing emissions.
18. "Multiple chamber incinerator" means any article, machine, equipment, contrivance, structure, or part of a structure used to dispose of combustible refuse by burning, consisting of three or more refractory lined combustion furnaces in series physically separated by refractory walls, interconnected by gas passage ports or ducts and employing adequate parameters necessary for maximum combustion of the material to be burned.
19. "New" means equipment, machines, devices, articles, contrivances, or installations built or installed on or after July 1, 1970, unless specifically designated within this article, and installations existing at said stated time which are later altered, repaired, or rebuilt and result in the emission of an additional or greater amount of air contaminants.
20. "Opacity" means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.
21. "Open burning" means the burning of any matter in such a manner that the products of combustion resulting from the burning are emitted directly into the ambient air without passing through an adequate stack, duct, or chimney.
22. "Particulate matter" means any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than one hundred micrometers.
23. "Particulate matter emissions" means all finely divided solid or liquid material, other than uncombined water, emitted to the ambient air.
24. "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this state, any other state or political subdivision or agency thereof and any legal successor, representative agent, or agency of the foregoing.
25. "Pesticide" includes (a) any agent, substance, or mixture of substances intended to prevent, destroy, control, or mitigate any insect, rodent, nematode, predatory animal, snail, slug, bacterium, weed, and any other form of plant or animal life,

fungus, or virus, that may infect or be detrimental to persons, vegetation, crops, animals, structures, or households or be present in any environment or which the department may declare to be a pest, except those bacteria, fungi, protozoa, or viruses on or in living man or other animals; (b) any agent, substance, or mixture of substances intended to be used as a plant regulator, defoliant, or desiccant; and (c) any other similar substance so designated by the department, including herbicides, insecticides, fungicides, nematocides, molluscicides, rodenticides, lampreycides, plant regulators, gametocides, post-harvest decay preventatives, and antioxidants.

26. "PM₁₀" means particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers.
27. "PM₁₀ emissions" means finely divided solid or liquid material with an aerodynamic diameter less than or equal to a nominal ten micrometers emitted to the ambient air.
28. "Premises" means any property, piece of land or real estate, or building.
29. "Process weight" means the total weight of all materials introduced into any specific process which may cause emissions. Solid fuels charged will be considered as part of the process weight, but liquid and gaseous fuels and combustion air will not.
30. "Process weight rate" means the rate established as follows:
 - a. For continuous or longrun steady state operations, the total process weight for the entire period of continuous operation or for a typical portion thereof, divided by the number of hours of such period or portion thereof.
 - b. For cyclical or batch operations, the total process weight for a period that covers a complete operation or an integral number of cycles, divided by the hours of actual process operation during such a period. Where the nature of any process or operation or the design of any equipment is such as to permit more than one interpretation of this definition, the interpretation that results in the minimum value for allowable emission shall apply.
31. "Public nuisance" means any condition of the ambient air beyond the property line of the offending person which is offensive to the senses, or which causes or constitutes an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property.

32. "Refuse" means any combustible waste material, trade waste, rubbish, or garbage containing carbon in a free or combined state.
33. "Rubbish" means nonputrescible solid wastes consisting of both combustible and noncombustible wastes. Combustible rubbish includes paper, rags, cartons, wood, furniture, rubber, plastics, yard trimmings, leaves, and similar materials. Noncombustible rubbish includes glass, crockery, cans, dust, metal furniture and like materials which will not burn at ordinary incinerator temperatures (one thousand six hundred to one thousand eight hundred degrees Fahrenheit [1144 degrees Kelvin to 1255 degrees Kelvin]).
34. "Salvage operation" means any operation conducted in whole or in part for the salvaging or reclaiming of any product or material.
35. "Smoke" means small gasborne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon, ash, and other combustible material, that form a visible plume in the air.
36. "Source" means any property, real or personal, or person contributing to air pollution.
37. "Source operation" means the last operation preceding emission which operation (a) results in the separation of the air contaminant from the process materials or in the conversion of the process materials into air contaminants, as in the case of combustion fuel; and (b) is not an air pollution abatement operation.
38. "Stack or chimney" means any flue, conduit, or duct arranged to conduct emissions.
39. "Submerged fill pipe" means any fill pipe the discharge opening of which is entirely submerged when the liquid level is six inches [15.24 centimeters] above the bottom of the tank; or when applied to a tank which is loaded from the side, means any fill pipe the discharge opening of which is entirely submerged when the liquid level is one and one-half times the fill pipe diameter in inches [centimeters] above the bottom of the tank.
40. "Standard conditions" means a dry gas temperature of sixty-eight degrees Fahrenheit [293 degrees Kelvin] and a gas pressure of fourteen and seven-tenths pounds per square inch absolute [101.3 kilopascals].
41. "Trade waste" means solid, liquid, or gaseous waste material resulting from construction or the conduct of any business, trade, or industry, or any demolition operation, including

wood, wood containing preservatives, plastics, cartons, grease, oil, chemicals, and cinders.

42. "Volatile organic compounds" means any compounds of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. This includes any such organic compound other than the following, which have been determined to have negligible photochemical reactivity: methane; ethane; methylene chloride (dichloromethane); 1, 1, 1-trichloroethane (methyl chloroform); 1,1,1-trichloro-2,2,2-trifluoroethane (CFC-113); trichlorofluoromethane (CFC-11); dichlorodifluoromethane (CFC-12); chlorodifluoromethane (CFC-22); trifluoromethane (FC-23); 1,2-dichloro 1,1,2,2-tetrafluoroethane (CFC-114); chloropentafluoroethane (CFC-115); 1,1,1-trifluoro 2,2-dichloroethane (HCFC-123); 1,1,1,2-tetrafluoroethane (HFC-134a); 1,1-dichloro 1-fluoroethane (HCFC-141b); 1-chloro 1,1-difluoroethane (HCFC-142b); 2-chloro - 1,1,1,2-tetrafluoroethane (HCFC-124); pentafluoroethane (HFC-125); 1,1,2,2-tetrafluoroethane (HFC-134); 1,1,1-trifluoroethane (HFC-143a); 1,1-difluoroethane (HFC-152a); and perfluorocarbon compounds which fall into these classes:
- a. Cyclic, branched, or linear, completely fluorinated alkanes;
 - b. Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
 - c. Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
 - d. Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

For purposes of determining compliance with emission limits, volatile organic compounds will be measured by the test methods in title 40 GFR, Code of Federal Regulations, part 60, appendix A, as applicable. Where such a method also measures compounds with negligible photochemical reactivity, these negligibly reactive compounds may be excluded as volatile organic compounds if the amount of such compounds is accurately quantified, and such exclusion is approved by the department.

As a precondition to excluding these compounds as volatile organic compounds or at any time thereafter, the department may require an owner or operator to provide monitoring or testing methods and results demonstrating, to the satisfaction of the enforcement authority, the amount of negligibly reactive compounds in the source's emissions.

43. "Waste classification" means the seven classifications of waste as defined by the incinerator institute of America and American society of mechanical engineers.

History: Amended effective October 1, 1987; January 1, 1989; June 1, 1990; June 1, 1992; March 1, 1994; December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-01-17. Enforcement.

1. Enforcement action will be consistent with procedures as approved by the United States environmental protection agency.
2. Notwithstanding any other provision in this article, any credible evidence may be used for the purpose of establishing whether a person has violated or is in violation of this article.
 - a. Information from the use of the following methods is presumptively credible evidence of whether a violation has occurred at a source:
 - (1) An enhanced monitoring protocol approved for the source pursuant to sections 114(a)(3) and 504(b) of the Federal Clean Air Act [42 U.S.C. 7401, et seq.] or the regulations promulgated thereunder.
 - (2) A monitoring method approved for the source pursuant to paragraph 3 of subdivision a of subsection 5 of section 33-15-14-06 and incorporated in a federally enforceable title V permit to operate.
 - (3) Compliance test methods specified in this article.
 - b. The following testing, monitoring, and information-gathering methods are presumptively credible testing, monitoring, or information-gathering methods:
 - (1) Any federally enforceable monitoring or testing methods, including those under title 40, Code of Federal Regulations, parts 50, 51, 60, 61, and 75.
 - (2) Other testing, monitoring, or information-gathering methods that produce information comparable to that produced by any method in paragraph 1 or in subdivision a of subsection 2 of section 33-15-01-17.

History: Effective June 1, 1990; amended effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-10

33-15-01-18. Compliance certifications. Notwithstanding any other provision in this article, for the purpose of submission of compliance certifications the owner or operator is not prohibited from using the following in addition to any specified compliance methods:

1. An enhanced monitoring protocol approved for the source pursuant to sections 114(a)(3) and 504(b) of the Federal Clean Air Act or the regulations promulgated thereunder.
2. Any other monitoring method approved for the source under paragraph 3 of subdivision a of subsection 5 of section 33-15-14-06 and incorporated into a federally enforceable title V permit to operate.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-10

CHAPTER 33-15-02

33-15-02-05. Methods of sampling and analysis. Air contaminants listed in under table 1 shall be measured by the method or methods listed in title 40, Code of Federal Regulations, parts 50 and 53. Hydrogen sulfide sampling equipment and methods must be approved by the department. Hydrogen sulfide analyzers must be designed for use as ambient air quality monitors and must be capable of meeting performance specifications as determined by the department.

The sampling and analytical procedures employed and the number, duration, and location of samples to be taken to measure ambient levels of air contaminants shall be consistent with obtaining results which are precise, accurate, and representative of the conditions being evaluated.

History: Amended effective October 1, 1987; December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-02-07. Concentrations of air contaminants in the ambient air restricted.

1. No person may cause or permit the emission of contaminants to the ambient air from any source in such a manner and amount that exceeds, at any place beyond the premises on which the source is located, those standards stated in section 33-15-02-04.
2. Nothing in any other part or section of this article may in any manner be construed as authorizing or legalizing the emission of air contaminants in such manner as prohibited in subsection 1.

History: Amended effective October 1, 1987.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

Table 1. AMBIENT AIR QUALITY STANDARDS

Air Contaminants	Standards (Maximum Permissible Concentrations)	
Particulates	50	micrograms per cubic meter of air, expected annual arithmetic mean
Inhalable Particulate (PM ₁₀)	150	micrograms per cubic meter of air, maximum 24-hour average concentration with no more than one expected exceedance per year
.....		
Sulfur Dioxide	0.023	parts per million (60 micrograms per cubic meter of air), maximum annual arithmetic mean concentration
	0.099	parts per million (260 micrograms per cubic meter of air), maximum 24-hour average concentration
	0.273	parts per million (715 micrograms per cubic meter of air), maximum 1-hour average concentration
.....		
Hydrogen Sulfide	10.0	parts per million (14 milligrams per cubic meter of air), maximum instantaneous (ceiling) concentration not to be exceeded
	0.20	parts per million (280 micrograms per cubic meter of air), maximum 1-hour average concentration not to be exceeded more than once per month
	0.10	parts per million (140 micrograms per cubic meter of air), maximum 24-hour average concentration not to be exceeded more than once per year
	0.02	parts per million (28 micrograms per cubic meter of air), maximum arithmetic mean concentration averaged over three consecutive months
.....		
Carbon Monoxide	9	parts per million (10 milligrams per cubic meter of air), maximum 8-hour concentration not to be exceeded more than once per year
	35	parts per million (40 milligrams per cubic meter of air), maximum 1-hour concentration not to be exceeded more than once per year
.....		
Ozone	0.12	parts per million (235 micrograms per cubic meter of air), maximum 1-hour concentration not to be exceeded more than once per year

Nitrogen Dioxide	0.05 <u>0.053</u>	parts per million (100 micrograms per cubic meter of air), maximum annual arithmetic mean
	0.1	parts per million (200 micrograms per cubic meter of air), maximum 1-hour concentration not to be exceeded over 1-percent-of-the-time-in-any-calendar quarter
Lead	1.5	micrograms per cubic meter of air, maximum arithmetic mean averaged over a calendar quarter

History: Amended effective December 1, 1994.

Table 2. METHODS OF AIR CONTAMINANT MEASUREMENT

[Repealed effective October 1, 1987]

CHAPTER 33-15-12

33-15-12-01.1. Scope. The subparts and appendices of title 40, Code of Federal Regulations, part 60 [40-CFR--60], as they exist on May 1, 1991 1994, which are listed in under section 33-15-12-02 are incorporated into this chapter by reference. Any changes to the standards of performance are listed below the title of the standard.

History: Effective June 1, 1992; amended effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-12-02. Standards of performance.

Subpart A - General provisions.

*60.2. The definition of administrator is deleted and replaced with the following:

Administrator means the department except for those duties that cannot be delegated by the United States environmental protection agency. For those duties that cannot be delegated, administrator means the department and the administrator of the United States environmental protection agency.

Subpart C - Emission guidelines and compliance times.

Subpart Ca - Emissions guidelines and compliance times for municipal waste combustors.

Subpart D - Standards of performance for fossil-fuel fired steam generators for which construction is commenced after August 17, 1971.

Subpart Da - Standards of performance for electric utility steam generating units for which construction is commenced after September 18, 1978.

Subpart Db - Standards of performance for industrial-commercial-institutional steam generating units.

Subpart Dc - Standards of performance for small industrial-commercial-institutional steam generating units.

Subpart E - Standards of performance for incinerators.

Subpart Ea - Standards of performance for municipal waste combustors.

Subpart F - Standards of performance for portland cement plants.

Subpart G - Standards of performance for nitric acid plants.

Subpart H - Standards of performance for sulfuric acid plants.

Subpart I - Standards of performance for asphalt concrete plants.

Subpart J - Standards of performance for petroleum refineries.

Subpart K - Standards of performance for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after July 1, 1970, and prior to May 19, 1978.

*60.110(c) is deleted in its entirety and replaced with the following:

(c) Any facility under 60.110(a) that commenced construction, reconstruction, or modification after July 1, 1970, and prior to May 19, 1978, is subject to the requirements of this subpart.

Subpart Ka - Standards of performance for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after May 18, 1978, and prior to July 23, 1984.

Subpart Kb - Standards of performance for volatile organic liquid storage vessels (including petroleum liquid storage vessels) for which construction, reconstruction, or modification commenced after July 23, 1984.

Subpart L - Standards of performance for secondary lead smelters.

Subpart M - Standards of performance for secondary brass and bronze ingot production plants.

Subpart N - Standards of performance for primary emissions from basic oxygen process furnaces for which construction is commenced after June 11, 1973.

Subpart Na - Standards of performance for secondary emissions from basic oxygen process steelmaking facilities for which construction is commenced after January 20, 1983.

Subpart O - Standards of performance for sewage treatment plants.

Subpart P - Standards of performance for primary copper smelters.

Subpart Q - Standards of performance for primary zinc smelters.

Subpart R - Standards of performance for primary lead smelters.

Subpart S - Standards of performance for primary aluminum reduction plants.

Subpart T - Standards of performance for the phosphate fertilizer industry: wet-process phosphoric acid plants.

Subpart U - Standards of performance for the phosphate fertilizer industry: superphosphoric acid plants.

Subpart V - Standards of performance for the phosphate fertilizer industry: diammonium phosphate plants.

Subpart W - Standards of performance for the phosphate fertilizer industry: triple superphosphate plants.

Subpart X - Standards of performance for the phosphate fertilizer industry: granular triple superphosphate storage facilities.

Subpart Y - Standards of performance for coal preparation plants.

Subpart Z - Standards of performance for ferroalloy production facilities.

Subpart AA - Standards of performance for steel plants: Electric arc furnaces.

Subpart AAa - Standards of performance for steel plants: electric arc furnaces and argon-oxygen decarburization vessels constructed after August 17, 1983.

Subpart BB - Standards of performance for kraft pulp mills.

Subpart CC - Standards of performance for glass manufacturing plants.

Subpart DD - Standards of performance for grain elevators.

Subpart EE - Standards of performance for surface coatings of metal furniture.

Subpart FF - [Reserved]

Subpart GG - Standards of performance for stationary gas turbines.

Subpart HH - Standards of performance for lime manufacturing plants.

Subpart KK - Standards of performance for lead-acid battery manufacturing plants.

Subpart LL - Standards of performance for metallic mineral processing plants.

Subpart MM - Standards of performance for automobile and light-duty truck surface coating operations.

Subpart NN - Standards of performance for phosphate rock plants.

Subpart PP - Standards of performance for ammonium sulfate manufacture.

Subpart QQ - Standards of performance for the graphic arts industry: publication rotogravure printing.

Subpart RR - Standards of performance for pressure-sensitive tape and label surface coating operations.

Subpart SS - Standards of performance for industrial surface coating: large appliances.

Subpart TT - Standards of performance for metal coil surface coating.

Subpart UU - Standards of performance for asphalt processing and asphalt roofing manufacture.

Subpart VV - Standards of performance for equipment leaks of VOC in the synthetic organic chemicals manufacturing industry.

Subpart WW - Standards of performance for the beverage can surface coating industry.

Subpart XX - Standards of performance for bulk gasoline terminals.

Subpart AAA - Standards of performance for new residential wood heaters.

Subpart BBB - Standards of performance for the rubber tire manufacturing industry.

Subpart CCC - [Reserved]

Subpart DDD - Standards of performance for the polymer manufacturing industry.

Subpart EEE - [Reserved]

Subpart FFF - Standards of performance for flexible vinyl and urethane coating and printing.

Subpart GGG - Standards of performance for equipment leaks of VOC in petroleum refineries.

Subpart HHH - Standards of performance for synthetic fiber production facilities.

Subpart III - Standards of performance for volatile organic compound (VOC) emissions from the synthetic organic chemical manufacturing industry (SOCMI) air oxidation unit processes.

Subpart JJJ - Standards of performance for petroleum dry cleaners.

Subpart KKK - Standards of performance for equipment leaks of VOC from onshore natural gas processing plants.

Subpart LLL - Standards of performance for onshore natural gas processing; SO₂ emissions.

Subpart NNN - Standards of performance for volatile organic compound (VOC) emissions from synthetic organic chemical manufacturing industry (SOCMI) distillation operations.

Subpart 000 - Standards of performance for nonmetallic mineral processing plants.

Subpart PPP - Standards of performance for wool fiberglass insulation manufacturing plants.

Subpart QQQ - Standards of performance for VOC emissions from petroleum refinery wastewater systems.

Subpart RRR - Standards of performance for volatile organic compound emissions from synthetic organic chemical manufacturing industry (SOCMI) reactor processes.

Subpart SSS - Standards of performance for magnetic tape coating facilities.

Subpart TTT - Standards of performance for industrial surface coating: surface coating of plastic parts for business machines.

Subpart UUU - Standards of performance for calciners and dryers in mineral industries.

Subpart VVV - Standards of performance for polymeric coating of supporting substrates facilities.

Appendix A - Test methods.

Appendix B - Performance specifications.

Appendix C - Determination of emission rate changes.

Appendix D - Required emission inventory information.

Appendix E - [Reserved]

Appendix F - Quality assurance procedures.

Appendix I - Removable label and owner's manual.

History: Effective June 1, 1992; amended effective March 1, 1994;
December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

CHAPTER 33-15-13

33-15-13-01.1. Scope. The subparts and appendices of title 40, Code of Federal Regulations, part 61 [40-CFR-61], as they exist on May 1, 1993 1994, which are listed in under section 33-15-13-01.2 are incorporated into this chapter by reference. Any changes to the emission standard are listed below the title of the standard.

History: Effective June 1, 1992; amended effective March 1, 1994; December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-13-02. Emission standard for asbestos.

1. **Applicability.** The provisions of this section are applicable to those sources specified in subsections 3 through 17.
2. **Definitions.** All terms that are used in this section and are not defined below are given the same meaning as in North Dakota Century Code chapter 23-25 and in section 33-15-13-01.2.
 - a. "Active waste disposal site" means any disposal site other than an inactive site.
 - b. "Adequately wet" means to sufficiently mix or penetrate with liquid to prevent the release of particulates. If visible emissions are observed coming from asbestos-containing material, then that material has not been adequately wetted; however, the absence of visible emissions is not sufficient evidence of being adequately wet.
 - c. "Asbestos" means the asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite (amosite), anthophyllite, and actinolite-tremolite.
 - d. "Asbestos abatement" means any demolition, renovation, salvage, repair, or construction activity which involves the repair, enclosure, encapsulation, removal, handling, or disposal of more than three square feet [0.28 square meters] or three linear feet [0.91 meters] of friable asbestos material. Asbestos abatement also means any inspections, preparation of management plans, and abatement project design for both friable and nonfriable asbestos material.

- e. "Asbestos abatement project designer" means any person who develops the plans, specifications, and designs for an asbestos abatement project.
- f. "Asbestos abatement project monitor" means any person, employed to monitor an asbestos removal project to ensure any of the following:
 - (1) The removal is conducted in accordance with state and federal regulations.
 - (2) State-of-the-art work practices are employed.
 - (3) The abatement is conducted as designed.
 - (4) Personal and ambient air samples are collected properly.

Persons acting as the project designer who ~~do not ensure~~ are not responsible for the proper collection of personal and ambient air samples ~~are--collected--properly~~ and employees of the asbestos removal contractor are excluded from this definition.

- g. "Asbestos abatement supervisor" means any person employed by the asbestos contractor who supervises workers engaged in asbestos removal, encapsulation, enclosure, and repair. Supervisors may include those individuals with the position title of foreman, working foreman, or leadman pursuant to collective bargaining agreements.
- h. "Asbestos-containing waste material" means asbestos mill tailings or any waste that contains commercial asbestos and is generated by a source subject to the provisions of this section. This term includes filters from control devices, friable asbestos waste material, and bags or other similar packaging contaminated with commercial asbestos. As applied to demolition and renovation operations, this term includes regulated asbestos-containing material waste and materials contaminated with asbestos including disposable equipment and clothing.
- i. "Asbestos contractor" means any partnership, firm, association, operation, or sole proprietorship that contracts to perform asbestos abatement for another.
- j. "Asbestos inspector" means any person who inspects facilities for asbestos-containing materials.
- k. "Asbestos management planner" means any person who develops facility plans for the management of asbestos-containing materials.

- l. "Asbestos mill" means any facility engaged in converting, or in any intermediate step in converting, asbestos ore into commercial asbestos. Outside storage of asbestos materials is not considered a part of the asbestos mill.
- m. "Asbestos tailings" means any solid waste that contains asbestos and is a product of asbestos mining or milling operations.
- n. "Asbestos waste from control devices" means any waste material that contains asbestos and is collected by a pollution control device.
- o. "Asbestos worker" means an employee or agent of an asbestos contractor, or a public employee engaged in the abatement of more than three square feet [0.28 square meters] or three linear feet [0.91 meters] of friable asbestos material, except for individuals engaged in abatement at their private residence.
- p. "Category I nonfriable asbestos-containing material" means asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than one percent asbestos as determined using the methods specified in appendix A, subpart F, title 40 CFR, Code of Federal Regulations, part 763, section 1, polarized light microscopy.
- q. "Category II nonfriable asbestos-containing material" means any material, excluding category I nonfriable asbestos-containing material, containing more than one percent asbestos as determined using the methods specified in appendix A, subpart F, title 40 CFR, Code of Federal Regulations, part 763, section 1, polarized light microscopy that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure or by mechanical forces expected to act on the material.
- r. "Commercial asbestos" means any material containing asbestos that is extracted from ore and has value because of its asbestos content.
- s. "Cutting" means to penetrate with a sharp-edged instrument and includes sawing, but does not include shearing, slicing, or punching.
- t. "Demolition" means the wrecking or taking out of any load-supporting structural member of a facility, together with any related handling operations or the intentional burning of any facility.
- u. "Emergency renovation operation" means a renovation operation that was not planned but results from a sudden,

unexpected event that, if not immediately attended to, presents a safety or public health hazard, is necessary to protect equipment from damage, or is necessary to avoid imposing an unreasonable financial burden. This term includes operations necessitated by nonroutine failures of equipment.

- v. "Encapsulation" means a method of asbestos abatement that includes the treatment of asbestos-containing materials with a sealant material that completely surrounds or embeds asbestos fibers in an adhesive matrix to prevent the release of fibers. A bridging encapsulant creates a membrane over the surface while a penetrating encapsulant penetrates the material and binds the material's components together.
- w. "Enclosure" means a method of asbestos abatement that includes the construction of a permanent, airtight, impermeable barrier around asbestos-containing material to prevent the release of asbestos fibers into the air.
- x. "Fabricating" means any processing (e.g., cutting, sawing, drilling) of a manufactured product that contains commercial asbestos, with the exception of processing at temporary sites (field fabricating) for the construction or restoration of facilities. In the case of friction products, fabricating includes bonding, debonding, grinding, sawing, drilling, or other similar operations performed as part of fabricating.
- y. "Facility" means any institutional, commercial, public, industrial, or residential structure, installation, or building (including any structure, installation, or building containing condominiums or individual dwelling units operated as a residential cooperative, but excluding residential buildings having four or fewer dwelling units); any ship; and any active or inactive waste disposal site. For purposes of this definition, any building, structure, or installation that contains a loft used as a dwelling is not considered a residential structure, installation, or building. Any structure, installation, or building that was previously subject to this section is not excluded, regardless of its current use or function.
- z. "Facility component" means any part of a facility including equipment.
- aa. "Friable asbestos material" means any material containing more than one percent asbestos that hand pressure or mechanical forces expected to act on the material can crumble, pulverize, or reduce to powder when dry. The percentage of asbestos is determined using the method

specified in appendix A, subpart F, title 40 CFR, Code of Federal Regulations, part 763, section 1, polarized light microscopy. If the asbestos content is greater than zero percent, assume the material contains greater than one percent asbestos or verify the asbestos content by point counting using polarized light microscopy. If a result obtained by point count is different from a result obtained by visual estimation, the point count result will be used.

- bb. "Fugitive source" means any source of emissions not controlled by an air pollution control device.
- cc. "Glove-bag" means a sealed compartment with attached inner gloves used for the handling of asbestos-containing materials. Properly installed and used, glove-bags provide a small work area enclosure typically used for small-scale asbestos stripping operations. Information on glove-bag installation, equipment and supplies, and work practices is contained in the occupational safety and health administration's (OSHA's) final rule on occupational exposure to asbestos, appendix G, title 29 CFR, Code of Federal Regulations, 1926.58.
- dd. "Grinding" means to reduce to powder or small fragments and includes mechanical chipping or drilling.
- ee. "In poor condition" means the binding of the material is losing its integrity as indicated by peeling, cracking, or crumbling of the material.
- ff. "Inactive waste disposal site" means any disposal site or portion of it where additional asbestos-containing waste material has not been deposited within the past year.
- gg. "Installation" means any building or structure or any group of buildings or structures at a single demolition or renovation site that are under the control of the same owner or operator (or owner or operator under common control).
- hh. "Leaktight" means that solids or liquids cannot escape or spill out. It also means dusttight.
- ii. "Malfunction" means any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner so that emissions of asbestos are increased. Failures of equipment shall not be considered malfunctions if they are caused in any way by poor maintenance, careless operations, or any other preventable upset conditions, equipment breakdown, or process failure.

- jj. "Manufacturing" means the combining of commercial asbestos, or in the case of woven friction products, the combining of textiles containing commercial asbestos, with any other materials, including commercial asbestos, and the processing of this combination into a product. Chlorine production is considered a part of manufacturing.
- kk. "Natural barrier" means a natural object that effectively precludes or deters access. Natural barriers include physical obstacles such as cliffs, lakes, or other large bodies of water, deep and wide ravines, and mountains. Remoteness by itself is not a natural barrier.
- ll. "Nonfriable asbestos-containing material" means any material containing more than one percent asbestos as determined using the method specified in appendix A, subpart F, title 40 CFR, Code of Federal Regulations, part 763, section 1, polarized light microscopy, that, when dry, can not be crumbled, pulverized, or reduced to powder by hand pressure or mechanical forces expected to act on the material.
- mm. "Nonscheduled renovation operation" means a renovation operation necessitated by the routine failure of equipment, which is expected to occur within a given period based on past operating experience, but for which an exact date cannot be predicted.
- nn. "Outside air" means the air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.
- oo. "Owner or operator of a demolition or renovation activity" means any person who owns, leases, operates, controls, or supervises a facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operations, or both.
- pp. "Particulate asbestos material" means finely divided particles of asbestos or material containing asbestos.
- qq. "Planned renovation operations" means a renovation operation, or a number of such operations, in which some regulated asbestos-containing material will be removed or stripped within a given period of time and that can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.
- rr. "Public employee" for the purpose of this chapter means any person employed by the United States government or the state of North Dakota or any of its political subdivisions

who provides service for which compensation is paid. This includes employment by appointment or election.

ss. "Regulated asbestos-containing material (RACM)" means:

- (1) Friable asbestos material.
- (2) Category I nonfriable asbestos-containing material that has become friable.
- (3) Category I nonfriable asbestos-containing material that will be or has been subjected to sanding, grinding, cutting, or abrading.
- (f) Category II nonfriable asbestos-containing material that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces acting on or expected to act on the material in the course of demolition or renovation operations regulated by this section.

tt. "Remove" means to take out regulated asbestos-containing material or facility components that contain or are covered with regulated asbestos-containing material from any facility.

uu. "Renovation" means altering in any way a facility or facility components, including the stripping or removal of regulated asbestos-containing material from a facility component. Operations in which load-supporting structural members are wrecked or taken out are demolitions.

vv. "Repair" means returning damaged asbestos-containing materials to an undamaged condition or to an intact state so as to prevent asbestos fiber release.

ww. "Resilient floor covering" means asbestos-containing floor tile, including asphalt and vinyl floor tiles and sheet vinyl floor covering containing more than one percent asbestos as determined using polarized light microscopy according to the methods specified in appendix A, subpart F, title 40 CFR, Code of Federal Regulations, part 763, section 1, polarized light microscopy.

xx. "Roadways" means surfaces on which motor vehicles travel. This term includes public and private highways, roads, streets, parking areas, and driveways.

yy. "Strip" means to take off regulated asbestos-containing material from any part of any facility or facility components.

- zz. "Structural member" means any member of a facility, such as beams, walls, ceilings, floors, etc.
- aaa. "Visible emissions" means any emissions which are visually detectable without the aid of instruments, coming from regulated asbestos-containing material or asbestos-containing waste material, or from any asbestos milling, manufacturing, or fabricating operations. This does not include condensed uncombined water vapor.
- bbb. "Waste generator" means any owner or operator of a source covered by this section whose act or process produces asbestos-containing waste material.
- ccc. "Waste shipment record" means the shipping document, required to be originated and signed by the waste generator and is used to track and substantiate the disposition of asbestos-containing waste material.
- ddd. "Working day" means any day Monday through Friday and includes holidays that fall on any day Monday through Friday.

3. Standard for asbestos mills.

- a. Each owner or operator of an asbestos mill shall either discharge no visible emissions to the outside air from that asbestos mill, including fugitive sources, or use the methods specified by subsection 13 to clean emissions containing asbestos material before they escape to, or are vented to, the outside air.
- b. Each owner or operator of an asbestos mill shall meet the following requirements:
 - (1) Monitor each potential source of asbestos emissions from any part of the mill facility, including air-cleaning devices, process equipment, and buildings that house equipment for material processing and handling, at least once each day during daylight hours for visible emissions to the outside air during periods of operation. The monitoring must be by visual observation of at least fifteen seconds duration per source of emissions.
 - (2) Inspect each air-cleaning device at least once each week for proper operation and for changes that signal the potential for malfunction, including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air-cleaning devices that can not be inspected on a weekly basis

according to this paragraph, submit to the department, and revise as necessary, a written maintenance plan to include, at a minimum, the following:

- (a) Maintenance schedule.
 - (b) Recordkeeping plan.
- (3) Maintain records of the results of visible emissions monitoring and air-cleaning device inspections using a suitable form which includes the following information:
- (a) Date and time of each inspection.
 - (b) Presence or absence of visible emissions.
 - (c) Condition of fabric filters including presence of any tears, holes, and abrasions.
 - (d) Presence of dust deposits on clean side of fabric filters.
 - (e) Brief description of corrective actions taken including date and time.
 - (f) Daily hours of operation for each air-cleaning device.
- (4) Furnish upon request and make available at the affected facility during normal business hours for inspection by the department all records required under this subdivision.
- (5) Retain a copy of all monitoring inspection records for at least two years.
- (6) Submit quarterly a copy of visible emissions monitoring records to the department if visible emissions occurred during the report period. Quarterly reports must be postmarked by the thirtieth day following the end of the calendar quarter.
4. **Standard for roadways.** No person may surface a roadway with asbestos tailings or asbesto-containing waste material.
5. **Standard for manufacturing.**
- a. **Applicability.** This section applies to the following manufacturing operations using commercial asbestos.

- (1) The manufacture of cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials.
- (2) The manufacture of cement products.
- (3) The manufacture of fireproofing and insulating materials.
- (4) The manufacture of friction products.
- (5) The manufacture of paper, millboard, and felt.
- (6) The manufacture of resilient floor covering.
- (7) The manufacture of paints, coatings, caulks, adhesives, and sealants.
- (8) The manufacture of plastics and rubber materials.
- (9) The manufacture of chlorine utilizing asbestos diaphragm technology.
- (10) The manufacture of shotgun shell wads.
- (11) The manufacture of asphalt concrete.

b. Standard. Each owner or operator of any of the manufacturing operations to which this section applies shall either:

- (1) Discharge no visible emissions to the outside air from these operations or from any building or structure in which they are conducted or from any other fugitive sources; or
- (2) Use the methods specified by subsection 13 to clean emissions containing asbestos material from these operations before they escape to, or are vented to, the outside air.
- (3) Monitor each potential source of asbestos emissions from any part of the manufacturing facility, including air-cleaning devices, process equipment, and buildings housing material processing and handling equipment, at least once each day during daylight hours for visible emission to the outside air during periods of operation. The monitoring must be by visual observation of at least fifteen seconds duration per source of emissions.
- (4) Inspect each air-cleaning device at least once each week for proper operation and for changes that signal

the potential for malfunctions, including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air-cleaning devices that cannot be inspected on a weekly basis according to this paragraph, submit to the department, and revise as necessary, a written maintenance plan to include, at a minimum, the following:

- (a) Maintenance schedule.
 - (b) Recordkeeping plans.
- (5) Maintain records of the results of visible emission monitoring and air-cleaning device inspections using a suitable form which includes the following information:
- (a) Date and time of each inspection.
 - (b) Presence or absence of visible emissions.
 - (c) Condition of fabric filters including presence of any tears, holes, and abrasions.
 - (d) Presence of dust deposits on clean side of fabric filters.
 - (e) Brief description of corrective action taken, including date and time.
 - (f) Daily hours of operation for each air-cleaning device.
- (6) Furnish upon request and make available at the affected facility during normal business hours for inspection by the department all records required under this subdivision.
- (7) Retain a copy of all monitoring and inspection records for at least two years.
- (8) Submit quarterly a copy of the visible emissions monitoring records to the department if visible emissions occurred during the report period. Quarterly reports must be postmarked by the thirtieth day following the end of the calendar quarter.

6. Standard for demolition and renovation.

a. Applicability. To determine which requirements of subdivisions a, b, and c of this subsection apply to the owner or operator of a demolition or renovation activity and prior to the commencement of the demolition or renovation, thoroughly inspect the affected facility, or part of the facility where the demolition or renovation operation will occur, for the presence of asbestos, including category I and category II nonfriable asbestos-containing material. The requirements of subdivisions b and c of this subsection apply to each owner or operator of an asbestos demolition or renovation operation including the removal of regulated asbestos-containing material, as follows:

- (1) For a demolition or renovation project involving the stripping or removal of more than three square feet [0.28 square meters] or three linear feet [0.91 meters] of regulated asbestos-containing material, all the procedural requirements of subdivision c apply, except for ordered demolitions as provided in paragraph 4.
- (2) For any facility being demolished, all the notification requirements of subdivision b apply.
- (3) For a renovation project where at least one hundred sixty square feet [14.9 square meters] of regulated asbestos-containing material on facility components or at least two hundred sixty linear feet [79.3 meters] of regulated asbestos-containing material on pipes or a total of thirty-five cubic feet [1 cubic meter] of regulated asbestos-containing material on or off facility components are to be stripped, removed, dislodged, cut, drilled, or similarly disturbed at a facility all the notification requirements of subdivision b apply.
 - (a) To determine whether this paragraph applies to planned renovation operations involving individual nonscheduled operations, predict the additive amount of regulated asbestos-containing material to be removed or stripped over the maximum period of time a prediction can be made, not to exceed one calendar year of January first through December thirty-first.
 - (b) To determine whether this paragraph applies to emergency renovation operations, estimate the amount of regulated asbestos-containing material to be removed or stripped as a result of the sudden unexpected event that necessitated the renovation.

- (4) If the facility is being demolished under an order of a state or local government agency, issued because the facility is structurally unsound and in danger of imminent collapse, only the requirements of subdivision b and paragraphs 4, 5, 6, 7, and 8 of subdivision c apply.
 - (5) Owners or operators of demolition or renovation operations are exempt from the requirements of 61.05(a), 61.07, and 61.09 of the general provisions of this chapter.
- b. Notification requirements. Each owner or operator to which this section applies shall:
- (1) Provide the department with written notice of the intention to demolish or renovate.
 - (2) Indicate whether the notice is an original or a revised notification and update the notice as necessary including when the amount of asbestos affected changes by at least twenty percent.
 - (3) Postmark or deliver the notice as follows:
 - (a) At least ten working days before demolition begins, except as provided in subparagraph b.
 - (b) As early as possible before, but not later than the following working day after, demolition begins if the operation is described in paragraph 4 of subdivision a or for an emergency renovation as described in subparagraph b of paragraph 3 of subdivision a of this subsection.
 - (c) At least ten working days before the end of the calendar year preceding the year for which notice is being given for renovations described in subparagraph a of paragraph 3 of subdivision a of this subsection.
 - (d) At least ten working days before renovation begins. When necessary, the department may accept a telephone notification followed by the written notification.
 - (e) In no event may an operation covered by this subsection begin on a date other than the date contained in the written notice unless the department has been supplied a properly amended notification following the timetables outlined above.

- (4) Include the following information on a notification form provided by the department:
- (a) Name, address, and telephone number of both the owner and operator and the asbestos removal contractor.
 - (b) Description of the facility or affected part of the facility being demolished or renovated, including the size, age, and prior and present use of the facility.
 - (c) An estimate of the amount of regulated asbestos-containing material to be removed from the facility in terms of square feet, linear feet or cubic feet, as appropriate. Also estimate the approximate amount of category I and category II nonfriable asbestos-containing material in the affected part of the facility that will not be removed before demolition. Also provide the procedures and analytical methods used to detect the presence and determine the quantity of regulated asbestos-containing material and category I and category II nonfriable asbestos-containing material.
 - (d) Location of the facility being demolished or renovated to include the street address, city, county, and state.
 - (e) Scheduled starting and completion dates of the asbestos abatement work or any other activity that would break up, dislodge, or similarly disturb asbestos material.
 - (f) Scheduled starting and completion dates of the demolition or renovation.
 - (g) Type of operation: demolition or renovation.
 - (h) A description of the demolition or renovation work to be performed including the demolition or renovation techniques and methods to be employed during the activity and a description of the affected facility components.
 - (i) Description of work practices and engineering controls to be used to comply with the requirements of this section, including asbestos removal and waste handling emission control procedures.

- (j) The name and location of the waste disposal site where the asbestos-containing waste material will be deposited.
- (k) The name, address, and telephone number of the waste transporter.
- (l) For emergency renovations, provide the date and hour that the emergency occurred, a description of the sudden unexpected event, and an explanation of how the event caused an unsafe condition or would cause equipment damage or an unreasonable financial burden.
- (m) Description of procedures to be followed in the event that unexpected regulated asbestos-containing material is found or category II nonfriable asbestos-containing material becomes crumbled, pulverized, or reduced to powder during the operation.
- (n) For facilities described in paragraph 4 of subdivision a, the name, title, and authority of the state or local governmental representative who has ordered the demolition, the date that the order was issued, and the date on which the demolition was ordered to begin. A copy of the order must be attached to the notification.
- (o) A signed statement by the contractor that all asbestos abatement supervisors and asbestos workers assigned to this project are certified by the department, in accordance with subsection 16.

c. Procedures for asbestos emission control. Each owner or asbestos contractor to whom this subsection applies shall comply with the following procedures:

- (1) Remove all regulated asbestos-containing material from a facility being demolished or renovated before any activity begins that would break up, dislodge, or similarly disturb the materials or preclude access to the materials for subsequent removal. Asbestos-containing material need not be removed before demolition if:
 - (a) It is category I nonfriable asbestos-containing material that is not in poor condition and is not friable.
 - (b) It is on a facility component that is encased in concrete or other similarly hard material and

adequately wetted whenever exposed during demolition and maintained wet until it is disposed of in accordance with subsection 11.

- (c) It was not accessible for testing and therefore was not discovered before demolition began and the material cannot be safely removed. If not removed for safety reasons, these materials must be adequately wetted when exposed during demolition and maintained wet until they are disposed of in accordance with subsection 11.
 - (d) They are category II nonfriable asbestos-containing material and the probability is low that the materials will become crumbled, pulverized, or reduced to powder during demolition.
- (2) When a facility component that contains, is covered with, or is coated with regulated asbestos-containing material is being taken out of the facility as a unit or in sections:
- (a) Adequately wet all regulated asbestos-containing material exposed during cutting or disjoining operations; and
 - (b) Carefully wrap or otherwise contain the facility member with an impermeable covering prior to the disjoining operation; and
 - (c) Carefully lower the units or sections to the floor and to ground level, not dropping, throwing, sliding, or otherwise damaging or disturbing the regulated asbestos-containing material.
- (3) When regulated asbestos-containing material is being stripped from a facility component while it remains in place in a facility, adequately wet the material during the stripping operation.
- (a) In renovation operations, wetting that would unavoidably damage equipment or present a safety hazard is not required if:
 - [1] The owner or operator has obtained prior written approval from the department based on a written application that wetting to comply with this paragraph would unavoidably damage equipment or present a safety hazard; and

[2] The owner or operator uses one of the following emission control methods:

[a] A local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping and removal of the asbestos materials. The system must exhibit no visible emissions to the outside air and be equipped with high efficiency particulate air filtration or be designed and operated in accordance with the requirements in subsection 13.

[b] A glove-bag system designed and operated to contain the particulate asbestos material produced by the stripping of the asbestos materials.

[c] Leaktight wrapping to contain all regulated asbestos-containing material prior to dismantlement.

(b) In renovation operations where wetting would result in equipment damage or a safety hazard and the methods allowed in subparagraph a of paragraph 3 of this subdivision cannot be used, another method may be used after obtaining written approval from the department based upon a determination that it is equivalent to wetting in controlling emissions or to the methods allowed in paragraph 3 of this subdivision.

(c) A copy of the department's written approval must be kept at the worksite and made available for inspection.

(4) After a facility component covered with, coated with, or containing regulated asbestos-containing material has been taken out of the facility as units or in sections pursuant to paragraph 2 of this subdivision it must be kept contained in leaktight wrapping or:

(a) Adequately wet the regulated asbestos-containing material during stripping; or

(b) Use a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping. The system must exhibit no visible emissions to the outside air and be equipped

with high efficiency particulate air filtration or be designed and operated in accordance with the requirements in subsection 13.

- (5) For large facility components such as reactor vessels, large tanks, and steam generators, but not beams (which must be handled in accordance with paragraphs 2, 3, and 4 of this subdivision) the regulated asbestos-containing material is not required to be stripped if the following requirements are met:
 - (a) The component is removed, transported, stored, disposed of, or reused without disturbing or damaging the regulated asbestos-containing material;
 - (b) The component is encased in a leaktight wrapping; and
 - (c) The leaktight wrapping is labeled according to subsection 11 during all loading and unloading operations and during storage.
- (6) For all regulated asbestos-containing material, including material that has been removed or stripped:
 - (a) Adequately wet the material and ensure that it remains wet until collected for disposal in accordance with subsection 11;
 - (b) Carefully lower the materials to the ground or a lower floor, not dropping, throwing, sliding, or otherwise damaging or disturbing the material; and
 - (c) Transport the materials to the ground via leaktight chutes or containers if they have been removed or stripped more than fifty feet [15.24 meters] above ground level and were not removed as units or in sections.

Regulated asbestos-containing material contained in leaktight wrapping that has been removed in accordance with paragraph 4 of this subdivision and subitem c of item 2 of subparagraph a of paragraph 3 of this subdivision need not be wetted.

- (7) When the temperature at the point of wetting is below zero degrees Celsius [32 degrees Fahrenheit], the owner or operator:

- (a) Need not comply with the wetting requirements of subparagraph a of paragraph 2 of subdivision c of subsection 4 and paragraph 3 of this subdivision. The owner or operator shall comply with the other requirements in this subdivision; and
 - (b) Remove facility components containing, coated with or covered with friable asbestos materials as units or in sections to the maximum extent possible; and
 - (c) During periods when wetting operations are suspended due to freezing temperatures, the owner or operator must record the temperature in the area containing the facility components at the beginning, middle, and end of each workday and keep daily temperature records. These records must be available for inspection by the department during normal business hours at the demolition or renovation site. The owner or operator shall retain the temperature records for at least two years.
- (8) No regulated asbestos-containing material may be stripped, removed, or otherwise handled or disturbed at a facility regulated by this subsection unless at least one onsite representative such as a supervisor, foreman or management level person, or other authorized representative who has completed the supervisor training requirements of subparagraph a of paragraph 2 and paragraph 4 of subdivision b of subsection 16 is present. Evidence that the required training has been completed shall be posted and made available for inspection by the department at the demolition or renovation site.
- (9) For facilities described in paragraph 4 of subdivision a, adequately wet the portion of the facility that contains friable asbestos materials during the wrecking operation.
- (10) If a facility is demolished by intentional burning, all regulated asbestos-containing material including category I and category II nonfriable asbestos-containing material must be removed in accordance with this subsection before burning.
- (11) When a demolition or renovation project that involves the disturbance of regulated asbestos-containing material is conducted in the ambient air, the owner or operator shall designate the boundaries of the work area by appropriate means.

7. **Standard for spraying.** The owner or operator of an operation in which asbestos-containing materials are spray applied shall use only those materials that contain one percent asbestos or less for spray-on application.

8. **Standard for fabricating.**

a. Applicability. This subsection applies to the following fabricating operations using commercial asbestos:

- (1) The fabrication of cement building products.
- (2) The fabrication of friction products, except those operations that primarily install asbestos friction materials on motor vehicles.
- (3) The fabrication of cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture; bulkheads, partitions, and ceilings for marine construction; and flow control devices for the molten metal industry.

b. Standard. Each owner or operator of any of the fabricating operations to which this subsection applies shall:

- (1) Discharge no visible emissions to the outside air from any of the operations or from any building or structure in which they are conducted or from any other fugitive sources; or
- (2) Use the methods specified by subsection 13 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.
- (3) Monitor each potential source of asbestos emissions from any part of the fabricating facility, including air-cleaning devices, process equipment, and buildings that house equipment for material processing and handling, at least once each day during daylight hours, for visible emissions to the outside air during periods of operation. The monitoring must be by visual observation of at least fifteen seconds duration per source of emissions.
- (4) Inspect each air-cleaning device at least once each week for proper operation and for changes that signal the potential for malfunction, including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air-cleaning

devices that cannot be inspected on a weekly basis according to this paragraph, submit to the department, and revise as necessary, a written maintenance plan to include at a minimum, the following:

- (a) Maintenance schedule.
 - (b) Recordkeeping plan.
- (5) Maintain records of the results of visible emission monitoring and air-cleaning device inspections using a suitable form which includes the following information:
- (a) Date and time of each inspection.
 - (b) Presence or absence of visible emissions.
 - (c) Condition of fabric filters, including the presence of any tears, holes, and abrasions.
 - (d) Presence of dust deposits on clean side of fabric filters.
 - (e) Brief description of corrective actions taken including date and time.
 - (f) Daily hours of operation for each air-cleaning device.
- (6) Furnish upon request and make available at the affected facility during normal business hours, for inspection by the department, all records required under this section.
- (7) Retain a copy of all monitoring and inspection records for at least two years.
- (8) Submit quarterly a copy of the visible emission monitoring record to the department if visible emissions occurred during the report period. Quarterly reports must be postmarked by the thirtieth day following the end of the calendar quarter.
9. **Standard for insulating materials.** No owner or operator of a facility may install or reinstall on a facility component any insulating materials that contain commercial asbestos if the materials are either molded and friable or wet applied and friable after drying. The provisions of this subsection do not apply to spray-applied insulating materials regulated under subsection 7.

10. **Standard for waste disposal for asbestos mills.** Each owner or operator of any source covered under the provisions of subsection 3 shall:

- a. Deposit all asbestos-containing waste material at department approved waste disposal sites operated in accordance with the provisions of subsection 15.
- b. Discharge no visible emissions to the outside air from the transfer of asbestos waste from control devices to the tailings conveyor, or use the methods specified by subsection 13 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air. Dispose of the asbestos waste from control devices in accordance with subdivision b of subsection 11 or subdivision c of this subsection.
- c. Discharge no visible emissions to the outside air during the collection, processing, packaging, transporting, or deposition of any asbestos-containing waste material, or use one of the disposal methods as follows:
 - (1) Use a wetting agent as follows:
 - (a) Adequately mix all asbestos-containing waste material with a wetting agent recommended by the manufacturer of the agent to effectively wet dust and tailings, before depositing the material at a waste disposal site. Use the agent as recommended for the particular dust by the manufacturer of the agent.
 - (b) Discharge no visible emissions to the outside air from the wetting operation or use the methods specified by subsection 13 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.
 - (c) Wetting may be suspended when the ambient temperature at the waste disposal site is less than fifteen degrees Fahrenheit [-9.44 degrees Celsius] as determined by an appropriate measurement method with an accuracy of plus or minus two degrees Fahrenheit [1.11 degrees Celsius]. During periods when wetting operations are suspended, the temperature must be recorded at least at hourly intervals, and records must be retained for at least two years in a form suitable for inspection.
 - (2) Use an alternative emission control and treatment method that has received prior written approval by

the department and administrator. To obtain approval for an alternative method, a written application must be submitted to the department and the administrator of the United States environmental protection agency demonstrating that the following criteria are met:

- (a) The alternative method will control asbestos emissions equivalent to currently required methods.
 - (b) That the alternative method is suitable for the intended application.
 - (c) The alternative method will not violate other regulations.
 - (d) The alternative method will not result in increased water pollution, land pollution, or occupational hazards.
- (3) When waste is transported by vehicle to a disposal site, all of the requirements of subdivision d of subsection 11 must be complied with.

11. **Standard for waste disposal for manufacturing, demolition, renovation, and fabricating operations.** Each owner or operator of any source covered under any of the provisions of subsection 5, 6, or 8 shall comply with all the provisions of this subsection. Each owner or operator of any source covered by subsection 10 shall comply with subdivision d of this subsection.

a. Discharge no visible emissions to the outside air during the collection processing (including incineration), packaging, transporting, or deposition of any asbestos-containing waste material generated by the source, or use one of the emission control and waste treatment methods as follows:

- (1) Adequately wet asbestos-containing waste material as follows:
 - (a) Mix asbestos waste from control devices with water to form a slurry; adequately wet other asbestos-containing waste material;
 - (b) Discharge no visible emissions to the outside air from collection, mixing, and wetting operations, or use the methods specified by subsection 13 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air;

- (c) After wetting, seal all asbestos-containing waste material in leaktight containers while wet. For materials that will not fit into containers without additional breaking, put materials into leaktight wrapping;
- (d) Label the containers or wrapped materials specified above as follows:

DANGER

CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

Alternatively, use warning labels currently specified by occupational safety and health standards of the department of labor, occupational safety and health administration (OSHA) under title 29 CFR, Code of Federal Regulations, 1910.1001 or title 29 CFR, Code of Federal Regulations, 1926.58; and

- (e) For asbestos-containing waste material to be transported off the facility site, label containers or wrapped materials with the name of the waste generator and the location at which the waste was generated.
- (2) Process asbestos-containing waste material into nonfriable forms as follows:
 - (a) Form all asbestos-containing waste material into nonfriable pellets or other shapes.
 - (b) Discharge no visible emissions to the outside air from the collection and processing operations including incineration, or use the methods specified by subsection 13 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.
 - (3) For facilities demolished where the regulated asbestos-containing material is not removed prior to demolition according to paragraph 4 of subdivision a and subparagraphs a, b, c, and d of paragraph 1 of subdivision c of subsection 6 adequately wet asbestos-containing waste material at all times during and after demolition and keep wet during handling and loading for transport to a disposal site. Asbestos-containing waste materials covered by this paragraph do not have to be sealed in leaktight

containers or wrapping but may be transported by covered hauling and disposed of in bulk.

- (4) Use an alternative disposal method that has received prior approval by the department and administrator of the United States environmental protection agency.
 - (5) As applied to demolition and renovation the requirements of subdivision a of this subsection do not apply to category I or category II nonfriable asbestos-containing material waste that is not or will not become crumbled, pulverized, or reduced to powder.
- b. Deposit all asbestos-containing waste material as soon as practical at:
- (1) Department-approved waste disposal sites operated in accordance with the provisions of subsection 15.
 - (2) A United States environmental protection agency approved site that converts regulated asbestos-containing material and asbestos-containing waste material into nonasbestos (asbestos free) material according to the provisions of subsection 17.
 - (3) The requirements of this subdivision do not apply to category I nonfriable asbestos-containing material that is not or will not become regulated asbestos-containing material.
- c. All facilities used for the temporary storage of asbestos-containing waste material must be controlled and the material must be stored in leaktight containers.
- (1) Post a warning sign at the entrances to the temporary storage facility with a label as follows:

DANGER

ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY

Alternatively, use warning labels currently specified by occupational safety and health standards of the department of labor, occupational safety and health administration (OSHA) under title 29 CFR, Code of Federal Regulations, 1910.1001 or title 29 CFR, Code of Federal Regulations, 1926.58.

- (2) Take necessary precautions to prevent or restrict access to the temporary storage facility.
 - (3) The temporary storage facility must be inspected at least once per week to ensure that good structural integrity of the storage facility is maintained and that the facility remains secure.
 - (4) The maximum length of time allowed for temporary storage of an asbestos-containing waste material may not exceed one hundred eighty days.
- d. Mark vehicles used to transport asbestos-containing waste material during the loading and unloading of waste so that the signs are visible. The markings must:
- (1) Be displayed in such a manner and location that a person can easily read the legend.
 - (2) Conform to the requirements for twenty-inch by fourteen-inch [50.8-centimeter by 35.56-centimeter] upright format signs specified in title 29 CFR, Code of Federal Regulations, 1910.145(d)(4) and this paragraph; and
 - (3) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
DANGER	2.5 cm [1 in.] Sans Serif, Gothic, or Block.
ASBESTOS DUST HAZARD	2.5 cm [1 in.] Sans Serif, Gothic, or Block.
CANCER AND LUNG DISEASE HAZARD	1.9 cm [3/4 in.] Sans Serif, Gothic, or Block.
Authorized Personnel Only	14 Point Gothic

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

- e. Prior to transportation of more than three square feet [0.28 square meters] or three linear feet [0.91 meters] of asbestos-containing waste material off the facility site:
- (1) The owner or operator and the transporter shall ensure that a waste shipment record has been appropriately completed and signed by the generator,

and accompanies the waste to the disposal site. The waste shipment record must include the following information:

- (a) Name, address, and telephone number of the facility owner or operator where the asbestos-containing waste materials were generated.
 - (b) Location of the facility where asbestos-containing waste material was generated.
 - (c) The name and address of this department as being the responsible agency for administering the asbestos NESHAP program.
 - (d) Estimated quantity of asbestos-containing waste material in cubic yards.
 - (e) Name and physical site location of the waste disposal site where the asbestos-containing waste will be deposited.
 - (f) The name and telephone number of the disposal site operator.
 - (g) The date transported.
 - (h) The name, address, and telephone number of the transporters.
 - (i) A certification that the contents of this consignment are fully and accurately described by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.
- (2) Provide a copy of the waste shipment record to the disposal site owner or operator at the same time as the asbestos-containing waste material is delivered to the disposal site.
 - (3) For waste shipments where a copy of the waste shipment record signed by the owner or operator of the designated disposal site is not received by the waste generator within thirty-five days of the date the waste was accepted by the initial transporter, contact the transporter or the owner or operator, or both, of the designated disposal site to determine the status of the waste shipment.

(4) Report in writing to this department if a copy of the waste shipment record signed by the owner or operator of the designated waste disposal site is not received by the waste generator within forty-five days of the date the waste was accepted by the initial transporter. Include in the report the following information:

(a) A copy of the waste shipment record for which a confirmation of delivery was not received; and

(b) A cover letter signed by the waste generator explaining the efforts taken to locate the asbestos waste shipment and the result of those efforts.

(5) Retain a copy of all waste shipment records including a copy of the waste shipment record signed by the owner or operator of the designated waste disposal site for at least two years.

(6) A copy of the completed waste shipment record must be submitted to the department by the owner or operator of the facility no later than ten days after the owner or operator of the facility receives the completed waste shipment record from the landfill operator.

f. Furnish upon request, and make available for inspection by the department, all records required under this section.

g. If an acceptable disposal site, as determined by subsection 15, is located on the same property as the facility where asbestos-containing waste materials were generated, then the recordkeeping requirements of subdivision e of this subsection do not apply. The owner shall maintain records which include information on the quantity, location, and date of asbestos-containing waste disposal activities.

12. **Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations.** Each owner or operator of any inactive waste disposal site that received deposits of asbestos-containing waste material generated by sources covered under subsection 3, 5, 8, or 10, shall:

a. Comply with one of the following:

(1) Discharge no visible emissions to the outside air from an inactive waste disposal site subject to this subsection;

- (2) Cover the asbestos-containing waste material with at least fifteen centimeters [6 inches] of compacted non-asbestos-containing material, and grow and maintain a cover of vegetation on the area adequate to prevent exposure of the asbestos-containing waste material;
 - (3) In areas where vegetation would be difficult to maintain, cover the asbestos-containing waste material with at least sixty centimeters [2 feet] of compacted non-asbestos-containing material, and maintain it to prevent exposure of the asbestos-containing waste or cover with at least six inches [15.24 centimeters] of compacted non-asbestos-containing material and at least an additional three inches [7.62 centimeters] of a nonasbestos crushed rock cover in place of the vegetation; or
 - (4) For inactive waste disposal sites for asbestos tailings, apply a resinous-based or petroleum-based dust suppression agent that effectively binds dust to control surface air emissions. Use the agent in the manner and frequency recommended for the particular asbestos tailings by the manufacturer of the dust suppression agent. Obtain prior approval of the department to use other equally effective dust suppression agents. For purposes of this paragraph, used, spent, or other waste oil is not considered a dust suppression agent.
- b. Unless a natural barrier adequately deters access by the general public, install and maintain warning signs and fencing as follows, or comply with paragraph 2 or 3 of subdivision a of this subsection.
- (1) Display warning signs at all entrances and at intervals of three hundred twenty-eight feet [100 meters] or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material was deposited. The warning signs must:
 - (a) Be posted in such a manner and location that a person can easily read the legend.
 - (b) Conform to the requirements for fifty-one-centimeter by thirty-six-centimeter [20-inch by 14-inch] upright format signs specified in title 29 CFR, Code of Federal Regulations, 1910.145(d)(4) and this subdivision.

- (c) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
DANGER	2.5 cm [1 in.] Sans Serif, Gothic, or Block.
ASBESTOS DUST HAZARD	2.5 cm [1 in.] Sans Serif, Gothic, or Block.
CANCER AND LUNG DISEASE HAZARD	1.9 cm [3/4 in.] Sans Serif, Gothic, or Block.
Authorized Personnel Only	14 Point Gothic

Spacing between any two lines must be at least equal to the height of the upper two lines.

- (2) Fence the perimeter of the site in a manner adequate to deter access by the general public.
 - (3) Upon request and supply of appropriate information, the department will determine whether a fence or a natural barrier adequately deters access by the general public.
- c. The owner or operator may use an alternative control method that has received prior approval of the department and administrator of the United States environmental protection agency rather than comply with the requirements of subdivision a or b of this subsection.
- d. Notify the department, in writing, at least forty-five days prior to excavating or otherwise disturbing any asbestos-containing waste material that has been deposited at a waste disposal site under this section and follow the procedures specified in the notification. If the excavation will begin on a date other than the one contained in the original notice, notice of a new start date must be provided to the department at least ten days before excavation begins and in no event shall excavation begin earlier than the date specified in the original notification. Include the following information in the notice:
- (1) Scheduled starting and completion dates.
 - (2) Reason for disturbing the waste.

- (3) Procedures to be used to control emissions during the excavation, storage, transport, and ultimate disposal of the excavated asbestos-containing waste material. If deemed necessary, the department may require changes in the emission control procedures to be used.
 - (4) Location of any temporary storage site and the final disposal site.
- e. Within sixty days of a site becoming inactive, record in accordance with state law a notation on the deed to the facility property and on any instrument that would normally be examined during a title search. This notation will in perpetuity notify any potential purchaser of the property that:
- (1) The land has been used for the disposal of asbestos-containing waste material;
 - (2) The survey plot and record of the location and quantity of asbestos-containing waste disposed of within the disposal site required in subdivision f of subsection 15 have been filed with the department; and
 - (3) The site is subject to this section.

13. Air-cleaning.

- a. The owner or operator who elects to use air-cleaning, as permitted in subsections 3, 5, 6, 7, 8, 10, and 11 shall:
- (1) Use fabric filter collection devices except as noted in subdivision b of this subsection, doing all of the following:
 - (a) Ensuring that the airflow permeability, as determined by A.S.T.M. method D737-75, does not exceed nine $\text{m}^3/\text{min}/\text{m}^2$ [$30 \text{ ft}^3/\text{min}/\text{ft}^2$] for woven fabrics or eleven $\text{m}^3/\text{min}/\text{m}^2$ [$35 \text{ ft}^3/\text{min}/\text{ft}^2$] for felted fabrics, except that twelve $\text{m}^3/\text{min}/\text{m}^2$ [$40 \text{ ft}^3/\text{min}/\text{ft}^2$] for woven and fourteen $\text{m}^3/\text{min}/\text{m}^2$ [$45 \text{ ft}^3/\text{min}/\text{ft}^2$] for felted fabrics is allowed for filtering air from asbestos ore dryers.
 - (b) Ensuring that felted fabric weighs at least four hundred seventy-five grams per square meter [14 ounces per square yard] and is at least one and six-tenths millimeters [$1/16$ inch] thick throughout.

- (c) Avoiding the use of synthetic fabrics that contain fill yarn other than that which is spun.
 - (2) Properly install, use, operate, and maintain all air-cleaning equipment authorized by this subsection. Bypass devices may be used only during upset or emergency conditions and then only for so long as it takes to shut down the operation generating the asbestos material.
 - (3) For fabric filters installed after January 10, 1989, provide for easy inspection for faulty bags.
- b. There are the following exceptions to paragraph 1 of subdivision a:
- (1) If the use of fabric creates a fire or explosion hazard or the department determines that a fabric filter is not feasible, the department may authorize as a substitute the use of wet collectors designed to operate with a unit contacting energy of at least 9.95 kilopascals [40 inches water gauge pressure].
 - (2) Use a high efficiency particulate air filter that is certified to be at least ninety-nine and ninety-seven hundredths percent efficient for particles with a diameter size of three-tenths microns and greater.
 - (3) The department and administrator of the United States environmental protection agency may authorize the use of filtering equipment other than that described in subdivisions a and b of this subsection if the owner or operator demonstrates to the administrator and the department's satisfaction that it is equivalent to the described equipment in filtering asbestos material.

14. Reporting.

- a. Any existing source to which this section applies (with the exception of sources subject to subsections 4, 7, and 9) which has not previously supplied a notice to this department or the administrator, shall provide such notice within ninety days of the effective date of this regulation. Any new source to which this section applies shall provide notice to this department within ninety days of the effective startup date of the source. Changes to the information provided in a notice must be submitted to this department within thirty days of the change taking place. The notice shall provide the following information to the department:

- (1) A description of the emission control equipment used for each process; and
 - (2) If a fabric filter device is used to control emissions;
 - (a) The airflow permeability in $\text{m}^3/\text{min}/\text{m}^2$ if the fabric filter device uses a woven fabric and; if the fabric is synthetic, whether the fill yarn is spun or not spun.
 - (b) If the fabric filter device uses a felted fabric, the density in g/m^2 , the minimum thickness in millimeters, and the airflow permeability in $\text{m}^3/\text{min}/\text{m}^2$.
 - (3) If a high efficiency particulate air filter is used to control emissions, the certified efficiency.
 - (4) For sources subject to subsections 10 and 11:
 - (a) A brief description of each process that generates asbestos-containing waste material;
 - (b) The average volume of asbestos-containing waste material disposed of in cubic yards per day;
 - (c) The emission control methods used in all stages of waste disposal; and
 - (d) The type of disposal site used for ultimate disposal, the name of the site operator, and the name and location of the disposal site.
 - (5) For sources subject to subsections 12 and 15:
 - (a) A brief description of the site; and
 - (b) The method or methods used to comply with the standard, or alternative procedures to be used.
- b. The information required by subdivision a of this subsection must accompany the information required by subsection 8 of section 33-15-13-01. Active waste disposal sites subject to subsection 15 shall also comply with this provision. Roadways, demolition and renovations, spraying, and insulating materials are exempted from the requirements of section 33-15-13-01.1.
15. **Standard for active waste disposal sites.** To be an acceptable site for disposal of asbestos-containing waste material under subsections 10, 11, and 17, an active waste disposal site must meet the requirements of this subsection.

- a. Either there shall be no visible emissions to the outside air from any active waste disposal site where asbestos-containing waste material has been deposited, or the requirements of subdivisions c and d of this subsection must be met.
- b. Unless a natural barrier adequately deters access by the general public, either warning signs and fencing must be installed and maintained as follows, or the requirements of paragraph 1 of subdivision c of this subsection must be met.
 - (1) Warning signs must be displayed at all entrances and at intervals of three hundred twenty-eight feet [100 meters] or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material is deposited. The warning signs must:
 - (a) Be posted in such a manner and location that a person may easily read the legend.
 - (b) Conform to the requirements of fifty-one centimeters by thirty-six centimeters [20 inches by 14 inches] upright format signs specified in title 29 GFR, Code of Federal Regulations, 1910.145(d)(4) and this subsection.
 - (c) Display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
Asbestos Waste Disposal Site	2.5 cm [1 in.] Sans Serif, Gothic, or Block
Avoid Creating Dust Breathing Asbestos Dust May Cause Lung Disease and Cancer	1.9 cm [3/4 in.] Sans Serif, Gothic, or Block 14 Point Gothic

Spacing between lines must be at least equal to the height of the upper two lines.

- (2) The perimeter of the disposal site must be fenced in order to adequately deter access to the general public.

- (3) Upon request and supply of appropriate information, the department will determine whether a fence or a natural barrier adequately deters access by the general public.
- c. Rather than meet the no visible emission requirements of subdivision a of this subsection, an active waste disposal site would be an acceptable site if at the end of each operating day, or at least once every twenty-four-hour period while the site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous twenty-four-hour period is covered with either:
- (1) At least fifteen centimeters [6 inches] of compacted non-asbestos-containing material; or
 - (2) A resinous-based or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. This agent must be used in the manner and frequency recommended for the particular dust by the manufacturer of the dust suppression agent. Other equally effective dust suppression agents may be used upon prior approval by the department. For purposes of this paragraph, used, spent, or other waste oil is not considered a dust suppression agent.
- d. Rather than meet the no visible emission requirements of subdivision a of this subsection, use an alternative emission control method that has received prior approval by the department and administrator of the United States environmental protection agency.
- e. For all asbestos-containing waste material received, the owner or operator of the active waste disposal site shall:
- (1) Maintain waste shipment records which include the following information:
 - (a) The name, address, and telephone number of the waste generator.
 - (b) The name, address, and telephone number of the transporters.
 - (c) The quantity of the asbestos-containing material in cubic yards.
 - (d) The presence of improperly enclosed or uncovered wastes or any asbestos-containing waste material not sealed in leaktight containers. Report in writing to this department by the following working day, the presence of a significant

amount of improperly enclosed or uncovered waste. Submit a copy of the waste shipment record along with the report.

- (e) The date of the receipt.
 - (2) As soon as possible and no longer than thirty days after receipt of the waste send a copy of the signed waste shipment record to the waste generator.
 - (3) Upon discovering a discrepancy between the quantity of waste designated on the waste shipment records and the quantity actually received, attempt to reconcile the discrepancy with the waste generator. If the discrepancy is not resolved within fifteen days after receiving the waste, immediately report in writing to this department. Describe the discrepancy and attempts to reconcile it, and submit a copy of the waste shipment record along with the report.
 - (4) Retain a copy of all records and reports required by this paragraph for at least two years.
- f. Maintain until closure, records of the location, depth and area and quantity in cubic yards of asbestos-containing waste material within the disposal site on a map or diagram of the disposal area.
 - g. Upon closure, comply with all the provisions of subsection 12.
 - h. Submit to this department, upon closure of the facility, a copy of records of asbestos waste disposal locations and quantities.
 - i. Furnish upon request and make available during normal business for inspection by this department, all records required under this section.
 - j. Comply with subdivision d of subsection 12 if it becomes necessary to excavate or otherwise disturb asbestos-containing waste material that has been previously covered.
16. **Asbestos abatement licensing and certification.** No public employees or employees of asbestos contractors shall engage in any asbestos abatement activity or provide asbestos abatement project monitoring unless they are certified with the department as provided in this subsection. Certification will be for a period of one year from the completion date of the initial training course or the last refresher source in the appropriate discipline. All asbestos contractors and firms who provide asbestos abatement project monitoring services,

must be licensed with this department, as provided in this subsection, prior to beginning asbestos abatement or asbestos abatement project monitoring activities. At least one person having completed the requirements for supervisor certification of subdivision b of this subsection is required to be at the worksite at all times while work is in progress, if the work involves repair, removal, encapsulation, enclosure, or handling of regulated asbestos-containing material if the work is being conducted by an asbestos contractor or public employees. At least one onsite individual having completed the supervisor training requirement of subdivision b of this subsection is required to be present if the activity is regulated by subsection 6 and the work is being conducted by employees of the owner.

a. Asbestos workers. All asbestos workers employed by asbestos abatement contractors and all public employees engaged in the repair, removal, enclosure, encapsulation, or handling of regulated asbestos-containing material, must obtain certification as outlined in all paragraphs of this subdivision except as provided in subdivision h.

(1) Application. Any applicant desiring certification as an asbestos worker shall make an application to the department on forms supplied by the department. Each application shall be accompanied by a nonrefundable fee of twenty-five dollars except as provided in subdivision g. This fee includes the processing of the initial examination specified in paragraph 3 of this subdivision.

(2) Initial training. Any applicant desiring certification as an asbestos worker shall complete the initial training requirements for asbestos worker accreditation under title 40 CFR, Code of Federal Regulations, part 763, appendix C to subpart E - environmental protection agency model contractor accreditation plan, by attending and successfully completing a training course designed for asbestos workers. The training course must have received approval from the environmental protection agency or the department.

(3) Examination. Any applicant for certification shall pass a written examination administered by the department. The department may accept proof of successful completion of an examination administered by an environmental protection agency or department approved training course provider. The examination and the results of the examination must be available to the department upon request. Any applicant who fails to obtain a minimum seventy percent passing score on the examination shall be eligible to take a

subsequent examination no earlier than one week following the previous examination. A twenty-five dollar fee is required for each examination. No more than three examinations may be given before requiring attendance of another initial training course. Information concerning the testing arrangements can be obtained from the department.

- (4) Refresher training. Any asbestos worker who has received initial training and has established full certification with the department, and who wishes to maintain continuous certification, shall complete a refresher training course as required by the model contractor accreditation plan within one year of completing the initial training course. The course content shall include, but not be limited to, a review of the changes in federal and state regulations, a discussion of the developments in state-of-the-art procedures and equipment as well as an overview of key aspects of the initial training course. Thereafter, the asbestos worker shall complete a refresher course within one year of the last refresher course.
 - (5) Certification renewal. Any asbestos worker who desires to renew their certification must have attended a refresher training course within twelve months prior to submittal of the renewal application. The renewal application shall include proof of attendance at such course and a recertification fee of twenty-five dollars. If an asbestos worker does not satisfy the refresher training requirements of this subdivision within two years of the date of the initial training course or of the last refresher training course, then the individual shall complete the initial training requirements provided in paragraph 2 of this subdivision to reestablish full certification.
 - (6) The certification card issued by the department must be available at the worksite for each asbestos worker.
- b. Other asbestos disciplines. Any individual, except asbestos workers, acting as or acting on behalf of an asbestos contractor who performs an asbestos abatement service or any individual who performs asbestos abatement project monitoring on behalf of a contracting firm or as a public employee must obtain certification as outlined in all paragraphs of this subdivision. This certification requirement applies to asbestos abatement supervisors, asbestos inspectors, asbestos management planners, asbestos abatement project designers, asbestos abatement

project monitors, and to public employees performing these duties except as provided in subdivision h.

(1) Application. Any person desiring certification in the disciplines of asbestos inspector, asbestos management planner, asbestos abatement project designer, asbestos abatement project monitor, and asbestos abatement supervisor shall make an application to the department on forms supplied by the department. Each application shall be accompanied by a nonrefundable fee of twenty-five dollars for each discipline within which the applicant is seeking certification except as provided in subdivision g. This fee includes the processing of the initial examination specified in paragraph 3 of this subdivision.

(2) The initial training requirements are as follows:

(a) Any applicant desiring certification as an asbestos inspector, asbestos management planner, asbestos abatement project designer, or asbestos abatement supervisor or any individual required to meet the training requirements of paragraph 8 of subdivision c of subsection 6 shall complete the initial training requirements set forth in title 40 GFR, Code of Federal Regulations, part 763, appendix C to subpart E - environmental protection agency model contractor accreditation plan, by attending and successfully completing a training course in the appropriate discipline. The training course must have received approval in the respective discipline from the environmental protection agency or the department. For the purpose of certification, the four-day asbestos abatement supervisor training course will fulfill the initial training requirements for asbestos abatement project designer.

(b) Asbestos abatement project monitors must have a valid state certification as asbestos abatement supervisor or asbestos abatement project designer and shall have completed a NIOSH 582 or equivalent air sampling course of not less than four days in length.

(3) Examination. Any applicant for certification in a specific discipline except asbestos abatement project monitor shall pass a written examination administered by the department for that discipline. The department may accept proof of successful completion of an examination administered by an environmental

protection agency or department approved training course provider. The examination and the results of the examination must be available to the department upon request. Any applicant who fails to obtain a minimum seventy percent passing score on the examination shall be eligible to take a subsequent examination no earlier than one week following the previous examination. A twenty-five dollar fee is required for each examination. No more than three examinations shall be given before requiring attendance of another initial training course.

- (4) Refresher training. Any asbestos abatement supervisor, asbestos inspector, asbestos management planner, or asbestos abatement project designer who has received initial training and has established full certification with the department, and who wishes to maintain continuous certification, or any individual who must meet the training requirements of paragraph 8 of subdivision c of subsection 6 shall complete a refresher training course as required by the model contractor accreditation plan within one year of completing the initial training course. The course content shall include, but not be limited to, a review of the changes in the federal and state regulations, a discussion of the developments in state-of-the-art procedures and equipment as well as an overview of key aspects of the initial training course. Thereafter, these persons shall complete a refresher course designed for the respective disciplines within one year of the last refresher course.
- (5) Certification renewal. Any asbestos abatement supervisor, asbestos inspector, asbestos management planner, asbestos abatement project designer, or asbestos abatement project monitor who desires to renew his or her certification must have attended a refresher training course in the appropriate discipline within twelve months prior to submittal of the renewal application. The renewal application shall include proof of attendance at such a course and a recertification fee of twenty-five dollars per discipline. If an individual does not satisfy the refresher training requirements of this subdivision in their respective discipline within two years of the date of the initial training or of the last refresher training, then that individual shall complete the initial training requirements provided in paragraph 2 of this subdivision to reestablish full certification. Refresher training of the air sampling course for project monitors is not required.

- (6) The certification card issued by the department must be available at the worksite.
- c. Asbestos contractor license. Each contractor who performs asbestos abatement services or performs asbestos abatement project monitoring services in the state shall obtain an asbestos contractor license except as provided in subdivision h.
- (1) Submit an application to the department on forms supplied by the department. An application shall be accompanied by a nonrefundable fee of one hundred dollars.
 - (2) The license fee will cover the period from January first through December thirty-first of each year unless the license is suspended, revoked, or denied as specified in subdivision f. The fee shall be one hundred dollars regardless of the application date. Following the initial submittal, the renewal fee shall be due and payable by January thirtieth of the following year.
 - (3) A contractor seeking an asbestos contractor license must have completed the appropriate training and certification requirements in subdivision b of this subsection. The contractor may designate an employee who has completed this requirement to serve as the contractor's agent for the purposes of obtaining an asbestos contractor license.
 - (4) Asbestos contractors who provide multiple services are not required to pay additional license fees.
 - (5) All certifiable services offered by an asbestos contractor must be performed by persons certified in accordance with subdivisions a and b of this subsection.
 - (6) A copy of the asbestos contractor license shall be made available at the worksite.
 - (7) This license does not exempt, supersede, or replace any other state or local licensing or permitting requirements.
- d. Approved initial and refresher training courses. The department will maintain and provide a listing of approved initial and refresher training courses. Applicants seeking approval of courses, other than those present on the department list, must submit information on the course content on application forms supplied by the department. The course content must satisfy the minimum requirements

of the model contractor accreditation plan. The department will advise the applicant whether the course is approved within thirty days of receipt of the necessary information.

- e. Reciprocity. Each applicant for asbestos worker or asbestos contractor certification who is licensed or certified for asbestos abatement in another state may petition the department for certification without written examination. The department shall evaluate the requirements in such other states and shall issue the certification without examination if the department determines that the requirements in such other states are at least as stringent as the requirements for certification in North Dakota. Each application for certification pursuant to this subdivision shall submit an application accompanied by a nonrefundable fee of twenty-five dollars.
- f. Suspension, revocation, or denial. An asbestos certification or license may be suspended, revoked, or denied if:
 - (1) Violations of the requirements of this section are noted;
 - (2) Another state has revoked, suspended, or denied a license or certification for violations of applicable standards;
 - (3) An incomplete application is filed; or
 - (4) The required fee is not submitted.
- g. Public employees will not be required to pay the twenty-five dollar certification or recertification fees.
- h. Any individual or asbestos contractor engaged in repair, removal, enclosure, or encapsulation activities involving less than or equal to three square feet [0.28 square meters] or three linear feet [0.91 meters] of asbestos-containing materials, are exempt from the certification and licensing requirements of this subsection.
- i. Upon written request, the department, at its discretion, may review training course material and conduct an audit of a training course to determine if the course and examination meet the training requirements of title 40 CFR, Code of Federal Regulations, part 763, appendix C to subpart E - environmental protection agency model contractor accreditation plan. Under the authority granted to this department by the environmental protection

agency on April 21, 1989, courses that this department determine to meet the model contractor accreditation plan shall be listed in the federal register list of approved courses.

- (1) Training courses seeking department approval shall submit the material necessary for the department to conduct the review including the submittal requirements listed in title 40 CFR, Code of Federal Regulations, part 763, appendix C, subpart III.
 - (2) The department must be provided access, without cost, to any asbestos course conducted in this state to determine if the course meets the requirement of the environmental protection agency model contractor accreditation plan. Following such an audit, the department may rescind approval or refuse to accept as adequate any course determined not to meet the training requirements of the environmental protection agency model contractor accreditation plan.
 - (3) Any training provider requesting a review of the provider's course for approval by this department shall submit a filing fee of one hundred fifty dollars plus an application processing fee. The application processing fee will be based on the actual processing costs, including time spent by this department to conduct the course review and course audit, and any travel and lodging expenses the department incurs conducting these items. Following the course review and audit, and after making a determination on the accreditation status of the course, a statement will be sent to the applicant listing the remaining application processing costs. The statement must be sent within fifteen months of the submittal of the initial filing fee.
17. **Standard for operations that convert asbestos-containing waste material into nonasbestos (asbestos-free) material.** Each owner or operator of an operation that converts regulated asbestos-containing material and asbestos-containing waste material into nonasbestos (asbestos-free) material shall:
- a. Obtain the prior written approval of this department and the administrator of the United States environmental protection agency to construct the facility. To obtain approval, the owner or operator shall provide the department and the administrator of the United States environmental protection agency with the following information:
 - (1) Application to construct pursuant to chapter 33-15-14.

- (2) In addition to the information requirements of chapter 33-15-14, provide a:
 - (a) Description of the waste feed handling and temporary storage.
 - (b) Description of process operating conditions.
 - (c) Description of the handling and temporary storage of the end products.
 - (d) Description of the protocol to be followed when analyzing output materials by transmission electron microscopy.
 - (3) Performance test protocol including provisions for obtaining information required under subdivision b of this subsection.
 - (4) The department may require that a demonstration of the process be performed prior to approval of the application to construct.
- b. Conduct a startup performance test. Test results must include:
- (1) A detailed description of the types and quantities of nonasbestos material, regulated asbestos containing material, and asbestos-containing waste material processed (e.g., asbestos cement products, friable asbestos insulation, plaster, wood, plastic, wire, etc.). Test feed is to include the full range of materials that will be encountered in actual operation of the process.
 - (2) Results of analyses, using polarized light microscopy, that document the asbestos content of the wastes processed.
 - (3) Results of analyses using transmission electron microscopy, that document that the output materials are free of asbestos. Samples for analysis are to be collected as eight-hour composite samples (one 200-gram [seven-ounce] sample per hour), beginning with the initial introduction of regulated asbestos-containing material or asbestos-containing waste material and continuing until the end of the performance test.
 - (4) A description of operating parameters, such as temperature and residence times, defining the full range over which the process is expected to operate to produce nonasbestos (asbestos-free) materials.

Specify the limits for each operating parameter within which the process will produce nonasbestos (asbestos-free) materials.

(5) The length of the test.

c. During the initial ninety days of operation;

- (1) Continuously monitor and log the operating parameters identified during startup performance tests that are intended to ensure the production of nonasbestos (asbestos-free) output material.
- (2) Monitor input materials to ensure that they are consistent with the test feed materials described during startup performance tests in paragraph 1 of this subdivision.
- (3) Collect and analyze samples taken as ten-day composite samples (one 200-gram [seven-ounce] sample collected every eight hours of operation) of all output materials for the presence of asbestos. Composite samples may be for fewer than ten days. Transmission electron microscopy must be used to analyze the output materials for the presence of asbestos. During the initial ninety-day period, all output materials must be stored onsite until analysis shows the material to be asbestos-free or be disposed of as asbestos-containing waste material according to subsection 11.

d. After the initial ninety days of operation:

- (1) Continuously monitor and record the operating parameters identified during startup performance testing and any subsequent performance testing. Any output produced during a period of deviation from the range of operating conditions established to ensure the production of nonasbestos (asbestos-free) output material shall be:
 - (a) Disposed of as asbestos-containing waste material according to subsection 11;
 - (b) Recycled as waste feed during process operations within the established range of operating conditions; or
 - (c) Stored temporarily onsite in a leaktight container until analyzed for asbestos content. Any product material that is not asbestos-free shall either be disposed of as

asbestos-containing waste material or recycled as waste feed to the process.

- (2) Collect and analyze monthly composite samples (one 200-gram [seven-ounce] sample collected every eight hours of operation) of the output material. Transmission electron microscopy must be used to analyze the output material for the presence of asbestos.
- e. Discharge no visible emissions to the outside air from any part of the operation or use the methods specified by subsection 13 to clean emissions containing particulate asbestos material before they escape to or are vented to the outside air.
- f. Maintain records onsite and include the following information:
- (1) Results of startup performance testing and all subsequent performance testing, including operating parameters, feed characteristics, and analyses of output materials.
 - (2) Results of the composite analysis required during the initial ninety days of operation under subdivision c of this subsection.
 - (3) Results of the monthly composite analysis required under subdivision d of this subsection.
 - (4) Results of continuous monitoring and logs of process operating parameters required under subdivisions c and d of this subsection.
 - (5) Information on waste shipments received as required in subdivision e of subsection 15.
 - (6) For output materials where no analyses were performed to determine the presence of asbestos, record the name and location of the purchaser or disposal site to which output materials were sold or deposited and the date of sale or disposal.
 - (7) Retain records required by this subdivision for at least two years.
- g. Submit the following reports to the department:
- (1) A report for each analysis of product composite samples performed during the initial ninety days of operation.

(2) A quarterly report, including the following information concerning activities during each consecutive three-month period:

(a) Results of analyses of monthly product composite samples.

(b) A description of any deviation from the operating parameters established during performance testing, the duration of the deviation, and steps taken to correct the deviation.

(c) Disposition of any product produced during a period of deviation, including whether it was recycled, disposed of as asbestos-containing waste material, or stored temporarily onsite until analyzed for asbestos content.

(d) The information on waste disposal activities as required in subdivision f of subsection 15.

h. Nonasbestos (asbestos-free) output material is not subject to any of the provisions of this section. Output material in which asbestos is detected, or output materials produced when the operating parameters deviated from those established during the startup performance testing, unless shown by transmission electron microscopy analysis to be asbestos-free shall be considered to be asbestos-containing waste and must be handled and disposed of in accordance with subsections 11 and 15 or reprocessed while all of the established operating parameters are being met.

History: Amended effective October 1, 1987; January 1, 1989; June 1, 1990; June 1, 1992; March 1, 1994; December 1, 1994.

General Authority: NDCC 23-25-03, 23-25-03.1

Law Implemented: NDCC 23-25-03, 23-25-03.1

CHAPTER 33-15-14

33-15-14-06. Title V permit to operate.

1. Definitions. For purposes of this section:

- a. "Affected source" means any source that includes one or more affected units.
- b. "Affected state" means any state that is contiguous to North Dakota whose air quality may be affected by a source subject to a proposed title V permit, permit modification, or permit renewal or which is within fifty miles [80.47 kilometers] of the permitted source.
- c. "Affected unit" means a unit that is subject to any acid rain emissions reduction requirement or acid rain emissions limitation under title VI of the Federal Clean Air Act.
- d. "Applicable requirement" means all of the following as they apply to emissions units at a source that is subject to requirements of this section (including requirements that have been promulgated or approved by the United States environmental protection agency through rulemaking at the time of issuance but have future-effective compliance dates):
 - (1) Any standard or other requirement provided for in the North Dakota state implementation plan approved or promulgated by the United States environmental protection agency through rulemaking under title I of the Federal Clean Air Act that implements the relevant requirements of the Federal Clean Air Act, including any revisions to that plan.
 - (2) Any term or condition of any permit to construct issued pursuant to this chapter.
 - (3) Any standard or other requirement under section 111 including section 111(d) of the Federal Clean Air Act.
 - (4) Any standard or other requirement under section 112 of the Federal Clean Air Act including any requirement concerning accident prevention under section 112(r)(7) of the Federal Clean Air Act.

- (5) Any standard or other requirement of the acid rain program under title IV of the Federal Clean Air Act.
 - (6) Any requirements established pursuant to section 504(b) or section 114(a)(3) of the Federal Clean Air Act.
 - (7) Any standard or other requirement governing solid waste incineration, under section 129 of the Federal Clean Air Act.
 - (8) Any standard or other requirement for consumer and commercial products, under section 183(e) of the Federal Clean Air Act.
 - (9) Any standard or other requirement for tank vessels under section 183(f) of the Federal Clean Air Act.
 - (10) Any standard or other requirement of the program to control air pollution from outer continental shelf sources, under section 328 of the Federal Clean Air Act.
 - (11) Any standard or other requirement of the regulations promulgated to protect stratospheric ozone under title VI of the Federal Clean Air Act, unless the administrator of the United States environmental protection agency has determined that such requirements need not be contained in a title V permit.
 - (12) Any national ambient air quality standard or increment or visibility requirement under part C of title I of the Federal Clean Air Act, but only as it would apply to temporary sources permitted pursuant to section 504(e) of the Federal Clean Air Act.
- e. "Designated representative" means a responsible natural person authorized by the owners and operators of an affected source and of all affected units at the source, as evidenced by a certificate of representation submitted in accordance with subpart B of 40 CFR 72, to represent and legally bind each owner and operator, as a matter of federal law, in matters pertaining to the acid rain program. Whenever the term "responsible official" is used in this section, or in any other regulations implementing title V of the Federal Clean Air Act, it shall be deemed to refer to the "designated representative" with regard to all matters under the acid rain program.
- f. "Draft permit" means the version of a permit for which the department offers public participation or affected state review.

- g. "Emergency" means any situation arising from sudden and reasonably unforeseeable events beyond the control of the source, including acts of God, which situation requires immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based emission limitation under the title V permit to operate, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.
- h. "Emissions allowable under the permit" means a federally enforceable permit term or condition determined at issuance to be required by an applicable requirement that establishes an emissions limit (including a work practice standard) or a federally enforceable emissions cap that the source has assumed to avoid an applicable requirement to which the source would otherwise be subject.
- i. "Emissions unit" means any part or activity of a stationary source that emits or has the potential to emit any regulated air contaminant or any contaminant listed under section 112(b) of the Federal Clean Air Act. This term does not alter or affect the definition of unit for purposes of title IV of the Federal Clean Air Act.
- j. "Environmental protection agency" or the "administrator" means the administrator of the United States environmental protection agency or the administrator's designee.
- k. "Federal Clean Air Act" means the Federal Clean Air Act, as amended [42 U.S.C. 7401 et seq.] or the regulations promulgated thereunder, as they existed on May 1, 1993.
- l. "Final permit" means the version of a title V permit issued by the department that has completed all review procedures required in this section.
- m. "Fugitive emissions" are those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.
- n. "General permit" means a title V permit to operate that meets the requirements of subdivision d of subsection 5.
- o. "Major source" means any stationary source (or any group of stationary sources that are located on one or more contiguous or adjacent properties, and are under common control of the same person (or persons under common control)) belonging to a single major industrial grouping and that are described in paragraph 1 or 2. For the purposes of defining "major source", a stationary source

or group of stationary sources shall be considered part of a single industrial grouping if all of the contaminant emitting activities at such source or group of sources on contiguous or adjacent properties belong to the same major group (i.e., all have the same two-digit code) as described in the standard industrial classification manual, 1987.

(1) A major source under section 112 of the Federal Clean Air Act, which is defined as:

(a) For contaminants other than radionuclides, any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, in the aggregate, ten tons [9.07 metric tons] per year (tpy) or more of any hazardous air contaminant which has been listed pursuant to section 112(b) of the Federal Clean Air Act, twenty-five tons [22.67 metric tons] per year or more of any combination of such hazardous air contaminants, or such lesser quantity as the administrator of the United States environmental protection agency may establish by rule. Notwithstanding the preceding sentence, emissions from any oil or gas exploration or production well (with its associated equipment) and emissions from any pipeline compressor pump station shall not be aggregated with emissions from other similar units, whether or not such units are in a contiguous area or under common control, to determine whether such units or stations are major sources.

(b) For radionuclides, "major source" shall have the meaning specified by the administrator of the United States environmental protection agency by rule.

(2) A major stationary source of air contaminants, that directly emits or has the potential to emit, one hundred tons [90.68 metric tons] per year or more of any air contaminant (including any major source of fugitive emissions of any such contaminant, as determined by rule by the administrator of the United States environmental protection agency). The fugitive emissions of a stationary source shall not be considered in determining whether it is a major stationary source for the purposes of this section, unless the source belongs to one of the following categories of stationary source:

(a) Coal cleaning plants (with thermal dryers).

- (b) Kraft pulp mills.
- (c) Portland cement plants.
- (d) Primary zinc smelters.
- (e) Iron and steel mills.
- (f) Primary aluminum ore reduction plants.
- (g) Primary copper smelters.
- (h) Municipal incinerators capable of charging more than two hundred fifty tons [226.80 metric tons] of refuse per day.
- (i) Hydrofluoric, sulfuric, or nitric acid plants.
- (j) Petroleum refineries.
- (k) Lime plants.
- (l) Phosphate rock processing plants.
- (m) Coke oven batteries.
- (n) Sulfur recovery plants.
- (o) Carbon black plants (furnace process).
- (p) Primary lead smelters.
- (q) Fuel conversion plants.
- (r) Sintering plants.
- (s) Secondary metal production plants.
- (t) Chemical process plants.
- (u) Fossil-fuel boilers (or combination thereof) totaling more than two hundred fifty million British thermal units per hour heat input.
- (v) Petroleum storage and transfer units with a total storage capacity exceeding three hundred thousand barrels.
- (w) Taconite ore processing plants.
- (x) Glass fiber processing plants.
- (y) Charcoal production plants.

- (z) Fossil-fuel-fired steam electric plants of more than two hundred fifty million British thermal units per hour heat input.
- (aa) All other stationary source categories regulated by a standard promulgated under section 111 or 112 of the Federal Clean Air Act, but only with respect to those air contaminants that have been regulated for that category.
- p. "Permit modification" means a revision to a title V permit that meets the requirements of subdivision e of subsection 6.
- q. "Permit program costs" means all reasonable (direct and indirect) costs required to develop and administer a permit program, under this section (whether such costs are incurred by the department or other state or local agencies that do not issue permits directly, but that support permit issuance or administration).
- r. "Permit revision" means any permit modification or administrative permit amendment.
- s. "Potential to emit" means the maximum capacity of a stationary source to emit any air contaminant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation is enforceable by the administrator of the United States environmental protection agency and the department.
- t. "Proposed permit" means the version of a permit that the department proposes to issue and forwards to the administrator of the United States environmental protection agency for review.
- u. "Regulated air contaminant" means the following:
 - (1) Nitrogen oxides or any volatile organic compounds.
 - (2) Any contaminant for which a national ambient air quality standard has been promulgated.
 - (3) Any contaminant that is subject to any standard promulgated under section 111 of the Federal Clean Air Act.

- (4) Any class I or II substance subject to a standard promulgated under or established by title VI of the Federal Clean Air Act.
 - (5) Any contaminant subject to a standard promulgated under section 112 or other requirements established under section 112 of the Federal Clean Air Act, including sections 112(g), (j), and (r) of the Federal Clean Air Act, including the following:
 - (a) Any contaminant subject to requirements under section 112(j) of the Federal Clean Air Act. If the administrator fails to promulgate a standard by the date established pursuant to section 112(e) of the Federal Clean Air Act, any contaminant for which a subject source would be major shall be considered to be regulated on the date eighteen months after the applicable date established pursuant to section 112(e) of the Federal Clean Air Act; and
 - (b) Any contaminant for which the requirements of section 112(g)(2) of the Federal Clean Air Act have been met, but only with respect to the individual source subject to section 112(g)(2) of the Federal Clean Air Act requirement.
- v. "Regulated contaminant" for fee calculation, which is used only for subsection 8, means any "regulated air contaminant" except the following:
- (1) Carbon monoxide.
 - (2) Any contaminant that is a regulated air contaminant solely because it is a class I or II substance subject to a standard promulgated under or established by title VI of the Federal Clean Air Act.
 - (3) Any contaminant that is a regulated air contaminant solely because it is subject to a standard or regulation under section 112(r) of the Federal Clean Air Act.
- w. "Renewal" means the process by which a permit is reissued at the end of its term.
- x. "Responsible official" means one of the following:
- (1) For a corporation: a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decisionmaking functions for the corporation, or a duly authorized

representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit and either:

- (a) The facilities employ more than two hundred fifty persons or have gross annual sales or expenditures exceeding twenty-five million dollars (in second quarter 1980 dollars).
 - (b) The delegation of authority to such representatives is approved in advance by the department.
- (2) For a partnership or sole proprietorship: a general partner or the proprietor, respectively.
- (3) For a municipality, state, federal, or other public agency: either a principal executive officer or ranking elected official. For the purposes of this section, a principal executive officer of a federal agency includes the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., a regional administrator of the United States environmental protection agency).
- (4) For affected sources:
- (a) The designated representative insofar as actions, standards, requirements, or prohibitions under title IV of the Federal Clean Air Act or the regulations promulgated thereunder are concerned.
 - (b) The designated representative for any other purposes under this section.
- y. "Section 502(b)(10) changes" are changes that contravene an express permit term. Such changes do not include changes that would violate applicable requirements or contravene federally enforceable permit terms and conditions that are monitoring (including test methods), recordkeeping, reporting, or compliance certification requirements.
- z. "Stationary source" means any building, structure, facility, or installation that emits or may emit any regulated air contaminant or any contaminant listed under section 112(b) of the Federal Clean Air Act.

- aa. "Title V permit to operate or permit (unless the context suggests otherwise)" means any permit or group of permits covering a source that is subject to this section that is issued, renewed, amended, or revised pursuant to this section.
- bb. "Title V source" means any source subject to the permitting requirements of this section, as provided in subsection 2.

2. Applicability.

- a. This section is applicable to the following sources:
 - (1) Any major source.
 - (2) Any source, including an area source, subject to a standard, limitation, or other requirement under section 111 of the Federal Clean Air Act.
 - (3) Any source, including an area source, subject to a standard or other requirement under section 112 of the Federal Clean Air Act, except that a source is not required to obtain a permit solely because it is subject to regulations or requirements under section 112(r) of the Federal Clean Air Act.
 - (4) Any affected source.
 - (5) Any source in a source category designated by the administrator of the United States environmental protection agency.
- b. The following source categories are exempt from the requirements of this section:
 - (1) All sources listed in subdivision a that are not major sources, affected sources, or solid waste incineration units required to obtain a permit pursuant to section 129(e) of the Federal Clean Air Act, are exempt from the obligation to obtain a title V permit until such time as the administrator of the United States environmental protection agency completes a rulemaking to determine how the program should be structured for nonmajor sources and the appropriateness of any permanent exemptions.
 - (2) In the case of nonmajor sources subject to a standard or other requirement under either section 111 or 112 of the Federal Clean Air Act after July 21, 1992, those the administrator of the United States environmental protection agency determines to be exempt from the requirement to obtain a title V

source permit at the time that the new standard is promulgated.

(3) Any source listed as exempt from the requirement to obtain a permit under this section may opt to apply for a title V permit. Sources that are exempted by paragraphs 1 and 2 of this subdivision and which do not opt to apply for a title V permit to operate are subject to the requirements of section 33-15-14-03.

(4) The following source categories are exempted from the obligation to obtain a permit under this section.

(a) All sources and source categories that would be required to obtain a permit solely because they are subject to 40 CFR 60, subpart AAA - standards of performance for new residential wood heaters.

(b) All sources and source categories that would be required to obtain a permit solely because they are subject to 40 CFR 61, subpart M - national emission standard for hazardous air contaminants for asbestos, standard for demolition and renovation.

c. For major sources, the department will include in the permit all applicable requirements for all relevant emissions units in the major source.

For any nonmajor source subject to the requirements of this section, the department will include in the permit all applicable requirements applicable to the emissions units that cause the source to be subject to this section.

d. Fugitive emissions from a source subject to the requirements of this section shall be included in the permit application and the permit in the same manner as stack emissions, regardless of whether the source category in question is included in the list of sources contained in the definition of major source.

3. **Scope.** Nothing within this section shall relieve the owner or operator of a source of the requirement to obtain a permit to construct under section 33-15-14-02 or to comply with any other applicable standard or requirement of this article.

4. **Permit applications.**

a. **Duty to apply.** For each title V source, the owner or operator shall submit a timely and complete permit application in accordance with this subdivision.

(1) Timely application.

- (a) A timely application for a source applying for a title V permit for the first time is one that is submitted within one year of the United States environmental protection agency approval of this rule or in accordance with the following schedule, whichever is earlier:

[1] The following designated air contaminant sources shall submit their initial application by February 1, 1995.

[a] Crude oil and natural gas production facilities.

[b] Natural gas processing facilities.

[c] Internal combustion engines used for natural gas transmission or distribution.

[d] Stationary gas turbines used for natural gas transmission or distribution.

[2] Except as provided in subparagraphs b, c, and d of this paragraph, all other applications shall be submitted by November 15, 1995.

- (b) Title V sources required to meet the requirements under section 112(g) of the Federal Clean Air Act, or to have a permit to construct under section 33-15-14-02, shall file a complete application to obtain the title V permit or permit revision within twelve months after commencing operation. Where an existing title V permit would prohibit such construction or change in operation, the source must obtain a permit revision before commencing operation.
- (c) For purposes of permit renewal, a timely application is one that is submitted at least six months, but not more than eighteen months, prior to the date of permit expiration.
- (d) Applications for initial phase II acid rain permits shall be submitted to the department by January 1, 1996, for sulfur dioxide, and by January 1, 1998, for nitrogen oxides.

(2) Complete application. To be deemed complete, an application must provide all information required pursuant to subdivision c, except that applications for a permit revision need supply such information only if it is related to the proposed change. Information required under subdivision c must be sufficient to evaluate the subject source and its application and to determine all applicable requirements. A responsible official must certify the submitted information consistent with subdivision d. Unless the department determines that an application is not complete within sixty days of receipt of the application, such application shall be deemed to be complete, except as otherwise provided in paragraph 3 of subdivision a of subsection 6. If, while processing an application that has been determined or deemed to be complete, the department determines that additional information is necessary to evaluate or take final action on that application, it may request such information in writing and set a reasonable deadline for a response. The source's ability to operate without a permit, as set forth in subdivision b of subsection 6, shall be in effect from the date the application is determined or deemed to be complete until the final permit is issued, provided that the applicant submits any requested additional information by the deadline specified by the department.

(3) Confidential information. If a source has submitted information to the department under a claim of confidentiality, the source must also submit a copy of such information directly to the administrator of the United States environmental protection agency when directed to do so by the department.

b. Duty to supplement or correct application. Any applicant who fails to submit any relevant facts or who has submitted incorrect information in a permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information. In addition, an applicant shall provide additional information as necessary to address any requirements that become applicable to the source after the date it filed a complete application but prior to release of a draft permit.

c. Standard application form and required information. All applications for a title V permit to operate shall be made on forms supplied by the department. Information as described below for each emissions unit at a title V source shall be included in the application. Emissions units or activities that have the potential to emit less

than the following quantities of air contaminants need not be included in permit applications:

Particulate: 5 tons [4.54 metric tons] per year
Inhalable particulate: 5 tons [4.54 metric tons] per year
Sulfur dioxide: 10 tons [9.07 metric tons] per year
Hydrogen sulfide: 2.5 tons [2.27 metric tons] per year
Carbon monoxide: 25 tons [22.68 metric tons] per year
Nitrogen oxides: 10 tons [9.07 metric tons] per year
Ozone: 10 tons [9.07 metric tons] per year
Reduced sulfur compounds: 2.5 tons [2.27 metric tons] per year
Volatile organic compounds: 10 tons [9.07 metric tons] per year

This exemption does not apply to contaminants listed in section 112(b) of the Federal Clean Air Act.

However, for exempted activities or emissions units, a list of such activities or units must be included in the application. An applicant may not omit information needed to determine the applicability of, or to impose, any applicable requirement, or to evaluate the fee amount required under subsection 8. The application, shall, as a minimum, include the elements specified below:

- (1) Identifying information, including company name and address (or plant name and address if different from the company name), owner's name and agent, and telephone number and names of plant site manager or contact.
- (2) A description of the source's processes and products (by Standard Industrial Classification Code) including any associated with each alternate scenario identified by the source.
- (3) The following emissions-related information:
 - (a) All emissions of contaminants for which the source is major, and all emissions of regulated air contaminants. A permit application shall describe all emissions of regulated air contaminants emitted from any emissions unit, except where such units are exempted under this subdivision.
 - (b) Identification and description of all points of emissions described in subparagraph a in sufficient detail to establish the basis for fees and applicability of requirements of the Federal Clean Air Act and this article.

- (c) Emissions rates in tons per year and in such terms as are necessary to establish compliance with the applicable standard.
 - (d) Fuels, fuel use, raw materials, production rates, and operating schedules.
 - (e) Identification and description of air pollution control equipment and compliance monitoring devices or activities.
 - (f) Limitations on source operation affecting emissions or any work practice standards, where applicable, for all regulated contaminants.
 - (g) Other information required by any applicable requirement including information related to stack height limitations developed pursuant to chapter 33-15-18.
 - (h) Calculations on which the information in subparagraphs a through g is based.
- (4) The following air pollution control requirements:
- (a) Citation and description of all applicable requirements; and
 - (b) Description of or reference to any applicable test method for determining compliance with each applicable requirement.
- (5) Other specific information that may be necessary to implement and enforce other applicable requirements of the Federal Clean Air Act or of this article or to determine the applicability of such requirements.
- (6) An explanation of any proposed exemptions from otherwise applicable requirements.
- (7) Information that the department determines to be necessary to define alternative operating scenarios identified by the source or to define permit terms and conditions.
- (8) A compliance plan for all title V sources that contains all the following:
- (a) A description of the compliance status of the source with respect to all applicable requirements.
 - (b) A description as follows:

- [1] For applicable requirements with which the source is in compliance, a statement that the source will continue to comply with such requirements.
- [2] For applicable requirements that will become effective during the permit term, a statement that the source will meet such requirements on a timely basis.
- [3] For requirements for which the source is not in compliance at the time of permit issuance, a narrative description of how the source will achieve compliance with such requirements.

(c) A compliance schedule as follows:

- [1] For applicable requirements with which the source is in compliance, a statement that the source will continue to comply with such requirements.
- [2] For applicable requirements that will become effective during the permit term, a statement that the source will meet such requirements on a timely basis. A statement that the source will meet in a timely manner applicable requirements that become effective during the permit term shall satisfy this provision, unless a more detailed schedule is expressly required by the applicable requirement.
- [3] A schedule of compliance for sources that are not in compliance with all applicable requirements at the time of permit issuance. Such a schedule shall include a schedule of remedial measures, including an enforceable sequence of actions with milestones, leading to compliance with any applicable requirements for which the source will be in noncompliance at the time of permit issuance. This compliance schedule shall resemble and be at least as stringent as that contained in any judicial consent decree or administrative order to which the source is subject. Any such schedule of compliance shall be supplemental to, and shall not sanction noncompliance with, the applicable requirements on which it is based.

- (d) A schedule for submission of certified progress reports no less frequently than every six months for sources required to have a schedule of compliance to remedy a violation.
 - (e) The compliance plan content requirements specified in this paragraph shall apply and be included in the acid rain portion of a compliance plan for an affected source, except as specifically superseded by regulations promulgated under title IV of the Federal Clean Air Act with regard to the schedule and method or methods the source will use to achieve compliance with the acid rain emissions limitations.
- (9) Requirements for compliance certification, including the following:
- (a) A certification of compliance with all applicable requirements by a responsible official consistent with subdivision d and section 114(a)(3) of the Federal Clean Air Act;
 - (b) A statement of methods used for determining compliance, including a description of monitoring, recordkeeping, and reporting requirements and test methods;
 - (c) A schedule for submission of compliance certifications during the permit term, to be submitted annually, or more frequently if specified by the underlying applicable requirement; and
 - (d) A statement indicating the source's compliance status with any applicable enhanced monitoring and compliance certification requirements of the Federal Clean Air Act.
- (10) The use of nationally standardized forms for acid rain portions of permit applications and compliance plans, as required by regulations promulgated under title IV of the Federal Clean Air Act.
- d. Any application form, report, or compliance certification submitted pursuant to these rules shall contain certification by a responsible official of truth, accuracy, and completeness. This certification and any other certification required under this section shall state that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

5. Permit content.

a. Standard permit requirements. Each permit issued under this section shall include, as a minimum, the following elements:

(1) Emission limitations and standards, including those operational requirements and limitations that assure compliance with all applicable requirements at the time of permit issuance.

(a) The permit must specify and reference the origin of and authority for each term or condition, and identify any difference in form as compared to the applicable requirement upon which the term or condition is based.

(b) The permit must state that, where an applicable requirement of the Federal Clean Air Act is more stringent than an applicable requirement of regulations promulgated under title IV of the Federal Clean Air Act, both provisions shall be incorporated into the permit and shall be enforceable by the administrator of the United States environmental protection agency and the department.

(c) Where the state implementation plan or this article allows a determination of an alternative emission limit at a title V source, equivalent to that contained in the plan, to be made in the permit issuance, renewal, or significant modification process, and the department elects to use such process, any permit containing such equivalency determination shall contain provisions to ensure that any resulting emissions limit has been demonstrated to be quantifiable, accountable, enforceable, and based on replicable procedures.

(2) Permit duration. Each title V permit to operate shall expire upon the fifth anniversary of its issuance.

(3) Monitoring and related recordkeeping and reporting requirements.

(a) Each permit shall contain the following requirements with respect to monitoring:

[1] All emissions monitoring and analysis procedures or test methods required under the applicable requirements, including any

procedures and methods promulgated pursuant to sections 504(b) or 114(a)(3) of the Federal Clean Air Act;

[2] Where the applicable requirement does not require periodic testing or instrumental or noninstrumental monitoring (which may consist of recordkeeping designed to serve as monitoring), periodic monitoring sufficient to yield reliable data from the relevant time period that are representative of the source's compliance with the permit, as reported pursuant to subparagraph c. Such monitoring requirements shall assure use of terms, test methods, units, averaging periods, and other statistical conventions consistent with the applicable requirement. Recordkeeping provisions may be sufficient to meet the requirements of this item; and

[3] As necessary, requirements concerning the use, maintenance, and, where appropriate, installation of monitoring equipment or methods.

(b) With respect to recordkeeping, the permit shall incorporate all applicable recordkeeping requirements and require, where applicable, the following:

[1] Records of required monitoring information that include the following:

[a] The date, place as defined in the permit, and time of sampling or measurements;

[b] The dates analyses were performed;

[c] The company or entity that performed the analyses;

[d] The analytical techniques or methods used;

[e] The results of such analyses; and

[f] The operating conditions as existing at the time of sampling or measurement;

- [2] Retention of records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sample, measurement, report, or application. Support information includes all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation, and copies of all reports required by the permit.
- (c) With respect to reporting, the permit shall incorporate all applicable reporting requirements and require the following:
- [1] Submittal of reports of any required monitoring at least every six months. All instances of deviations from permit requirements must be clearly identified in such reports. All required reports must be certified by a responsible official consistent with subdivision d of subsection 4.
 - [2] Prompt reporting of deviations from permit requirements, including those attributable to upset conditions as defined in the permit, the probable cause of such deviations, and any corrective actions or preventive measures taken. The department shall define "prompt" in the permit consistent with chapter 33-15-01 and the applicable requirements.
- (4) A permit condition prohibiting emissions exceeding any allowances that the source lawfully holds under title IV of the Federal Clean Air Act or the regulations promulgated thereunder.
- (a) No permit revision shall be required for increases in emissions that are authorized by allowances acquired pursuant to title IV of the Federal Clean Air Act, or the regulations promulgated thereunder, provided that such increases do not require a permit revision under any other applicable requirement.
 - (b) No limit shall be placed on the number of allowances held by the source. The source may not, however, use allowances as a defense to noncompliance with any other applicable requirement.

- (c) Any such allowance shall be accounted for according to the procedures established in regulations promulgated under title IV of the Federal Clean Air Act.
- (5) A severability clause to ensure the continued validity of the various permit requirements in the event of a challenge to any portions of the permit.
- (6) Provisions stating the following:
 - (a) The permittee must comply with all conditions of the title V permit. Any permit noncompliance constitutes a violation of the Federal Clean Air Act and this article and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.
 - (b) It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
 - (c) The permit may be modified, revoked, reopened, and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any permit condition.
 - (d) The permit does not convey any property rights of any sort, or any exclusive privilege.
 - (e) The permittee must furnish to the department, within a reasonable time, any information that the department may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. Upon request, the permittee must also furnish to the department copies of records required to be kept by the permit or, for information claimed to be confidential, the permittee must also furnish such records directly to the administrator of the United States environmental protection agency along with a claim of confidentiality.

- (7) A provision to ensure that the source pays fees to the department consistent with the fee schedule approved pursuant to subsection 8.
- (8) Emissions trading. No permit revision shall be required, under any approved economic incentives, marketable permits, emissions trading and other similar programs or processes for changes that are provided for in the permit and the state implementation plan or this article.
- (9) Terms and conditions for reasonably anticipated operating scenarios identified by the source in its application as approved by the department. Such terms and conditions:
 - (a) Shall require the source, contemporaneously with making a change from one operating scenario to another, to record in a log at the permitted facility a record of the scenario under which it is operating;
 - (b) Shall extend the permit shield described in subdivision f to all terms and conditions under each such operating scenario; and
 - (c) Must ensure that the terms and conditions of each such alternative scenario meet all applicable requirements and the requirements of this section.
- (10) Terms and conditions, if the permit applicant requests them, for the trading of emissions increases and decreases in the permitted facility, to the extent that the applicable requirements, including this article and the state implementation plan, provide for trading such increases and decreases without a case-by-case approval of each emissions trade. Such terms and conditions:
 - (a) Shall include all terms required under subdivisions a and c to determine compliance;
 - (b) Shall extend the permit shield described in subdivision f to all terms and conditions that allow such increases and decreases in emissions; and
 - (c) Must meet all applicable requirements and requirements of this section.
- (11) If a permit applicant requests it, the department shall issue permits that contain terms and

conditions, including all terms required under subdivisions a and c to determine compliance, allowing for the trading of emissions increases and decreases in the permitted facility solely for the purpose of complying with a federally enforceable emissions cap that is established in the permit independent of otherwise applicable requirements. The permit applicant shall include in its application proposed replicable procedures and permit terms that ensure the emissions trades are quantifiable and enforceable. The department shall not be required to include in the emissions trading provisions any emissions units for which emissions are not quantifiable or for which there are no replicable procedures to enforce the emissions trades. The permit shall also require compliance with all applicable requirements. The permittee shall supply written notification at least seven days prior to the change to the department and the administrator of the United States environmental protection agency and shall state when the change will occur and shall describe the changes in emissions that will result and how these increases and decreases in emissions will comply with the terms and conditions of the permit. The permit shield described in subdivision f shall extend to terms and conditions that allow such increases and decreases in emissions.

b. Federally enforceable requirements.

- (1) All terms and conditions in a title V permit, including any provisions designed to limit a source's potential to emit, are enforceable by the administrator of the United States environmental protection agency and citizens under the Federal Clean Air Act.
- (2) Notwithstanding paragraph 1, the department shall specifically designate as not being federally enforceable under the Federal Clean Air Act any terms and conditions included in the permit that are not required under the Federal Clean Air Act or under any of its applicable requirements. Terms and conditions so designated are not subject to the requirements of subsections 6 and 7, or of this subsection, other than those contained in this subdivision.

c. Compliance requirements. All title V permits shall contain the following elements with respect to compliance:

- (1) Consistent with paragraph 3 of subdivision a, compliance certification, testing, monitoring, reporting, and recordkeeping requirements sufficient

to assure compliance with the terms and conditions of the permit. Any document, including reports, required by a title V permit shall contain a certification by a responsible official that meets the requirements of subdivision d of subsection 4.

- (2) Inspection and entry requirements that require that, upon presentation of credentials and other documents as may be required by law, the permittee shall allow the department or an authorized representative to perform the following:
 - (a) Enter upon the permittee's premises where a title V source is located or emissions-related activity is conducted, or where records must be kept under the conditions of the permit;
 - (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit;
 - (c) Inspect at reasonable times any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under the permit; and
 - (d) As authorized by the Federal Clean Air Act and this article, sample or monitor at reasonable times substances or parameters for the purpose of assuring compliance with the permit or applicable requirements.
- (3) A schedule of compliance consistent with paragraph 8 of subdivision c of subsection 4.
- (4) Progress reports consistent with an applicable schedule of compliance and paragraph 8 of subdivision c of subsection 4 to be submitted at least semiannually, or at a more frequent period if specified in the applicable requirement or by the department. Such progress reports shall contain the following:
 - (a) Dates for achieving the activities, milestones, or compliance required in the schedule of compliance, and dates when such activities, milestones, or compliance were achieved; and
 - (b) An explanation of why any dates in the schedule of compliance were not or will not be met, and any preventive or corrective measures adopted.

(5) Requirements for compliance certification with terms and conditions contained in the permit, including emission limitations, standards, or work practices. Permits shall include each of the following:

(a) The frequency, which is annually or such more frequent periods as specified in the applicable requirement or by the department, of submissions of compliance certifications;

(b) In accordance with paragraph 3 of subdivision a, a means for monitoring the compliance of the source with its emissions limitations, standards, and work practices. The means for monitoring shall be contained in applicable requirements or United States environmental protection agency guidance;

(c) A requirement that the compliance certification include the following:

[1] The identification of each term or condition of the permit that is the basis of the certification;

[2] The compliance status;

[3] Whether compliance was continuous or intermittent;

[4] The methods used for determining the compliance status of the source, currently and over the reporting period consistent with paragraph 3 of subdivision a; and

[5] Such other facts as the department may require to determine the compliance status of the source;

(d) A requirement that all compliance certifications be submitted to the administrator of the United States environmental protection agency as well as to the department; and

(e) Such additional requirements as may be specified pursuant to sections 114(a)(3) and 504(b) of the Federal Clean Air Act.

(6) Such other provisions as the department may require.

d. General permits.

- (1) The department may, after notice and opportunity for public participation provided under subdivision h of subsection 6, issue a general permit covering numerous similar sources. Any general permit shall comply with all requirements applicable to other title V permits and shall identify criteria by which sources may qualify for the general permit. To sources that qualify, the department shall grant the conditions and terms of the general permit notwithstanding the shield provisions of subdivision f, the source shall be subject to enforcement action for operation without a title V permit to operate if the source is later determined not to qualify for the conditions and terms of the general permit. General permits shall not be authorized for affected sources under the acid rain program unless otherwise provided in regulations promulgated under title IV of the Federal Clean Air Act. The department is not required to issue a general permit in lieu of individual title V permits.
 - (2) Title V sources that would qualify for a general permit must apply to the department for coverage under the terms of the general permit or must apply for a title V permit to operate consistent with subsection 4. The department may, in the general permit, provide for applications which deviate from the requirements of subsection 4, provided that such applications meet the requirements of title V of the Federal Clean Air Act, and include all information necessary to determine qualification for, and to assure compliance with, the general permit. Without repeating the public participation procedures required under subdivision h of subsection 6, the department may grant a source's request for authorization to operate under a general permit, but such a grant shall not be a final permit action for purposes of judicial review.
- e. Temporary sources. The department may issue a single permit authorizing emissions from similar operations by the same source owner or operator at multiple temporary locations. The operation must be temporary and involve at least one change of location during the term of the permit. No affected source shall be permitted as a temporary source. Permits for temporary sources shall include the following:
- (1) Conditions that will assure compliance with all applicable requirements at all authorized locations;

- (2) Requirements that the owner or operator notify the department at least ten days in advance of each change in location; and
- (3) Conditions that assure compliance with all other provisions of this section.

f. Permit shield.

- (1) Except as provided in this section, upon written request by the applicant, the department shall include in a title V permit to operate a provision stating that as of the date of permit issuance, the source is considered to be in compliance with any applicable requirements provided that:
 - (a) Such applicable requirements are included and are specifically identified in the permit; or
 - (b) The department, in acting on the permit application or revision, determines in writing that other requirements specifically identified are not applicable to the source, and the permit includes the determination or a concise summary thereof.
- (2) A title V permit that does not expressly state that a permit shield exists shall be presumed not to provide such a shield.
- (3) Nothing in this subdivision or in any title V permit shall alter or affect the following:
 - (a) The provisions of section 303 of the Federal Clean Air Act (emergency orders), including the authority of the administrator of the United States environmental protection agency under that section;
 - (b) The liability of an owner or operator of a source for any violation of applicable requirements prior to or at the time of permit issuance;
 - (c) The applicable requirements of the acid rain program, consistent with section 408(a) of the Federal Clean Air Act; or
 - (d) The ability of the United States environmental protection agency to obtain information from a source pursuant to section 114 of the Federal Clean Air Act.

g. Emergency provision.

- (1) An "emergency" means any situation arising from sudden and reasonably unforeseeable events beyond the control of the source, including acts of God, which situation requires immediate corrective action to restore normal operation, and that causes the source to exceed a technology-based emission limitation under the title V permit to operate, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.
- (2) Effect of an emergency. An emergency constitutes an affirmative defense to an action brought for noncompliance with such technology-based emission limitations if the conditions of paragraph 3 are met.
- (3) The affirmative defense of emergency shall be demonstrated through properly signed, contemporaneous operating logs, or other relevant evidence that:
 - (a) An emergency occurred and that the permittee can identify the causes of the emergency;
 - (b) The permitted facility was at the time being properly operated;
 - (c) During the period of the emergency the permittee took all reasonable steps to minimize levels of emissions that exceeded the emission standards, or other requirements in the permit; and
 - (d) The permittee submitted notice of the emergency to the department within one working day of the time when emission limitations were exceeded due to the emergency. This notice fulfills the requirement of item 2 of subparagraph c of paragraph 3 of subdivision a of subsection 5. This notice must contain a description of the emergency, any steps taken to mitigate emissions, and corrective actions taken.
- (4) In any enforcement proceeding, the permittee seeking to establish the occurrence of an emergency has the burden of proof.
- (5) This provision is in addition to any emergency or upset provision contained in any applicable requirement and the malfunction notification required under subdivision b of subsection 2 of section

33-15-01-13 when a threat to health and welfare would exist.

6. Permit issuance, renewal, reopenings, and revisions.

a. Action on application.

- (1) A permit, permit modification, or renewal may be issued only if all of the following conditions have been met:
 - (a) The department has received a complete application for a permit, permit modification, or permit renewal, except that a complete application need not be received before issuance of a general permit under subdivision d of subsection 5.
 - (b) Except for modifications qualifying for minor permit modification procedures under paragraphs 1 and 2 of subdivision e, the department has complied with the requirements for public participation under subdivision h;
 - (c) The department has complied with the requirements for notifying and responding to affected states under subdivision b of subsection 7;
 - (d) The conditions of the permit provide for compliance with all applicable requirements and the requirements of this section; and
 - (e) The administrator of the United States environmental protection agency has received a copy of the proposed permit and any notices required under subdivisions a and b of subsection 7, and has not objected to issuance of the permit under subdivision c of subsection 7 within the time period specified therein.
- (2) Except for applications received during the initial transitional period described in 40 CFR 70.4(b)(11) or under regulations promulgated under title IV or title V of the Federal Clean Air Act for the permitting of affected sources under the acid rain program, the department shall take final action on each permit application, including a request for permit modification or renewal, within eighteen months after receiving a complete application.

- (3) The department shall provide notice to the applicant of whether the application is complete. Unless the department requests additional information or otherwise notifies the applicant of incompleteness within sixty days of receipt of an application, the application shall be deemed complete. For modifications processed through minor permit modification procedures, such as those in paragraphs 1 and 2 of subdivision e, a completeness determination is not required.
- (4) The department shall provide a statement that sets forth the legal and factual basis for the draft permit conditions, including references to the applicable statutory or regulatory provisions. The department shall send this statement to the United States environmental protection agency and to any other person who requests it.
- (5) The submittal of a complete application shall not affect the requirement that any source have a permit to construct under section 33-15-14-02.

b. Requirement for a permit.

- (1) Except as provided in the following sentence, paragraphs 2 and 3, subparagraph e of paragraph 1 of subdivision e, and subparagraph e of paragraph 2 of subdivision e, no title V source may operate after the time that it is required to submit a timely and complete application under this section, except in compliance with a permit issued under this section. If a title V source submits a timely and complete application for permit issuance, including for renewal, the source's failure to have a title V permit is not a violation of this section until the department takes final action on the permit application, except as noted in this subsection. This protection shall cease to apply if, subsequent to the completeness determination made pursuant to paragraph 3 of subdivision a, and as required by paragraph 2 of subdivision a of subsection 4, the applicant fails to submit by the deadline specified in writing by the department any additional information identified as being needed to process the application. For timely and complete renewal applications for which the department has failed to issue or deny the renewal permit before the expiration date of the previous permit, all the terms and conditions of the permit, including the permit shield that was granted pursuant to subdivision f of subsection 5 shall remain in effect until the renewal permit has been issued or denied.

- (2) A permit revision is not required for section 502(b)(10) changes provided:
- (a) The changes are not modifications under chapters 33-15-12, 33-15-13, and 33-15-15 or title I of the Federal Clean Air Act.
 - (b) The changes do not exceed the emissions allowable under the title V permit whether expressed therein as a rate of emissions or in terms of total emissions.
 - (c) A permit to construct under section 33-15-14-02 has been issued, if required.
 - (d) The facility provides the department and the administrator of the United States environmental protection agency with written notification at least seven days in advance of the proposed change. The written notification shall include a description of each change within the permitted facility, the date on which the change will occur, any change in emissions, and any permit term or condition that is no longer applicable as a result of the change.

The permit shield described in subdivision f of subsection 5 shall not apply to any change made pursuant to this paragraph.

- (3) A permit revision is not required for changes that are not addressed or prohibited by the permit provided:
- (a) Each such change shall meet all applicable requirements and shall not violate any existing permit term or condition.
 - (b) The source must provide contemporaneous written notice to the department and the administrator of the United States environmental protection agency of each such change, except for changes that qualify as insignificant under the provisions of subdivision c of subsection 4. Such written notice shall describe each such change, including the date, any change in emissions, contaminants emitted, and any applicable requirement that would apply as a result of the change.
 - (c) The permittee shall keep a record describing changes made at the source that result in emissions of a regulated air contaminant subject

to an applicable requirement, but not otherwise regulated under the permit, and the emissions resulting from those changes.

- (d) The changes are not subject to any requirements under title IV of the Federal Clean Air Act.
- (e) The changes are not modifications under chapters 33-15-12, 33-15-13, and 33-15-15 or any provision of title I of the Federal Clean Air Act.
- (f) A permit to construct under section 33-15-14-02 has been issued, if required.

The permit shield described in subdivision f of subsection 5 shall not apply to any change made pursuant to this paragraph.

c. Permit renewal and expiration.

- (1) Permits being renewed are subject to the same procedural requirements, including those for public participation, affected state and the United States environmental protection agency review, that apply to initial permit issuance; and
- (2) Permit expiration terminates the source's right to operate unless a timely and complete renewal application has been submitted consistent with subdivision b of subsection 6 and subparagraph c of paragraph 1 of subdivision a of subsection 4.

d. Administrative permit amendments.

- (1) An "administrative permit amendment" is a permit revision that:
 - (a) Corrects typographical errors;
 - (b) Identifies a change in the name, address, or phone number of any person identified in the permit, or provides a similar minor administrative change at the source;
 - (c) Requires more frequent monitoring or reporting by the permittee;
 - (d) Allows for a change in ownership or operational control of a source where the department determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of

permit responsibility, coverage, and liability between the current and new permittee has been submitted to the department;

- (e) Incorporates into the title V permit the requirements from a permit to construct, provided that the permit to construct review procedure is substantially equivalent to the requirements of subsections 6 and 7 that would be applicable to the change if it were subject to review as a permit modification, and compliance requirements substantially equivalent to those contained in subsection 5; or
 - (f) Incorporates any other type of change which the administrator of the United States environmental protection agency has approved as part of the approved title V operating permit program.
- (2) Administrative permit amendments for purposes of the acid rain portion of the permit shall be governed by regulations promulgated under title IV of the Federal Clean Air Act.
 - (3) Administrative permit amendment procedures. An administrative permit amendment may be made by the department consistent with the following:
 - (a) The department shall take no more than sixty days from receipt of a request for an administrative permit amendment to take final action on such request, and may incorporate such changes without providing notice to the public or affected states provided that it designates any such permit revisions as having been made pursuant to this subdivision.
 - (b) The department shall submit a copy of the revised permit to the administrator of the United States environmental protection agency.
 - (c) The source may implement the changes addressed in the request for an administrative amendment immediately upon submittal of the request provided a permit to construct under section 33-15-14-02 has been issued, if required.
 - (4) The department may, upon taking final action granting a request for an administrative permit amendment, allow coverage by the permit shield in subdivision f of subsection 5 for administrative permit amendments made pursuant to subparagraph e of paragraph 1 of subdivision d which meet the relevant requirements of

subsections 5, 6, and 7 for significant permit modifications.

e. Permit modification. A permit modification is any revision to a title V permit that cannot be accomplished under the provisions for administrative permit amendments under subdivision d of this subsection. A permit modification for purposes of the acid rain portion of the permit shall be governed by regulations promulgated under title IV of the Federal Clean Air Act.

(1) Minor permit modification procedures.

(a) Criteria.

[1] Minor permit modification procedures may be used only for those permit modifications that:

[a] Do not violate any applicable requirement;

[b] Do not involve significant changes to existing monitoring, reporting, or recordkeeping requirements in the permit;

[c] Do not require or change a case-by-case determination of an emission limitation or other standard, or a source-specific determination for temporary sources of ambient impacts, or a visibility or increment analysis;

[d] Do not seek to establish or change a permit term or condition for which there is no corresponding underlying applicable requirement and that the source has assumed to avoid an applicable requirement to which the source would otherwise be subject. Such terms and conditions include a federally enforceable emissions cap assumed to avoid classification as a modification under any provision of title I of the Federal Clean Air Act; and an alternative emissions limit approved pursuant to regulations promulgated under section 112(i)(5) of the Federal Clean Air Act;

- [e] Are not modifications under chapters 33-15-12, 33-15-13, and 33-15-15 or any provision of title I of the Federal Clean Air Act; and
 - [f] Are not required to be processed as a significant modification.
- [2] Notwithstanding item 1 of this subparagraph and subparagraph a of paragraph 2 of subdivision e, minor permit modification procedures may be used for permit modifications involving the use of economic incentives, marketable permits, emissions trading, and other similar approaches, to the extent that such minor permit modification procedures are explicitly provided for in the state implementation plan, this article or in applicable requirements promulgated by the United States environmental protection agency.
- (b) Application. An application requesting the use of minor permit modification procedures shall meet the requirements of subdivision c of subsection 4 and shall include the following:
- [1] A description of the change, the emissions resulting from the change, and any new applicable requirements that will apply if the change occurs;
 - [2] The source's suggested draft permit;
 - [3] Certification by a responsible official, consistent with subdivision d of subsection 4, that the proposed modification meets the criteria for use of minor permit modification procedures and a request that such procedures be used; and
 - [4] Completed forms for the department to use to notify the administrator of the United States environmental protection agency and affected states as required under subsection 7.
- (c) United States environmental protection agency and affected state notification. Within five working days of receipt of a complete permit modification application, the department shall notify the administrator of the United States environmental protection agency and affected

states of the requested permit modification. The department shall promptly send any notice required under paragraph 2 of subdivision b of subsection 7 to the administrator of the United States environmental protection agency.

(d) Timetable for issuance. The department may not issue a final permit modification until after the United States environmental protection agency forty-five-day review period or until the United States environmental protection agency has notified the department that the United States environmental protection agency will not object to issuance of the permit modification, whichever is first, although the department can approve the permit modification prior to that time. Within ninety days of the department's receipt of an application under minor permit modification procedures or fifteen days after the end of the administrator's forty-five-day review period under subdivision c of subsection 7, whichever is later, the department shall:

- [1] Issue the permit modification as proposed;
- [2] Deny the permit modification application;
- [3] Determine that the requested modification does not meet the minor permit modification criteria and should be reviewed under the significant modification procedures; or
- [4] Revise the draft permit modification and transmit to the administrator the new proposed permit modification as required by subdivision a of subsection 7.

(e) Source's ability to make change. A source may make the change proposed in its minor permit modification application only after it files such application and the department approves the change in writing. If the department allows the source to make the proposed change prior to taking action specified in items 1, 2, and 3 of subparagraph d, the source must comply with both the applicable requirements governing the change and the proposed permit terms and conditions. During this time period, the source need not comply with the existing permit terms and conditions it seeks to modify. However, if the source fails to comply with its proposed permit terms and conditions during this time period,

the existing permit terms and conditions it seeks to modify may be enforced against it.

(f) The permit shield under subdivision f of subsection 5 shall not extend to minor permit modifications.

(2) Group processing of minor permit modifications. Consistent with this paragraph, the department may modify the procedure outlined in paragraph 1 to process groups of a source's applications for certain modifications eligible for minor permit modification processing.

(a) Criteria. Group processing of modifications may be used only for those permit modifications:

[1] That meet the criteria for minor permit modification procedures under item 1 of subparagraph a of paragraph 1 of subdivision e; and

[2] That collectively are below the threshold level which is ten percent of the emissions allowed by the permit for the emissions unit for which the change is requested, twenty percent of the applicable definition of major source in subsection 1, or five tons [4.54 metric tons] per year, whichever is least.

(b) Application. An application requesting the use of group processing procedures shall meet the requirements of subdivision c of subsection 4 and shall include the following:

[1] A description of the change, the emissions resulting from the change, and any new applicable requirements that will apply if the change occurs.

[2] The source's suggested draft permit.

[3] Certification by a responsible official, consistent with subdivision d of subsection 4, that the proposed modification meets the criteria for use of group processing procedures and a request that such procedures be used.

[4] A list of the source's other pending applications awaiting group processing, and a determination of whether the requested

modification, aggregated with these other applications, equals or exceeds the threshold set under item 2 of subparagraph a of paragraph 2 of subdivision e.

[5] Certification, consistent with subdivision d of subsection 4, that the source has notified the United States environmental protection agency of the proposed modification. Such notification need only contain a brief description of the requested modification.

[6] Completed forms for the department to use to notify the administrator of the United States environmental protection agency and affected states as required under subsection 7.

(c) United States environmental protection agency and affected state notification. On a quarterly basis or within five business days of receipt of an application demonstrating that the aggregate of a source's pending applications equals or exceeds the threshold level set under item 2 of subparagraph a of paragraph 2 of subdivision e, whichever is earlier, the department shall meet its obligation under paragraph 1 of subdivision a of subsection 7 and paragraph 1 of subdivision b of subsection 7 to notify the administrator of the United States environmental protection agency and affected states of the requested permit modifications. The department shall send any notice required under paragraph 2 of subdivision b of subsection 7 to the administrator of the United States environmental protection agency.

(d) Timetable for issuance. The provisions of subparagraph d of paragraph 1 of subdivision e shall apply to modifications eligible for group processing, except that the department shall take one of the actions specified in items 1 through 4 of subparagraph d of paragraph 1 of subdivision e within one hundred eighty days of receipt of the application or fifteen days after the end of the administrator's forty-five-day review period under subdivision c of subsection 7, whichever is later.

(e) Source's ability to make change. The provisions of subparagraph e of paragraph 1 apply to modifications eligible for group processing.

(f) The permit shield under subdivision f of subsection 5 shall not extend to group processing of minor permit modifications.

(3) Significant modification procedures.

(a) Criteria. Significant modification procedures shall be used for applications requesting permit modifications that do not qualify as minor permit modifications or as administrative amendments. Every significant change in existing monitoring permit terms or conditions and every relaxation of reporting or recordkeeping permit terms or conditions shall be considered significant. Nothing herein shall be construed to preclude the permittee from making changes consistent with this subsection that would render existing permit compliance terms and conditions irrelevant.

(b) Significant permit modifications shall meet all requirements of this section, including those for applications, public participation, review by affected states, and review by the United States environmental protection agency, as they apply to permit issuance and permit renewal. The department shall complete review of significant permit modifications within nine months after receipt of a complete application.

f. Reopening for cause.

(1) Each issued permit shall include provisions specifying the conditions under which the permit will be reopened prior to the expiration of the permit. A permit shall be reopened and revised under any of the following circumstances:

(a) Additional applicable requirements under the Federal Clean Air Act become applicable to a major title V source with a remaining permit term of three or more years. Such a reopening shall be completed not later than eighteen months after promulgation of the applicable requirement. No such reopening is required if the effective date of the requirement is later than the date on which the permit is due to expire, unless the original permit or any of its terms and conditions has been extended.

- (b) Additional requirements, including excess emissions requirements, become applicable to an affected source under title IV of the Federal Clean Air Act or the regulations promulgated thereunder. Upon approval by the administrator of the United States environmental protection agency, excess emissions offset plans shall be deemed to be incorporated into the permit.
 - (c) The department or the United States environmental protection agency determines that the permit contains a material mistake or that inaccurate statements were made in establishing the emissions standards or other terms or conditions of the permit.
 - (d) The administrator of the United States environmental protection agency or the department determines that the permit must be revised or revoked to assure compliance with the applicable requirements.
- (2) Proceedings to reopen and issue a permit shall follow the same procedures as apply to initial permit issuance and shall affect only those parts of the permit for which cause to reopen exists. Such reopening shall be made as expeditiously as practicable.
 - (3) Reopenings under paragraph 1 shall not be initiated before a notice of such intent is provided to the title V source by the department at least thirty days in advance of the date that the permit is to be reopened, except that the department may provide a shorter time period in the case of an emergency.
- g. Reopenings for cause by the United States environmental protection agency.
- (1) If the administrator of the United States environmental protection agency finds that cause exists to terminate, modify, or revoke and reissue a permit pursuant to subdivision f, within ninety days after receipt of such notification, the department shall forward to the United States environmental protection agency a proposed determination of termination, modification, or revocation and reissuance, as appropriate.
 - (2) The administrator of the United States environmental protection agency will review the proposed determination from the department within ninety days of receipt.

- (3) The department shall have ninety days from receipt of the United States environmental protection agency objection to resolve any objection that the United States environmental protection agency makes and to terminate, modify, or revoke and reissue the permit in accordance with the administrator's objection.
 - (4) If the department fails to submit a proposed determination or fails to resolve any objection, the administrator of the United States environmental protection agency will terminate, modify, or revoke and reissue the permit after taking the following actions:
 - (a) Providing at least thirty days' notice to the permittee in writing of the reasons for any such action.
 - (b) Providing the permittee an opportunity for comment on the administrator's proposed action and an opportunity for a hearing.
- h. Public participation. Except for modifications qualifying for minor permit modification procedures, all permit proceedings, including initial permit issuance, significant modifications, and renewals, shall be subject to procedures for public notice including offering an opportunity for public comment and a hearing on the draft permit. These procedures shall include the following:
- (1) Notice shall be given by publication in a newspaper of general circulation in the area where the source is located or in a state publication designed to give general public notice; to persons on a mailing list developed by the department, including those who request in writing to be on the list; and by other means if necessary to assure adequate notice to the affected public;
 - (2) The notice shall identify the affected facility; the name and address of the permittee; the name and address of the department; the activity or activities involved in the permit action; the emissions change involved in any permit modification; the name, address, and telephone number of a person from whom interested persons may obtain additional information, including copies of the permit draft, the application, all relevant supporting materials, and all other materials available to the department that are relevant to the permit decision; a brief description of the comment procedures required by this subsection; and the time and place of any hearing that may be held, including a statement of

procedures to request a hearing, unless a hearing has already been scheduled;

- (3) The department shall provide such notice and opportunity for participation by affected states as is provided for by subsection 7;
- (4) The department shall provide at least thirty days for public comment and shall give notice of any public hearing at least thirty days in advance of the hearing; and
- (5) The department shall keep a record of the commenters and also of the issues raised during the public participation process. These records shall be available to the public.

7. Permit review by the United States environmental protection agency and affected states.

a. Transmission of information to the administrator.

- (1) The department shall provide a copy of each permit application including any application for a permit modification (including the compliance plan), to the administrator of the United States environmental protection agency except that the applicant shall provide such information directly to the administrator of the United States environmental protection agency when directed to do so by the department. The department shall provide a copy of each proposed permit and each final title V permit to operate to the administrator of the United States environmental protection agency. To the extent practicable, the preceding information shall be provided in computer-readable format compatible with the United States environmental protection agency's national data base management system.
- (2) The department may waive the requirements of paragraph 1 and paragraph 1 of subdivision b for any category of sources (including any class, type, or size within such category) other than major sources upon approval by the administrator of the United States environmental protection agency.
- (3) The department shall keep these records for at least five years.

b. Review by affected states.

- (1) The department shall give notice of each draft permit to any affected state on or before the time that the

notice to the public under subdivision h of subsection 6 is given, except to the extent paragraphs 1 and 2 of subdivision e of subsection 6 requires the timing of the notice to be different.

- (2) As part of the submittal of the proposed permit to the administrator of the United States environmental protection agency (or as soon as possible after the submittal for minor permit modification procedures allowed under paragraphs 1 and 2 of subdivision e of subsection 6) the department shall notify the administrator of the United States environmental protection agency and any affected state in writing of any refusal by the department to accept all recommendations for the proposed permit that the affected state submitted during the public or affected state review period. The notice shall include the department's reasons for not accepting any such recommendation. The department is not required to accept recommendations that are not based on applicable requirements or the requirements of this section.
- c. United States environmental protection agency objection: No permit for which an application must be transmitted to the administrator of the United States environmental protection agency under subdivision a shall be issued if the administrator of the United States environmental protection agency objects to its issuance in writing within forty-five days of receipt of the proposed permit and all necessary supporting information.
- d. Public petitions to the administrator of the United States environmental protection agency. If the administrator of the United States environmental protection agency does not object in writing under subdivision c, any person may petition the administrator of the United States environmental protection agency within sixty days after the expiration of the administrator's forty-five-day review period to make such objection. Any such petition shall be based only on objections to the permit that were raised with reasonable specificity during the public comment period provided for in subdivision h of subsection 6, unless the petitioner demonstrates that it was impracticable to raise such objections within such period, or unless the grounds for such objection arose after such period. If the administrator of the United States environmental protection agency objects to the permit as a result of a petition filed under this subdivision, the department shall not issue the permit until the United States environmental protection agency's objection has been resolved, except that a petition for review does not stay the effectiveness of a permit or its

requirements if the permit was issued after the end of the forty-five-day review period and prior to the United States environmental protection agency objection. If the department has issued a permit prior to receipt of the United States environmental protection agency objection under this subdivision, the department may thereafter issue only a revised permit that satisfies the United States environmental protection agency's objection. In any case, the source will not be in violation of the requirement to have submitted a timely and complete application.

- e. Prohibition on default issuance. The department shall issue no title V permit to operate, including a permit renewal or modification, until affected states and the United States environmental protection agency have had an opportunity to review the proposed permit as required under this subsection.

8. Permit to operate fees.

- a. The owner or operator of each installation that meets the applicability requirements of subsection 2 shall pay an annual fee. The fee is determined by the actual annual emissions of regulated contaminants.
- b. The Effective January 1, 1995, the annual fee shall be assessed at a rate of twenty-five dollars per ton of emissions of each regulated contaminant identified in section 112(b) of the Federal Clean Air Act. All other regulated contaminants will be assessed a fee at a rate of eight ten dollars per ton. The minimum fee will be five hundred dollars per source. The maximum fee will be one hundred thousand dollars per source.
- c. In determining the amount due, that portion of any regulated contaminant which is emitted in excess of four thousand tons [3628.74 metric tons] per year will be exempt from the fee calculation.
- d. Each boiler with a heat input greater than two hundred fifty million British thermal units per hour will be assessed fees on an individual basis and independent of the fees associated with the rest of the installation. The four thousand tons [3628.74 metric tons] per year cap referenced in subdivision c is applied to each boiler.
- e. Any state-owned facility is exempt from the fee.
- f. The ~~initial~~ fee calculation will be based upon actual annual emissions from the previous calendar year 1993.

- g. The fee rates and the limits established under subdivision b shall be adjusted on an annual basis to account for any increase in the consumer price index published by the department of labor, as of the close of the twelve-month period ending on August thirty-first of each calendar year.
- h. Any source issued a general permit under this section is subject to the minor source permit to operate fees under subsection 10 of section 33-15-14-03.
- i. Any source that qualifies as a "small business" under section 507 of the Federal Clean Air Act may petition the department to reduce or exempt any fee required under this section. Sufficient documentation of the petitioner's financial status must be submitted with the request to allow the department to evaluate the request.
- j. The department shall send a notice, identifying the amount of the annual permit fee, to the owner or operator of each affected source. The fee is due within sixty days following receipt of such notice.

9. Enforcement.

The department may suspend, revoke, or terminate a permit for violations of this article, violation of any permit condition or for failure to respond to a notice of violation or any order issued pursuant to this article. A permit to operate which has been revoked or terminated pursuant to this article must be surrendered forthwith to the department. No person may operate or cause the operation of a source if the department denies, terminates, revokes, or suspends a permit to operate.

History: Effective March 1, 1994; amended effective December 1, 1994.

General Authority: NDCC 23-25-03, 23-25-04, 23-25-04.1, 23-25-04.2

Law Implemented: NDCC 23-25-03, 23-25-04, 23-25-04.1, 23-25-04.2

STAFF COMMENT: Chapters 33-15-21 and 33-15-22 contain all new material but are not underscored so as to improve readability.

**CHAPTER 33-15-21
ACID RAIN PROGRAM**

Section	
33-15-21-01	General Provisions
33-15-21-02	Designated Representative
33-15-21-03	Acid Rain Applications
33-15-21-04	Acid Rain Compliance Plan and Compliance Options
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33-15-21-07	Permit Revisions
33-15-21-08	Compliance Certification
33-15-21-09	Continuous Emissions Monitoring
33-15-21-10	Acid Rain Nitrogen Oxides Emission Reduction Program [Reserved]
33-15-21-11	Sulfur Dioxide Opt-Ins [Reserved]

33-15-21-01. General provisions.

1. **Definitions.** The terms used in this chapter have the meanings set forth in title IV of the Clean Air Act, 42 U.S.C 7401, et seq. as amended by the Clean Air Act Amendments of 1990, 42 U.S.C. 7651, et seq. (November 15, 1990). All terms not defined herein have the meaning given them in section 33-15-01-04 or in North Dakota Century Code chapter 23-25.
 - a. "Acid rain compliance option" means one of the methods of compliance used by an affected unit under the acid rain program as described in a compliance plan submitted and approved in accordance with section 33-15-21-04 or regulations or rules implementing section 407 of the Act.
 - b. "Acid rain emissions limitation" means:
 - (1) For the purposes of sulfur dioxide emissions:
 - (a) The tonnage equivalent of the basic phase II allowance allocations authorized to be allocated to an affected unit for use in a calendar year;
 - (b) As adjusted:
 - [1] By allowances allocated by the administrator pursuant to section 403, section 405 (a)(2), (a)(3), (b)(2), (c)(4),

(d)(3), and (h)(2), and section 406 of the Act;

[2] By allowances allocated by the administrator pursuant to subpart D of title 40, Code of Federal Regulations, part 72, and thereafter; and

[3] By allowance transfers to or from the compliance subaccount for that unit that were recorded or properly submitted for recordation by the allowance transfer deadline as provided in title 40, Code of Federal Regulations, 73.35, after deductions and other adjustments are made pursuant to title 40, Code of Federal Regulations, 73.34(c).

(2) For purposes of nitrogen oxides emissions, the applicable limitation established by regulations promulgated by the administrator pursuant to section 407 of the Act, as modified by an acid rain permit application submitted to the department, and an acid rain permit issued by the department, in accordance with rules implementing section 407 of the Act.

- c. "Acid rain emissions reduction requirement" means a requirement under the acid rain program to reduce the emissions of sulfur dioxide or nitrogen oxides from a unit to a specified level or by a specified percentage.
- d. "Acid rain permit or permit" means the legally binding written document, or portion of such document, issued by the department following an opportunity for appeal pursuant to North Dakota Century Code chapter 28-32 or article 33-22, or both, including any permit revisions, specifying the acid rain program requirements applicable to an affected source, to each affected unit at an affected source, and to the owners and operators and the designated representative of the affected source or the affected unit.
- e. "Acid rain program" means the national sulfur dioxide and nitrogen oxides air pollution control and emissions reduction program established in accordance with title IV of the Act, title 40, Code of Federal Regulations, parts 72, 73, 75, 77, and 78, and regulations or rules implementing sections 407 and 410 of the Act, and this chapter.
- f. "Act" means the Federal Clean Air Act, 42 U.S.C. 7401, et seq. as amended by Public Law No. 101-549 (November 15, 1990).

- g. "Actual sulfur dioxide emissions rate" means the annual average sulfur dioxide emissions rate for the unit (expressed in lb/mmBtu), for the specified calendar year; provided that, if the unit is listed in the national allowance data base, the "1985 actual sulfur dioxide emissions rate" for the unit is the rate specified by the administrator in the national allowance data base under the data field "SO₂RTE".
- h. "Administrator" means the administrator of the United States environmental protection agency or the administrator's duly authorized representative.
- i. "Affected source" means a source that includes one or more affected units.
- j. "Affected unit" means a unit that is subject to any acid rain emissions reduction requirement or acid rain emissions limitation.
- k. "Affiliate" has the meaning set forth in section 2(a)(11) of the Public Utility Holding Company Act of 1935, 15 U.S.C. 79b(a)(11), as of November 15, 1990.
- l. "Allocate or allocation" means the initial crediting of an allowance by the administrator to an allowance tracking system unit account or general account.
- m. "Allowance" means an authorization by the administrator under the acid rain program to emit up to one ton of sulfur dioxide during or after a specified calendar year.
- n. "Allowance deduction, or deduct when referring to allowances" means the permanent withdrawal of allowances by the administrator from an allowance tracking system compliance subaccount to account for the number of the tons of sulfur dioxide emissions from an affected unit for the calendar year, for tonnage emissions estimates calculated for periods of missing data as provided in title 40, Code of Federal Regulations, part 75, or for any other allowance surrender obligations of the acid rain program.
- o. "Allowances held or hold allowances" means the allowances recorded by the administrator, or submitted to the administrator for recordation in accordance with title 40, Code of Federal Regulations, 73.50, in an allowance tracking system account.
- p. "Allowance tracking system" means the acid rain program system by which the administrator allocates, records, deducts, and tracks allowances.

- q. "Allowance tracking system account" means an account in the allowance tracking system established by the administrator for purposes of allocating, holding, transferring, and using allowances.
- r. "Allowance transfer deadline" means midnight of January thirtieth or, if January thirtieth is not a business day, midnight of the first business day thereafter and is the deadline by which allowances may be submitted for recordation in an affected unit's compliance subaccount for the purposes of meeting the unit's acid rain emissions limitation requirements for sulfur dioxide for the previous calendar year.
- s. "Authorized account representative" means a responsible natural person who is authorized, in accordance with title 40, Code of Federal Regulations, part 73, to transfer and otherwise dispose of allowances held in an allowance tracking system general account; or, in the case of a unit account, the designated representative of the owners and operators of the affected unit.
- t. "Basic phase II allowance allocations" means:
- (1) For calendar years 2000 through 2009 inclusive, allocations of allowances made by the administrator pursuant to section 403 and section 405 (b)(1), (3), and (4); (c)(1), (2), (3), and (5); (d)(1), (2), (4), and (5); (e); (f); (g)(1), (2), (3), (4), and (5); (h)(1); (i); and (j) of the Act.
 - (2) For each calendar year beginning in 2010, allocations of allowances made by the administrator pursuant to section 403 and section 405 (b)(1), (3), and (4); (c)(1), (2), (3), and (5); (d)(1), (2), (4), and (5); (e); (f); (g)(1), (2), (3), (4), and (5); (h)(1) and (3); (i); and (j) of the Act.
- u. "Boiler" means an enclosed fossil or other fuel-fired combustion device used to produce heat and to transfer heat to recirculating water, steam, or any other medium.
- v. "Certificate of representation" means the completed and signed submission required by title 40, Code of Federal Regulations, 72.20, for certifying the appointment of a designated representative for an affected source or a group of identified affected sources authorized to represent the owners and operators of such sources and of the affected units at such sources with regard to matters under the acid rain program
- w. "Certifying official" means:

- (1) For a corporation, a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decisionmaking functions for the corporation;
 - (2) For partnership or sole proprietorship, a general partner or the proprietor, respectively; and
 - (3) For a local government entity or state, federal, or other public agency, either a principal executive officer or ranking elected official.
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- x. "Coal" means all solid fuels classified as anthracite, bituminous, subbituminous, or lignite by the American society for testing and materials designation ASTM D388-92 "Standard Classification of Coals by Rank".
 - y. "Coal-derived fuel" means any fuel, whether in a solid, liquid, or gaseous state, produced by the mechanical, thermal, or chemical processing of coal (e.g., pulverized coal, coal refuse, liquefied or gasified coal, washed coal, chemically cleaned coal, coal-oil mixtures, and coke).
 - z. "Coal-fired" means the combustion of fuel consisting of coal or any coal-derived fuel, except a coal-derived gaseous fuel with a sulfur content no greater than natural gas, alone or in combination with any other fuel, where a unit is "coal-fired" if it uses coal or coal-derived fuel as its primary fuel (expressed in mmbtu); provided that, if the unit is listed in the national allowance data base, the primary fuel is the fuel listed in the national allowance data base under the data field "PRIMEFUEL".
 - aa. "Cogeneration unit" means a unit that has equipment used to produce electric energy and forms of useful thermal energy, such as heat or steam, for industrial, commercial, heating or cooling purposes, through the sequential use of energy.
 - bb. "Commence commercial operation" means to have begun to generate electricity for sale, including the sale of test generation.
 - cc. "Commence construction" means that an owner or operator has either undertaken a continuous program of construction or has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction.
 - dd. "Commence operation" means to have begun any mechanical, chemical, or electronic process, including startup of an

emissions control technology or emissions monitor or of a unit's combustion chamber.

- ee. "Common stack" means the exhaust of emissions from two or more units through a single flue.
- ff. "Compliance certification" means a submission to the administrator or the department that is required by this chapter, by title 40, Code of Federal Regulations, part 72, 73, 75, 77, or 78, or by regulations or rules implementing sections 407 or 410 of the Act to report an affected source or an affected unit's compliance or noncompliance with a provision of the acid rain program and that is signed and verified by the designated representative in accordance with subpart B of title 40, Code of Federal Regulations, part 72, section 33-15-21-08, and the acid rain program regulations or rules generally.
- gg. "Compliance plan", for purposes of the acid rain program, means the document submitted for an affected source in accordance with subsections 1 and 2 of section 33-15-21-03 and specifying the methods, including one or more acid rain compliance options under section 33-15-21-04 or regulations or rules implementing section 407 of the Act, by which each affected unit at the source will meet the applicable acid rain emissions limitation and acid rain emissions reduction requirements.
- hh. "Compliance subaccount" means the subaccount in an affected unit's allowance tracking system account, established pursuant to title 40, Code of Federal Regulations, 73.31 (a) or (b), in which are held, from the date that allowances for the current calendar year are recorded under title 40, Code of Federal Regulations, 73.34(a) until December thirty-first, allowances available for use by the unit in the current calendar year and, after December thirty-first until the date that deductions are made under title 40, Code of Federal Regulations, 73.35(b), allowances available for use by the unit in the preceding calendar year, for the purpose of meeting the unit's acid rain emissions limitation for sulfur dioxide.
- ii. "Compliance use date" means the first calendar year for which an allowance may be used for purposes of meeting a unit's acid rain emissions limitation for sulfur dioxide.
- jj. "Construction" means fabrication, erection, or installation of a unit or any portion of a unit.
- kk. "Designated representative" means a responsible natural person authorized by the owners and operators of an affected source and of all affected units at the source, as evidenced by a certificate of representation submitted

in accordance with subpart B of title 40, Code of Federal Regulations, part 72, to represent and legally bind each owner and operator, as a matter of federal law, in matters pertaining to the acid rain program. Whenever the term "responsible official" is used in section 33-15-14-06, it shall be deemed to refer to the "designated representative" with regard to all matters under the acid rain program.

- ll. "Diesel fuel" means a low sulfur fuel oil of grades 1-D or 2-D, as defined by the American society for testing and materials ASTM D975-91, "Standard Specification for Diesel Fuel Oils".
- mm. "Direct public utility ownership" means direct ownership of equipment and facilities by one or more corporations, the principal business of which is sale of electricity to the public at retail. Percentage ownership of such equipment and facilities shall be measured on the basis of book value.
- nn. "Draft acid rain permit or draft permit" means the version of the acid rain permit, or the acid rain portion of an operating permit, that the department offers for public comment.
- oo. "Emissions" means air pollutants exhausted from a unit or source into the atmosphere, as measured, recorded, and reported to the administrator by the designated representative and as determined by the administrator, in accordance with the emissions monitoring requirements of title 40, Code of Federal Regulations, part 75.
- pp. "EPA" means the United States environmental protection agency.
- qq. "Excess emissions" means:
 - (1) Any tonnage of sulfur dioxide emitted by an affected unit during a calendar year that exceeds the acid rain emissions limitation for sulfur dioxide for the unit; and
 - (2) Any tonnage of nitrogen oxide emitted by an affected unit during a calendar year that exceeds the annual tonnage equivalent of the acid rain emissions limitation for nitrogen oxides applicable to the affected unit taking into account the unit's heat input for the year.
- rr. "Existing unit" means a unit, including a unit subject to section 111 of the Act, that commenced commercial operation before November 15, 1990, and that on or after

November 15, 1990, served a generator with a nameplate capacity of greater than twenty-five megawatts electrical. "Existing unit" does not include simple combustion turbines or any unit that on or after November 15, 1990, served only generators with a nameplate capacity of twenty-five megawatts electrical or less. Any "existing unit" that is modified, reconstructed, or repowered after November 15, 1990, shall continue to be an "existing unit".

- ss. "Facility" means any institutional, commercial, or industrial structure, installation, plant, source, or building.
- tt. "Fossil fuel" means natural gas, petroleum, coal, or any form of solid, liquid, or gaseous fuel derived from such material.
- uu. "Fossil fuel-fired" means the combustion of fossil fuel or any derivative of fossil fuel, alone or in combination with any other fuel, independent of the percentage of fossil fuel consumed in any calendar year.
- vv. "Fuel oil" means any petroleum-based fuel, including diesel fuel or petroleum derivatives such as oil tar, as defined by the American society for testing and materials in ASTM D396-90a, "Standard Specification for Fuel Oils", and any recycled or blended petroleum products or petroleum byproducts used as a fuel whether in a liquid, solid, or gaseous state.
- ww. "Gas-fired" means the combustion of natural gas, or a coal-derived gaseous fuel with a sulfur content no greater than natural gas, for at least ninety percent of the average annual heat input during the previous three calendar years and for at least eighty-five percent of the annual heat input in each of those calendar years; and any fuel other than coal or any other coal-derived fuel for the remaining heat input, if any.
- xx. "General account" means an allowance tracking system account that is not a unit account.
- yy. "Generator" means a device that produces electricity and was or would have been required to be reported as a generating unit pursuant to the United States department of energy form eight hundred sixty (1990 edition).
- zz. "Generator output capacity" means the full-load continuous rating of a generator under specific conditions as designed by the manufacturer.

- aaa. "Heat input" means the product (expressed in mmBtu/time) of the gross calorific value of the fuel (expressed in Btu/lb) and the fuel feed rate into the combustion device (expressed in mass of fuel/time) and does not include the heat derived from preheated combustion air, recirculated flue gases, or exhaust from other sources.
- bbb. "Independent power production facility" means a source that:
- (1) Is nonrecourse project financed, as defined by the secretary of energy at title 10, Code of Federal Regulations, part 715;
 - (2) Is used for the generation of electricity, eighty percent or more of which is sold at wholesale;
 - (3) Is a new unit required to hold allowances under title IV of the Act; and
 - (4) Provided that direct public utility ownership of the equipment comprising the facility does not exceed fifty percent.
- ccc. "Life-of-the-unit, firm power contractual arrangement" means a unit participation power sales agreement under which a utility or industrial customer reserves, or is entitled to receive, a specified amount or percentage of nameplate capacity and associated energy generated by any specified generating unit and pays its proportional amount of such unit's total costs, pursuant to a contract:
- (1) For the life of the unit;
 - (2) For a cumulative term of no less than thirty years, including contracts that permit an election for early termination; or
 - (3) For a period equal to or greater than twenty-five years or seventy percent of the economic useful life of the unit determined as of the time the unit was built, with option rights to purchase or release some portion of the nameplate capacity and associated energy generated by the unit at the end of the period.
- ddd. "Nameplate capacity" means the maximum electrical generating output (expressed in MWe) that a generator can sustain over a specified period of time when not restricted by seasonal or other deratings, as listed in the national allowance data base under the data field "NAMECAP" if the generator is listed in the national allowance data base or as measured in accordance with the

United States department of energy standards if the generator is not listed in the national allowance data base.

- eee. "National allowance data base" means the data base established by the administrator under section 402(4)(C) of the Act.
- fff. "Natural gas" means a naturally occurring fluid mixture of hydrocarbons containing little or no sulfur (e.g., methane, ethane, or propane), produced in geological formations beneath the earth's surface, and maintaining a gaseous state at standard atmospheric temperature and pressure conditions under ordinary conditions.
- ggg. "New unit" means a unit that commences commercial operation on or after November 15, 1990, including any such unit that serves a generator with a nameplate capacity of twenty-five megawatts electrical or less or that is a simple combustion turbine.
- hhh. "Offset plan" means a plan pursuant to title 40, Code of Federal Regulations, part 77 for offsetting excess emissions of sulfur dioxide that have occurred at an affected unit in any calendar year.
- iii. "Oil-fired" means the combustion of: fuel oil for more than ten percent of the average annual heat input during the previous three calendar years or for more than fifteen percent of the annual heat input in any one of those calendar years; and any solid, liquid, or gaseous fuel, other than coal or any other coal-derived fuel, except a coal-derived gaseous fuel with a sulfur content no greater than natural gas, for the remaining heat input, if any.
- jjj. "Operating permit" means a permit issued under section 33-15-14-06.
- kkk. "Owner" means any of the following persons:
 - (1) Any holder of any portion of the legal or equitable title in an affected unit;
 - (2) Any holder of a leasehold interest in an affected unit;
 - (3) Any purchaser of power from an affected unit under a life-of-the-unit, firm power contractual arrangement. However, unless expressly provided for in a leasehold agreement, owner shall not include a passive lessor, or a person who has an equitable interest through such lessor, whose rental payments are not based,

either directly or indirectly, upon the revenues or income from the affected unit; or

(4) With respect to any allowance tracking system general account, any person identified in the submission required by title 40, Code of Federal Regulations, 73.31(c) that is subject to the binding agreement for the authorized account representative to represent that person's ownership interest with respect to allowances.

lll. "Owner or operator" means any person who is an owner or who operates, controls, or supervises an affected unit or affected source and includes any holding company, utility system, or plant manager of an affected unit or affected source.

mmm. "Permit revision" means a permit modification, fast tract modification, administrative permit amendment, or automatic permit amendment, as provided in section 33-15-21-07.

nnn. "Phase II" means the acid rain program period beginning January 1, 2000, and continuing into the future thereafter.

ooo. "Potential electrical output capacity" means the megawatts electrical capacity rating for the units which shall be equal to thirty-three percent of the maximum design heat input capacity of the steam generating unit, as calculated according to appendix D of title 40, Code of Federal Regulations, part 72.

ppp. "Power distribution system" means the portion of an electricity grid owned or operated by a utility that is dedicated to delivering electric energy to customers.

qqq. "Power purchase commitment" means a commitment or obligation of a utility to purchase electric power from a facility pursuant to:

(1) A power sales agreement;

(2) A state regulatory authority order requiring a utility to:

(a) Enter into a power sales agreement with the facility;

(b) Purchase from the facility; or

(c) Enter into arbitration concerning the facility for the purpose of establishing terms and conditions of the utility's purchase of power;

(3) A letter of intent or similar instrument committing to purchase power (actual electrical output or generator output capacity) from the source at a previously offered or lower price and a power sales agreement applicable to the source is executed within the timeframe established by the terms of the letter of intent but no later than November 15, 1992, or, where the letter of intent does not specify a timeframe, a power sales agreement applicable to the source is executed on or before November 15, 1992; or

(4) A utility competitive bid solicitation that has resulted in the selection of the qualifying facility of independent power production facility as the winning bidder.

rrr. "Power sales agreement" is a legally binding agreement between a qualifying facility, independent power producer, or firm associated with such facility and a regulated electric utility that establishes the terms and conditions for the sale of power from the facility to the utility.

sss. "Primary fuel or primary fuel supply" means the main fuel type (expressed in mmbtu) consumed by an affected unit for the applicable calendar year.

ttt. "Proposed acid rain permit or proposed permit" means the version of an acid rain permit that the department submits to the administrator after the public comment period, but prior to completion of the United States environmental protection agency permit review period under subdivision c of subsection 7 of section 33-15-14-06 and title 40, Code of Federal Regulations, 70.8(c).

uuu. "Qualifying facility" means a "qualifying small power production facility" within the meaning of section 3(17)(C) of the Federal Power Act or a "qualifying cogeneration facility" within the meaning of section 3(18)(B) of the Federal Power Act.

vvv. "Qualifying power purchase commitment" means a power purchase commitment in effect as of November 15, 1990 without regard to changes to that commitment so long as:

(1) The identity of the electric output purchaser, the identity of the steam purchaser, and the location of the facility remain unchanged as of the date the facility commences commercial operation; and

- (2) The terms and conditions of the power purchase commitment are not changed in such a way as to allow the costs of compliance with the acid rain program to be shifted to the purchaser.

www. "Qualifying repowering technology" means:

- (1) Replacement of an existing coal-fired boiler with one of the following clean coal technologies: atmospheric or pressurized fluidized bed combustion, integrated gasification combined cycle, magnetohydrodynamics, direct and indirect coal-fired turbines, integrated gasification fuel cells, or as determined by the administrator, in consultation with the secretary of energy, a derivative of one or more of these technologies, and any other technology capable of controlling multiple-combustion emissions simultaneously with improved boiler or generation efficiency and with significantly greater waste reduction relative to the performance of technology in widespread commercial use as of November 15, 1990; or
- (2) Any oil-fired or gas-fired unit that has been awarded clean coal technology demonstration funding as of January 1, 1991, by the United States department of energy.

xxx. "Receive or receipt of" means the date the administrator or the department comes into possession of information or correspondence, whether sent in writing or by authorized electronic transmission, as indicated in an official correspondence log, or by a notation made on the information or correspondence, by the administrator or the department in the regular course of business.

yyy. "Recordation, record, or recorded" means, with regard to allowances, the transfer of allowances by the administrator from one allowance tracking system account or subaccount to another.

zzz. "Schedule of compliance" means an enforceable sequence of actions, measures, or operations designed to achieve or maintain compliance, or correct noncompliance, with an applicable requirement of the acid rain program, including any applicable acid rain permit requirement.

aaaa. "Secretary of energy" means the secretary of the United States department of energy or the secretary's duly authorized representative.

bbbb. "Simple combustion turbine" means a unit that is a rotary engine driven by a gas under pressure that is created by

the combustion of any fuel. This term includes combined cycle units without auxiliary firing. This term excludes combined cycle units with auxiliary firing, unless the unit did not use the auxiliary firing from 1985 through 1987 and does not use auxiliary firing at any time after November 15, 1990.

- cccc. "Solid waste incinerator" means a source as defined in section 129(g)(1) of the Act.
- dddd. "Source" means any governmental, institutional, commercial, or industrial structure, installation, plant, building, or facility that emits or has the potential to emit any regulated air pollutant under the Act. For purposes of section 502(c) of the Act, a "source", including a "source" with multiple units, shall be considered a single "facility".
- eeee. "Stack" means a structure that includes one or more flues and the housing for the flues.
- ffff. "State" means one of the forty-eight contiguous states and the District of Columbia and includes any nonfederal authorities, including local agencies, interstate associations, and statewide agencies with approved state-operating permit programs. The term "state" shall have its conventional meaning where such meaning is clear from the context.
- gggg. "State-operating permit program" means an operating permit program that the administrator has approved as meeting the requirements of titles IV and V of the Act and title 40, Code of Federal Regulations, parts 70 and 72.
- hhhh. "Submit or serve" means to send or transmit a document, information, or correspondence to the person specified in accordance with the applicable regulation:
- (1) In person;
 - (2) By United States postal service certified mail with the official postmark or, if service is by the administrator or the department, by any other mail service by the United States postal service; or
 - (3) By other means with an equivalent time and date mark used in the regular course of business to indicate the date of dispatch or transmission and a record of prompt delivery. Compliance with any "submission", "service", or "mailing" deadline shall be determined by the date of dispatch, transmission, or mailing and not the date of receipt.

- iiii. "Ton or tonnage" means any "short ton" (i.e., two thousand pounds). For the purpose of determining compliance with the acid rain emissions limitations and reduction requirements, total tons for a year shall be calculated as the sum of all recorded hourly emissions (or the tonnage equivalent of the recorded hourly emissions rates) in accordance with title 40, Code of Federal Regulations, part 75, with any remaining fraction of a ton equal to or greater than fifty hundredths ton deemed to equal one ton and any fraction of a ton less than fifty hundredths ton deemed not to equal any ton.
- jjjj. "Total planned net output capacity" means the planned generator output capacity, excluding that portion of the electrical power which is designed to be used at the power production facility, as specified under one or more qualifying power purchase commitments or contemporaneous documents as of November 15, 1990. "Total installed net output capacity" shall be the generator output capacity, excluding that portion of the electrical power actually used at the power production facility, as installed.
- kkkk. "Unit" means a fossil fuel-fired combustion device.
- llll. "Unit account" means an allowance tracking system account, established by the administrator for an affected unit pursuant to title 40, Code of Federal Regulations, 73.31(a) or (b).
- mmmm. "Utility" means any person that sells electricity.
- nnnn. "Utility competitive bid solicitation" is a public request from a regulated utility for offers to the utility for meeting future generating needs. A qualifying facility, independent power production facility may be regarded as having been "selected" in such solicitation if the utility has named the facility as a project with which the utility intends to negotiate a power sales agreement.
- oooo. "Utility regulatory authority" means an authority, board, commission, or other entity, limited to the local, state, or federal level, whenever so specified, responsible for overseeing the business operations of utilities located within its jurisdiction, including utility rates and charges to customers.
- pppp. "Utility unit" means a unit owned or operated by a utility:
 - (1) That serves a generator that produces electricity for sale; or

- (2) That during 1985 served a generator that produced electricity for sale.
 - (3) Notwithstanding paragraphs 1 and 2, a unit that was in operation during 1985, but did not serve a generator that produced electricity for sale during 1985, and did not commence commercial operation on or after November 15, 1990, is not a utility unit for purposes of the acid rain program.
 - (4) Notwithstanding paragraphs 1 and 2, a unit that cogenerates steam and electricity is not a utility unit for purposes of the acid rain program, unless the unit is constructed for the purpose of supplying, or commences construction after November 15, 1990, and supplies, more than one-third of its potential electrical output capacity and more than twenty-five megawatts electrical output to any power distribution system for sale.
2. **Measurements, abbreviations, and acronyms.** Measurements, abbreviations, and acronyms used in this chapter are defined as follows:
- a. ASTM - American society for testing and materials.
 - b. Btu - British thermal unit.
 - c. CFR - Code of Federal Regulations.
 - d. DOE - department of energy.
 - e. mmBtu - million Btu.
 - f. MWe - megawatt electrical.
 - g. SO₂ - sulfur dioxide.
3. **Applicability.**
- a. Each of the following units shall be an affected unit, and any source that includes such a unit shall be an affected source, subject to the requirements of the acid rain program:
 - (1) A unit listed in table 1 of title 40, Code of Federal Regulations, 73.10(a).
 - (2) An existing unit that is identified in table 2 or 3 of title 40, Code of Federal Regulations, 73.10 and any other existing utility unit, except a unit under subdivision b of this subsection.

(3) A utility unit, except a unit under subdivision b of this subsection, which:

- (a) Is a new unit;
- (b) Did not serve a generator with a nameplate capacity greater than twenty-five megawatts electrical on November 15, 1990, but serves such a generator after November 15, 1990;
- (c) Was a simple combustion turbine on November 15, 1990, but adds or uses auxiliary firing after November 15, 1990;
- (d) Was an exempt cogeneration facility under paragraph 4 of subdivision b but during any three calendar year period after November 15, 1990, sold, to a utility power distribution system, an annual average of more than one-third of its potential electrical output capacity and more than two hundred nineteen thousand megawatts electrical-hours electric output, on a gross basis;
- (e) Was an exempt qualifying facility under paragraph 5 of subdivision b but, at any time after the later of November 15, 1990, or the date the facility commences commercial operation, fails to meet the definition of qualifying facility;
- (f) Was an exempt independent power production facility under paragraph 6 of subdivision b but, at any time after the later of November 15, 1990, or the date the facility commences commercial operation, fails to meet the definition of an independent power production facility; or
- (g) Was an exempt solid waste incinerator under paragraph 7 of subdivision b but during any three calendar year period after November 15, 1990, consumes twenty percent or more (on a Btu basis) fossil fuel.

b. The following types of units are not affected units subject to the requirements of the acid rain program:

- (1) A simple combustion turbine that commenced operation before November 15, 1990.
- (2) Any unit that commenced commercial operation before November 15, 1990, and that did not, as of

November 15, 1990, and does not currently, serve a generator with a nameplate capacity of greater than twenty-five megawatts electrical.

(3) Any unit that, during 1985, did not serve a generator that produced electricity for sale and that did not, as of November 15, 1990, and does not currently, serve a generator that produces electricity for sale.

(4) A cogeneration facility that:

(a) For a unit that commenced construction on or prior to November 15, 1990, was constructed for the purpose of supplying equal to or less than one-third its potential electrical output capacity or equal to or less than two hundred nineteen thousand megawatts electrical-hours actual electric output on an annual basis to any utility power distribution system for sale on a gross basis. If the purpose of construction is not known, it will be presumed to be consistent with the actual operation from 1985 through 1987. However, if in any three calendar year period after November 15, 1990, such unit sells to a utility power distribution system an annual average of more than one-third of its potential electrical output capacity and more than two hundred nineteen thousand megawatts electrical-hours actual electric output on a gross basis, that unit shall be an affected unit, subject to the requirements of the acid rain program; or

(b) For units that commenced construction after November 15, 1990, supplies equal to or less than one-third its potential electrical output capacity or equal to or less than two hundred nineteen thousand megawatts electrical-hours actual electric output on an annual basis to any utility power distribution system for sale on a gross basis. However, if in any three calendar year period after November 15, 1990, such unit sells to a utility power distribution system an annual average of more than one-third of its potential electrical output capacity and more than two hundred nineteen thousand megawatts electrical-hours actual electric output on a gross basis, that unit shall be an affected unit, subject to the requirements of the acid rain program.

(5) A qualifying facility that:

- (a) Has, as of November 15, 1990, one or more qualifying power purchase commitments to sell at least fifteen percent of its total planned net output capacity; and
 - (b) Consists of one or more units designated by the owner or operator with total installed net output capacity not exceeding one hundred thirty percent of the total planned net output capacity. If the emissions rates of the units are not the same, the administrator may exercise discretion to designate which units are exempt.
 - (6) An independent power production facility that:
 - (a) Has, as of November 15, 1990, one or more qualifying power purchase commitments to sell at least fifteen percent of its total planned net output capacity; and
 - (b) Consists of one or more units designated by the owner or operator with total installed net output capacity not exceeding one hundred thirty percent of its total planned net output capacity. If the emissions rates of the units are not the same, the administrator may exercise discretion to designate which units are exempt.
 - (7) A solid waste incinerator, if more than eighty percent on a Btu basis of the annual fuel consumed at such incinerator is other than fossil fuels. For a solid waste incinerator that began operation before January 1, 1985, the average annual fuel consumption of nonfossil fuels for calendar years 1985 through 1987 must be greater than eighty percent for such an incinerator to be exempt. For a solid waste incinerator that began operation after January 1, 1985, the average annual fuel consumption of nonfossil fuels for the first three years of operation must be greater than eighty percent for such an incinerator to be exempt. If, during any three calendar year period after November 15, 1990, such incinerator consumes twenty percent or more fossil fuel on a Btu basis, such incinerator will be an affected source under the acid rain program.
 - (8) A nonutility unit.
- c. A certifying official of any unit may petition the administrator for a determination of applicability under title 40, Code of Federal Regulations, 72.6(c). The administrator's determination of applicability shall be

binding upon the department, unless the petition is found to have contained significant errors or omissions.

4. New units exemption.

- a. Applicability. This subsection applies to any new utility unit that serves one or more generators with total nameplate capacity of twenty-five megawatts electrical or less and burns only fuels with a sulfur content of five hundredths percent or less by weight, as determined in accordance with paragraph 1 of subdivision d.
- b. Petition for written exemption. The designated representative, authorized in accordance with subpart B of title 40, Code of Federal Regulations, part 72, of a source that includes a unit under subdivision a may petition the department for a written exemption, or to renew a written exemption, for the unit from certain requirements of the acid rain program. The petition shall be submitted on a form approved by the department which includes the following elements:
 - (1) Identification of the unit.
 - (2) The nameplate capacity of each generator served by the unit.
 - (3) A list of all fuels currently burned by the unit and their percentage sulfur content by weight, determined in accordance with subdivision a.
 - (4) A list of all fuels that are expected to be burned by the unit and their sulfur content by weight.
 - (5) The special provisions in subdivision d.
- c. North Dakota state department of health and consolidated laboratories' action.
 - (1) (a) The department will issue, for any unit meeting the requirements of subdivisions a and b, a written exemption from the requirements of the acid rain program except for the requirements specified in this subsection, title 40, Code of Federal Regulations, 72.2 through 72.7, and title 40, Code of Federal Regulations, 72.10 through 72.13; provided that no unit shall be exempted unless the designated representative of the unit surrenders, and the administrator deducts from the unit's allowances tracking system account, allowances pursuant to title 40, Code of Federal Regulations, 72.7(c)(1)(i) and (d)(1).

(b) The exemption shall take effect on January first of the year immediately following the date on which the written exemption is issued as a final agency action subject to judicial review, in accordance with paragraph 2 of subdivision c; provided that the owners and operators, and, to the extent applicable, the designated representative, shall comply with the requirements of the acid rain program concerning all years for which the unit was not exempted, even if such requirements arise, or must be complied with, after the exemption takes effect. The exemption shall not be a defense against any violation of such requirements of the acid rain program whether the violation occurs before or after the exemption takes effect.

(2) In considering and issuing or denying a written exemption under paragraph 1 of subdivision c, the department will apply the permitting procedures in section 33-15-21-06 by:

(a) Treating the petition as an acid rain permit application under such provisions;

(b) Issuing or denying a draft written exemption that is treated as the issuance or denial of a draft permit under such provisions; and

(c) Issuing or denying a proposed written exemption that is treated as the issuance or denial of a proposed permit under such provisions; provided that no provision under section 33-15-21-06 concerning the content, effective date, or term of an acid rain permit shall apply to the written exemption or proposed written exemption under this subsection.

(3) A written exemption issued under this subsection shall have a term of five years from its effective date, except as provided in paragraph 3 of subdivision d.

d. Special provisions.

(1) The owners and operators of each unit exempted under this subsection shall determine the sulfur content by weight of its fuel as follows:

(a) For petroleum or petroleum products that the unit burns starting on the first day on which the exemption takes effect until the exemption terminates, a sample of each delivery of such

fuel shall be tested using American society for testing and materials methods ASTM D4057-88 and ASTM D129-91, ASTM D2622-92, or ASTM D4294-90.

- (b) For natural gas that the unit burns starting on the first day on which the exemption takes effect until the exemption terminates, the sulfur content shall be assumed to be five hundredths percent or less by weight.
 - (c) For gaseous fuel other than natural gas which the unit burns starting on the first day on which the exemption takes effect until the exemption terminates, a sample of each delivery of such fuel shall be tested using American society for testing and materials methods ASTM D1072-90 and ASTM D1265-92; provided that if the gaseous fuel is delivered by pipeline to the unit, a sample of the fuel shall be tested, at least once every quarter in which the unit operates during any year for which the exemption is in effect, using American society for testing and materials method ASTM D1072-90.
- (2) The owners and operators of each unit exempted under this subsection shall retain at the source that includes the unit, the records of the results of the tests performed under subparagraphs a and c of paragraph 1 and a copy of the purchase agreements for the fuel under paragraph 1, stating the sulfur content of such fuel. Such records and documents shall be retained for five years from the date they are created.
 - (3) On the earlier of the date the written exemption expires, the date a unit exempted under this subsection burns any fuel with a sulfur content in excess of five hundredths percent by weight, as determined in accordance with paragraph 1, or twenty-four months prior to the date the unit first serves one or more generators with total nameplate capacity in excess of twenty-five megawatts electrical, the unit shall no longer be exempted under this subsection and shall be subject to all requirements of the acid rain program, except that:
 - (a) Notwithstanding subdivisions b and c of subsection 1 of section 33-15-21-03, the designated representative of the source that includes the unit shall submit a complete acid rain permit application on the later of January 1, 1998, or the date the unit is no longer exempted under this subsection.

- (b) For purposes of applying monitoring requirements under title 40, Code of Federal Regulations, part 75, the unit shall be treated as a new unit that commenced commercial operation on the date the unit no longer meets the requirements of subdivision a of this subsection.

5. Retired units exemption.

- a. Applicability. This subsection applies to any affected unit that is retired prior to the issuance, including renewal, of an acid rain permit for the unit as a final agency action.
- b. Petition for written exemption.
 - (1) The designated representative, authorized in accordance with subpart B of title 40, Code of Federal Regulations, part 72, of a source that includes a unit under subdivision a may petition the department for a written exemption, or to renew a written exemption, for the unit from certain requirements of the acid rain program.
 - (2) A petition under this subsection shall be submitted on or before:
 - (a) The deadline for submitting an acid rain permit application for phase II; or
 - (b) If the unit has a phase II acid rain permit, the deadline for reapplying for such permit.
 - (3) The petition under this subsection shall be submitted on a form approved by the department which includes the following elements:
 - (a) Identification of the unit;
 - (b) The applicable deadline under paragraph 2;
 - (c) The actual or expected date of retirement of the unit;
 - (d) The following statement: "I certify that this unit [is or will be, as applicable] permanently retired on the date specified in this petition and will not emit any sulfur dioxide or nitrogen oxides after such date";
 - (e) A description of any actions that have been or will be taken and provide the basis for the certification in subparagraph d; and

- (f) The special provisions in subdivision d.
- c. North Dakota state department of health and consolidated laboratories' action.
 - (1) (a) The department will issue, for any unit meeting the requirements of subdivisions a and b, a written exemption from the requirements of sections 33-15-21-01 through 33-15-21-08 and title 40, Code of Federal Regulations, part 72, except for the requirements specified in this subsection and title 40, Code of Federal Regulations, 72.1 through 72.6, title 40, Code of Federal Regulations, 72.8, and title 40, Code of Federal Regulations, 72.10 through 72.13.
 - (b) The exemption shall take effect on January first of the year following the date on which the written exemption is issued as a final agency action subject to judicial review, in accordance with paragraph 2; provided that the owners and operators, and, to the extent applicable, the designated representative, shall comply with the requirements of sections 33-15-21-01 through 33-15-21-08 and title 40, Code of Federal Regulations, part 72, concerning all years for which the unit was not exempted, even if such requirements arise or must be complied with after the exemption takes effect. The exemption shall not be a defense against any violation of such requirements of the acid rain program whether the violation occurs before or after the exemption takes effect.
- (2) In considering and issuing or denying a written exemption under paragraph 1, the department will apply the procedures in section 33-15-21-06 by:
 - (a) Treating the petition as an acid rain permit application under such provisions;
 - (b) Issuing or denying a draft written exemption that is treated as the issuance or denial of a draft permit under such provisions; and
 - (c) Issuing or denying a proposed written exemption that is treated as a proposed permit under such provisions; provided that no provision under section 33-15-21-06 concerning, the content, effective date, or term of an acid rain permit shall apply to the written exemption or proposed written exemption under this section.

- (3) A written exemption issued under this subsection shall have a term of five years, except as provided in paragraph 3 of subdivision d.

d. Special provisions.

- (1) A unit exempted under this subsection shall not emit any sulfur dioxide and nitrogen dioxide starting on the date it is exempted.
- (2) The owners and operators of a unit exempted under this subsection shall comply with monitoring requirements in accordance with title 40, Code of Federal Regulations, part 75, and will be allocated allowances in accordance with title 40, Code of Federal Regulations, part 73.
- (3) A unit exempted under this subsection shall not resume operation unless the designated representative of the source that includes the unit submits an acid rain permit application for the unit not less than twenty-four months prior to the later of January 1, 2000, or the date the unit is to resume operation. On the earlier of the date the written exemption expires or the date an acid rain permit application is submitted or is required to be submitted under this subdivision, the unit shall no longer be exempted under this subsection and shall no longer be exempted under this subsection and shall be subject to all requirements of sections 33-15-21-01 through 33-15-21-08 and title 40, Code of Federal Regulations, part 72.

6. Standard requirements.

a. Permit requirements.

- (1) The designated representative of each affected source and each affected unit at the source shall:
 - (a) Submit a complete acid rain permit application under this chapter in accordance with the deadlines specified in subsection 1 of section 33-15-21-03; and
 - (b) Submit in a timely manner any supplemental information that the department determines is necessary in order to review an acid rain permit application and issue or deny an acid rain permit.
- (2) The owners and operators of each affected source and each affected unit at the source shall:

- (a) Operate the unit in compliance with a complete acid rain permit application or a superseding acid rain permit issued by the department; and
- (b) Have an acid rain permit.

b. Monitoring requirements.

- (1) The owners and operators and, to the extent applicable, designated representative of each affected source and each affected unit at the source shall comply with the monitoring requirements as provided in title 40, Code of Federal Regulations, part 75, and section 407 of the Act and regulations or rules implementing section 407 of the Act.
- (2) The emissions measurements recorded and reported in accordance with title 40, Code of Federal Regulations, part 75, and section 407 of the Act and regulations or rules implementing section 407 of the Act shall be used to determine compliance by the unit with the acid rain emissions limitations and emissions reduction requirements for sulfur dioxide and nitrogen oxides under the acid rain program.
- (3) The requirements of title 40, Code of Federal Regulations, part 75, and regulations or rules implementing section 407 of the Act shall not affect the responsibility of the owners and operators to monitor emissions of other pollutants or other emissions characteristics at the unit under other applicable requirements of the Act and other provisions of the operating permit for the source.

c. Sulfur dioxide requirements.

- (1) The owners and operators of each source and each affected unit at the source shall:
 - (a) Hold allowances, as of the allowance transfer deadline, in the unit's compliance subaccount, after deductions under title 40, Code of Federal Regulations, 73.34(c), not less than the total annual emissions of sulfur dioxide for the previous calendar year from the unit; and
 - (b) Comply with the applicable acid rain emissions limitation for sulfur dioxide.
- (2) Each ton of sulfur dioxide emitted in excess of the acid rain emissions limitations for sulfur dioxide shall constitute a separate violation of the Act.

- (3) An affected unit shall be subject to the requirements under paragraph 1 as follows:
 - (a) Starting January 1, 2000, an affected unit under paragraph 2 of subdivision a of subsection 3; or
 - (b) Starting on the later of January 1, 2000, or the deadline for monitor certification under title 40, Code of Federal Regulations, part 75, an affected unit under paragraph 3 of subdivision a of subsection 3.
 - (4) Allowances shall be held in, deducted from, or transferred among allowance tracking system accounts in accordance with the acid rain program.
 - (5) An allowance shall not be deducted, in order to comply with the requirements under subparagraph a of paragraph 1 of subdivision c, prior to the calendar year for which the allowance was allocated.
 - (6) An allowance allocated by the administrator under the acid rain program is a limited authorization to emit sulfur dioxide in accordance with the acid rain program. No provision of the acid rain program, the acid rain permit application, the acid rain permit, or the written exemption under subsections 4 and 5 and no provision of law shall be construed to limit the authority of the United States environmental protection agency to terminate or limit such authorization.
 - (7) An allowance allocated by the administrator under the acid rain program does not constitute a property right.
- d. Nitrogen oxides requirements. The owners and operators of the source and each affected unit at the source shall comply with the applicable acid rain emissions limitation for nitrogen oxides.
- e. Excess emissions requirements.
- (1) The designated representative of an affected unit that has excess emissions in any calendar year shall submit a proposed offset plan to the administrator, as required under title 40, Code of Federal Regulations, part 77, and submit a copy to the department.
 - (2) The owners and operators of an affected unit that has excess emissions in any calendar year shall:

- (a) Pay to the administrator without demand the penalty required, and pay to the administrator upon demand the interest on that penalty, as required by title 40, Code of Federal Regulations, part 77; and
- (b) Comply with the terms of an approved offset plan, as required by title 40, Code of Federal Regulations, part 77.

f. Recordkeeping and reporting requirements.

- (1) Unless otherwise provided, the owners and operators of the source and each affected unit at the source shall keep onsite at the source each of the following documents for a period of five years from the date the document is created. This period may be extended for cause, at any time prior to the end of five years, in writing by the administrator or the department.
 - (a) The certificate of representation for the designated representative for the source and each affected unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation, in accordance with title 40, Code of Federal Regulations, 72.24; provided that the certificate and documents shall be retained onsite at the source beyond such five-year period until such documents are superseded because of the submission of a new certificate of representation changing the designated representative.
 - (b) All emissions monitoring information, in accordance with title 40, Code of Federal Regulations, part 75.
 - (c) Copies of all reports, compliance certifications, and other submissions and all records made or required under the acid rain program.
 - (d) Copies of all documents used to complete an acid rain permit application and any other submission under the acid rain program or to demonstrate compliance with the requirements of the acid rain program.
- (2) The designated representative of an affected source and each affected unit at the source shall submit the reports and compliance certifications required under

the acid rain program, including those under section 33-15-21-08 and title 40, Code of Federal Regulations, part 75.

g. Liability.

- (1) Any person who knowingly violates any requirement or prohibition of the acid rain program, a complete acid rain permit application, an acid rain permit, or a written exemption under subsections 4 or 5, including any requirement for the payment of any penalty owed to the United States, shall be subject to enforcement by the administrator pursuant to section 113(c) of the Act and by the department.
- (2) Any person who knowingly makes a false, material statement in any record, submission, or report under the acid rain program shall be subject to criminal enforcement by the administrator pursuant to section 113(c) of the Act and 18 U.S.C. 1001 and by the department.
- (3) No permit revision shall excuse any violation of the requirements of the acid rain program that occurs prior to the date that the revision takes effect.
- (4) Each affected source and each affected unit shall meet the requirements of the acid rain program.
- (5) Any provision of the acid rain program that applies to an affected source, including a provision applicable to the designated representative of an affected source, shall also apply to the owners and operators of such source and of the affected units at the source.
- (6) Any provision of the acid rain program that applies to an affected unit, including a provision applicable to the designated representative of an affected unit, shall also apply to the owners and operators of such unit. Except as provided under subsection 2 of section 33-15-21-04, phase II repowering extension plans, section 407 of the Act and regulations or rules implementing section 407 of the Act, and except with regard to the requirements applicable to units with a common stack under title 40, Code of Federal Regulations, part 75, including title 40, Code of Federal Regulations, 75.16, 75.17, and 75.18, the owners and operators and the designated representative of one affected unit shall not be liable for any violation by any other affected unit of which they are not owners or operators or the designated representative and that is located at a

source of which they are not owners or operators or the designated representative.

- (7) Each violation of a provision of sections 33-15-21-01 through 33-15-21-10 and title 40, Code of Federal Regulations, parts 72, 73, 75, 77, and 78, and regulations or rules implementing sections 407 and 410 of the Act by an affected source or affected unit, or by an owner or operator or designated representative of such source or unit, shall be a separate violation of the Act.
- h. Effect on other authorities. No provision of the acid rain program, an acid rain permit application, an acid rain permit, or a written exemption under subsections 4 or 5 shall be construed as:
- (1) Except as expressly provided in title IV of the Act, exempting or excluding the owners and operators and, to the extent applicable, the designated representative of an affected source or affected unit from compliance with any other provision of the Act, including the provisions of title I of the Act relating to applicable national ambient air quality standards or state implementation plans;
 - (2) Limiting the number of allowances a unit can hold; provided, that the number of allowances held by the unit shall not affect the source's obligation to comply with any other provisions of the Act or this article;
 - (3) Requiring a change of any kind in any state law regulating electric utility rates and charges, affecting any state law regarding such state regulation, or limiting such state regulation, including any prudence review requirements under such state law;
 - (4) Modifying the Federal Power Act or affecting the authority of the federal energy regulatory commission under the Federal Power Act; or
 - (5) Interfering with or impairing any program for competitive bidding for power supply in a state in which such program is established.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03, 23-25-04, 23-25-04.1

Law Implemented: NDCC 23-25-03, 23-25-04, 23-25-04.1, 23-25-10

33-15-21-02. Designated representative.

1. Submissions.

- a. The designated representative shall submit a certificate of representation, and any superseding certificate of representation, to the administrator in accordance with subpart B of title 40, Code of Federal Regulations, part 72, and, concurrently, shall submit a copy to the department. Whenever the term "designated representative" is used in this section, the term shall be construed to include the alternate designated representative.
- b. Each submission under the acid rain program shall be submitted, signed, and certified by the designated representative for all sources on behalf of which the submission is made.
- c. In each submission under the acid rain program, the designated representative shall certify, by the designated representative's signature:
 - (1) The following statement, which shall be included verbatim in such submission: "I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made".
 - (2) The following statement, which shall be included verbatim in such submission: "I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information or omitting required statements and information, including the possibility of fine or imprisonment".
- d. The department will accept or act on a submission made on behalf of owners or operators of an affected source and an affected unit only if the submission has been made, signed, and certified in accordance with subdivisions b and c.
- e. (1) The designated representative of a source shall serve notice on each owner and operator of the source and of an affected unit at the source:

- (a) By the date of submission, of any acid rain program submissions by the designated representative;
 - (b) Within ten business days of receipt of a determination, of any written determination by the administrator or the department; and
 - (c) Provided that the submission or determination covers the source or the unit.
- (2) The designated representative of a source shall provide each owner and operator of an affected unit at the source a copy of any submission or determination under paragraph 1, unless the owner or operator expressly waives the right to receive such a copy.

2. **Objections.**

- a. Except as provided in title 40, Code of Federal Regulations, 72.23, no objection or other communication submitted to the administrator or the department concerning the authorization, or any submission, action or inaction, of the designated representative shall affect any submission, action, or inaction of the designated representative, or the finality of any decision by the department, under the acid rain program. In the event of such communication, the department is not required to stay any submission or the effect of any action or inaction under the acid rain program.
- b. The department will not adjudicate any private legal dispute concerning the authorization or any submission, action, or inaction of any designated representative, including private legal disputes concerning the proceeds of allowance transfers.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03, 23-25-04

Law Implemented: NDCC 23-25-03, 23-25-04

33-15-21-03. **Acid rain permit applications.**

1. **Requirement to apply.**

- a. **Duty to apply.** The designated representative of any source with an affected unit shall submit a complete acid rain permit application by the applicable deadline in subdivisions b and c of this subsection, and the owners and operators of such source and any affected unit at the

source shall not operate the source or unit without a permit that states its acid rain program requirements.

b. Deadlines.

- (1) For any source with an existing unit described under paragraph 2 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department on or before January 1, 1996.
- (2) For any source with a new unit described under subparagraph a of paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department at least twenty-four months before the later of January 1, 2000, or the date on which the unit commences operation.
- (3) For any source with a unit described under subparagraph b of paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department at least twenty-four months before the later of January 1, 2000, or the date on which the unit begins to serve a generator with a nameplate capacity greater than twenty-five megawatts electrical.
- (4) For any source with a unit described under subparagraph c of paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department at least twenty-four months before the later of January 1, 2000, or the date on which the auxiliary firing commences operation.
- (5) For any source with a unit described under subparagraph d of paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department before the later of January 1, 1998, or March first of the year following the three calendar year period in which the unit sold to a utility power distribution system an annual average of more than one-third of its potential electrical output capacity and more than two hundred nineteen thousand megawatts

electrical-hours actual electric output on a gross basis.

- (6) For any source with a unit described under subparagraph e of paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department before the later of January 1, 1998, or March first of the year following the calendar year in which the facility fails to meet the definition of qualifying facility.
 - (7) For any source with a unit described under subparagraph f of paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department before the later of January 1, 1998, or March first of the year following the calendar year in which the facility fails to meet the definition of an independent power production facility.
 - (8) For any source with a unit described under subparagraph g of paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the designated representative shall submit a complete acid rain permit application governing such unit to the department before the later of January 1, 1998, or March first of the year following the three calendar year period in which the incinerator consumed twenty percent or more fossil fuel on a British thermal unit basis.
- c. Duty to reapply. The designated representative shall submit a complete acid rain permit application for each source with an affected unit at least six months but no more than eighteen months prior to the expiration of an existing acid rain permit governing the unit.
 - d. The original and two copies of all permit applications shall be submitted to the department and one copy shall be submitted to the administrator, United States environmental protection agency, region eight.
2. **Information requirements for acid rain permit applications.** A complete acid rain permit application shall be submitted on a form approved by the department, which includes the following elements:
- a. Identification of the affected source for which the permit application is submitted;

- b. Identification of each affected unit at the source for which the permit application is submitted;
 - c. A complete compliance plan for each unit, in accordance with section 33-15-21-04;
 - d. The standard requirements under subsection 6 of section 33-15-21-01; and
 - e. If the unit is a new unit, the date that the unit has commenced or will commence operation and the deadline for monitor certification.
3. **Permit application shield and binding effect of permit application.**
- a. Once a designated representative submits a timely and complete acid rain permit application, the owners and operators of the affected source and the affected units covered by the permit application shall be deemed in compliance with the requirement to have an acid rain permit under paragraph 2 of subdivision a of subsection 6 of section 33-15-21-01 and subdivision a of subsection 1 of section 33-15-21-03; provided that any delay in issuing an acid rain permit is not caused by the failure of the designated representative to submit in a complete and timely fashion supplemental information, as required by the department, necessary to issue a permit.
 - b. Prior to the date on which an acid rain permit is issued as a final agency action subject to judicial review, an affected unit governed by and operated in accordance with the terms and requirements of a timely and complete acid rain permit application shall be deemed to be operating in compliance with the acid rain program.
 - c. A complete acid rain permit application shall be binding on the owners and operators and the designated representative or the affected source and the affected units covered by the permit application and shall be enforceable as an acid rain permit from the date of submission of the permit application until the issuance or denial of such permit as a final agency action subject to judicial review.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-04.1

33-15-21-04. Acid rain compliance plan and compliance options.

1. General.

- a. For each affected unit included in an acid rain permit application, a complete compliance plan shall include:
 - (1) For sulfur dioxide emissions, a certification that, as of the allowance transfer deadline, the designated representative will hold allowances in the unit's compliance subaccount, after deductions under title 40, Code of Federal Regulations, 73.34(c), not less than the total annual emissions of sulfur dioxide from the unit. The compliance plan may also specify, in accordance with section 33-15-21-04, one or more of the acid rain compliance options.
 - (2) For nitrogen oxides emissions, a certification that the unit will comply with the applicable limitation established by regulations or rules implementing section 407 of the Act or shall specify one or more acid rain compliance options, in accordance with section 407 of the Act and regulations or rules implementing section 407.
- b. The compliance plan may include a multiunit compliance option under subsection 2 of section 33-15-21-04 or section 407 of the Act or regulations or rules implementing section 407.
 - (1) A plan for a compliance option that includes units at more than one affected source shall be complete only if:
 - (a) Such plan is signed and certified by the designated representative for each source with an affected unit governed by such plan; and
 - (b) A complete permit application is submitted covering each unit governed by such plan.
 - (2) The department's approval of a plan under paragraph 1 that includes units in more than one state shall be final only after every permitting authority with jurisdiction over any such unit has approved the plan with the same modifications or conditions, if any.
- c. Conditional approval. In the compliance plan, the designated representative of an affected unit may propose, in accordance with section 33-15-21-04, any acid rain compliance option for conditional approval; provided that an acid rain compliance option under section 407 of the Act may be conditionally proposed only to the extent provided in regulations or rules implementing section 407 of the Act.

- (1) To activate a conditionally approved acid rain compliance option, the designated representative shall notify the department in writing that the conditionally approved compliance option will actually be pursued beginning January first of a specified year. Such notification shall be subject to the limitations on activation under subsection 2 of section 33-15-21-04 and regulations or rules implementing section 407 of the Act. If the conditionally approved compliance option includes a plan described in paragraph 1 of subdivision b, the designated representative of each source governed by the plan shall sign and certify the notification.
- (2) The notification under paragraph 1 of subdivision c shall specify the first calendar year and the last calendar year for which the conditionally approved acid rain compliance option is to be activated. A conditionally approved compliance option shall be activated, if at all, before the date of any enforceable milestone applicable to the compliance option. The date of activation of the compliance option shall not be a defense against failure to meet the requirements applicable to that compliance option during each calendar year for which the compliance option is activated.
- (3) Upon submission of a notification meeting the requirements of paragraphs 1 and 2, the conditionally approved acid rain compliance option becomes binding on the owners and operators and the designated representative of any unit governed by the conditionally approved compliance option.
- (4) A notification meeting the requirements of paragraphs 1 and 2 will revise the unit's permit in accordance with subsection 4 of section 33-15-21-07 (administrative permit amendment).

d. Termination of compliance option.

- (1) The designated representative for a unit may terminate an acid rain compliance option by notifying the department in writing that an approved compliance option will be terminated beginning January first of a specified year. Such notification shall be subject to the limitations on termination under subsection 2 of section 33-15-21-04 and regulations or rules implementing section 407 of the Act. If the compliance option includes a plan described in paragraph 1 of subdivision b, the designated representative for each source governed by the plan shall sign and certify the notification.

- (2) The notification under paragraph 1 shall specify the calendar year for which the termination will take effect.
- (3) Upon submission of a notification meeting the requirements of paragraphs 1 and 2, the termination becomes binding on the owners and operators and the designated representative of any unit governed by the acid rain compliance option to be terminated.
- (4) A notification meeting the requirements of paragraphs 1 and 2 will revise the unit's permit in accordance with subsection 4 of section 33-15-21-07 (administrative permit amendment).

2. Repowering extensions.

a. Applicability.

- (1) This subsection shall apply to the designated representative of:
 - (a) Any existing affected unit that is a coal-fired unit and has a 1985 actual sulfur dioxide emissions rate equal to or greater than one and two-tenths lbs/mmBtu; or
 - (b) Any new unit that will be a replacement unit, as provided in paragraph 2 of subdivision b, for a unit meeting the requirements of subparagraph a; or
 - (c) Any oil-fired or gas-fired unit or oil-fired and gas-fired unit that has been awarded clean coal technology demonstration funding as of January 1, 1991, by the secretary of energy.
- (2) A repowering extension does not exempt the owner or operator for any unit governed by the repowering plan from the requirement to comply with such unit's acid rain emissions limitations for sulfur dioxide.

b. The designated representative of any unit meeting the requirements of subparagraph a of paragraph 1 of subdivision a may include in the unit's acid rain permit application a repowering extension plan that includes a demonstration that:

- (1) The unit will be repowered with a qualifying repowering technology in order to comply with the emissions limitations for sulfur dioxide; or

- (2) The unit will be replaced by a new utility unit that has the same designated representative and that is located at a different site using a qualified repowering technology and the existing unit will be permanently retired from service on or before the date on which the new utility unit commences commercial operation.
- c. In order to apply for a repowering extension, the designated representative of a unit under subdivision a shall:
- (1) Submit to the department, by January 1, 1996, a complete repowering extension plan;
 - (2) Submit to the administrator before June 1, 1997, a complete petition for approval of repowering technology in accordance with title 40, Code of Federal Regulations, 72.44(d) and submit a copy to the department; and
 - (3) If the repowering extension plan is submitted for conditional approval, submit to the department by December 31, 1997, a notification to activate the plan in accordance with subdivision c of subsection 1.
- d. Contents of repowering extension plan. A complete repowering extension plan shall include the following elements:
- (1) Identification of the existing unit governed by the plan.
 - (2) The unit's federally approved state implementation plan sulfur dioxide emissions limitation.
 - (3) The unit's 1995 actual sulfur dioxide emissions rate, or best estimate of the actual emissions rate; provided that the actual emissions rate is submitted to the department by January 30, 1996.
 - (4) A schedule for construction, installation, and commencement of operation of the repowering technology approved or submitted for approval under title 40, Code of Federal Regulations, 72.44(d) with dates for the following milestones:
 - (a) Completion of design engineering;
 - (b) For a plan under paragraph 1 of subdivision b, removal of the existing unit from operation to install the qualified repowering technology;

- (c) Commencement of construction;
 - (d) Completion of construction;
 - (e) Startup testing;
 - (f) For a plan under paragraph 2 of subdivision b, shutdown of the existing unit; and
 - (g) Commencement of commercial operation of the repowering technology.
- (5) For a plan under paragraph 2 of subdivision b:
- (a) Identification of the new unit. A new unit shall not be included in more than one repowering extension plan.
 - (b) Certification that the new unit will replace the existing unit.
 - (c) Certification that the new unit has the same designated representative as the existing unit.
 - (d) Certification that the existing unit will be permanently retired from service on or before the date the new unit commences commercial operation.
- (6) The special provisions of subdivision g.
- e. North Dakota state department of health and consolidated laboratories' action on repowering extension plan.
- (1) The department will not approve a repowering extension plan until the administrator makes a conditional determination that the technology is a qualified repowering technology, unless the department approves such plan subject to the conditional determination of the administrator.
 - (2) Permit issuance.
 - (a) Upon a conditional determination by the administrator that the technology to be used in the repowering extension plan is a qualified repowering technology and a determination by the department that such plan meets the requirements of this subsection, the department will issue the acid rain portion of the operating permit including:
 - [1] The approved repowering extension plan; and

[2] A schedule of compliance with enforceable milestones for construction, installation, and commencement of operation of the repowering technology and other requirements necessary to ensure that emission reduction requirements under this subsection will be met.

(b) Except as otherwise provided in subdivision f, the repowering extension shall be in effect starting January 1, 2000, and ending on the day before the date specified in the acid rain permit on which the existing unit will be removed from operation to install the qualifying repowering technology or will be permanently removed from service for replacement by a new unit with such technology; provided that the repowering extension shall end no later than December 31, 2003.

(c) The portion of the operating permit specifying the repowering extension and other requirements under subparagraph a shall be subject to the administrator's final determination, under title 40, Code of Federal Regulations, 72.44(d)(4), that the technology to be used in the repowering extension plan is a qualifying repowering technology.

(3) Allowance allocation. Allowances will be allocated in accordance with title 40, Code of Federal Regulations, 72.44(f)(3) and (g).

f. Failed repowering projects.

(1) (a) If, at any time before the end of the repowering extension under subparagraph b of paragraph 2 of subdivision e, the designated representative of a unit governed by an approved repowering extension plan submits the notification under subdivision d of subsection 2 of section 33-15-21-08 that the owners and operators have decided to terminate efforts to properly design, construct, and test the repowering technology specified in the plan before completion of construction or startup testing, the designated representative may submit to the department a proposed permit modification demonstrating that such efforts were in good faith. If such demonstration is to the satisfaction of the administrator, the unit shall not be deemed in violation of the Act because of such a termination and the department will revise the

operating permit in accordance with subparagraph b of this subsection.

(b) Regardless of whether notification under subparagraph a is given, the repowering extension will end beginning on the earlier of the date of such notification or the date by which the designated representative was required to give such notification under subdivision d of subsection 2 of section 33-15-21-08.

(2) The designated representative of a unit governed by an approved repowering extension plan may submit to the department a proposed permit modification demonstrating that the repowering technology specified in the plan was properly constructed and tested on such unit but was unable to achieve the emissions reduction limitations specified in the plan and that it is economically or technologically infeasible to modify the technology to achieve such limits, the unit shall not be deemed in violation of the Act because of such failure to achieve the emissions reduction limitations. In order to be properly constructed and tested, the repowering technology shall be constructed at least to the extent necessary for direct testing of the multiple combustion emissions, including sulfur dioxide and nitrogen oxides, from such unit while operating the technology at nameplate capacity. If such demonstration is to the satisfaction of the administrator:

(a) The unit shall not be deemed in violation of the Act because of such failure to achieve the emissions reduction limitations;

(b) The department will revise the acid rain portion of the operating permit in accordance with subparagraphs c and d and with subsection 2 of section 33-15-21-07;

(c) The existing unit may be retrofitted or repowered with another clean coal or other available control technology; and

(d) The repowering extension will continue in effect until the earlier of the date the existing unit commences commercial operation with such control technology or December 31, 2003.

g. Special provisions.

(1) Emissions limitations.

- (a) Sulfur dioxide. Allowances allocated during the repowering extension under paragraph 2 of subdivision e and subdivision f to a unit governed by an approved repowering extension plan shall not be transferred to any allowance tracking system account other than the unit accounts of other units at the same source as that unit.
 - (b) Nitrogen oxides. Any existing unit governed by an approved repowering extension plan shall be subject to the acid rain emissions limitations for nitrogen oxides in accordance with section 407 of the Act and regulations or rules implementing section 407 of the Act beginning on the date that the unit is removed from operation to install the repowering technology or is permanently removed from service.
 - (c) No existing unit governed by an approved repowering extension plan shall be eligible for a waiver under section 111(j) of the Act.
 - (d) No new unit governed by an approved repowering extension plan shall receive an exemption from the requirements imposed under section 111 of the Act.
- (2) Reporting requirements. Each unit governed by an approved repowering extension plan shall comply with the special reporting requirements of subsection 2 of section 33-15-21-08.
 - (3) Liability.
 - (a) The owners and operators of a unit governed by an approved repowering plan shall be liable for any violation of the plan or this subsection at that or any other unit governed by the plan.
 - (b) The units governed by the plan under paragraph 2 of subdivision b shall continue to have a common designated representative until the existing unit is permanently retired under the plan.
 - (4) Terminations. Except as provided in subdivision f, a repowering extension plan shall not be terminated after December 31, 1999.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03, 23-25-04

Law Implemented: NDCC 23-25-04, 23-25-04.1

33-15-21-05. Acid rain permit contents.

1. General.

a. Each acid rain permit including any draft or proposed acid rain permit must contain the following elements:

- (1) All elements required for a complete acid rain permit application under subsection 2 of section 33-15-21-03 as approved or adjusted by the department;
- (2) The applicable acid rain emissions limitation for sulfur dioxide; and
- (3) The applicable acid rain emissions limitation for nitrogen oxides.

b. Each acid rain permit is deemed to incorporate the definitions of terms under subsection 1 of section 33-15-21-01.

2. **Permit shield.** Each affected unit operated in accordance with the acid rain permit that governs the unit and that was issued in compliance with title IV of the Act, as provided in sections 33-15-21-01 through 33-15-21-08, title 40, Code of Federal Regulations, parts 72, 73, 75, 77, and 78, and the regulations or rules implementing section 407 of the Act, shall be deemed to be operating in compliance with the acid rain program, except as provided in paragraph 6 of subdivision g of subsection 6 of section 33-15-21-01.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-04, 23-25-04.1

33-15-21-06. Acid rain permit issuance procedures.

1. **General.** The department will issue or deny all acid rain permits in accordance with section 33-15-14-06, including the completeness determination, draft permit, administrative record, statement of basis, public notice and comment period, public hearing, proposed permit, permit issuance, permit revision, and appeal procedures as amended by sections 33-15-21-06 and 33-15-21-07.

2. **Completeness.** The department will submit a written notice of application completeness to the administrator within ten working days following a determination by the department that the acid rain permit application is complete.

3. **Statement of basis.**

- a. The statement of basis will briefly set forth significant factual, legal, and policy considerations on which the department relied in issuing or denying the draft permit.
 - b. The statement of basis will include the reasons and supporting authority for approval or disapproval of any compliance options requested in the permit application, including references to applicable statutory or regulatory provisions and to the administrative record.
 - c. The department will submit to the administrator a copy of the draft acid rain permit and the statement of basis and all other relevant portions of the operating permit that may affect the draft acid rain permit.
4. **Issuance of acid rain permits.**
- a. Proposed permit. After the close of the public comment period, the department will incorporate all necessary changes and issue or deny a proposed acid rain permit.
 - b. The department will submit the proposed acid rain permit or denial of a proposed acid rain permit to the administrator in accordance with subdivision a of subsection 7 of section 33-15-14-06, the provisions of which shall be treated as applying to the issuance or denial of a proposed acid rain permit.
 - c. (1) Following the administrator's review of the proposed acid rain permit or denial of a proposed acid rain permit, the department under subdivision c of subsection 7 of section 33-15-14-06 will incorporate any required changes and issue or deny the acid rain permit in accordance with section 33-15-21-05.

(2) No acid rain permit, including a draft or proposed permit, shall be issued unless the administrator and the department have received a certificate of representation for the designated representative of the source in accordance with subpart B of title 40, Code of Federal Regulations, part 72.
 - d. Permit issuance deadline and effective date.

(1) On or before December 31, 1997, the department will issue an acid rain permit to each affected source whose designated representative submitted a timely and complete acid rain permit application by January 1, 1996, in accordance with subsection 1 of section 33-15-21-02 and meets the requirements of sections 33-15-14-06 and 33-15-21-06.

- (2) Nitrogen oxides. Not later than January 1, 1999, the department will reopen the acid rain permit to add the acid rain program nitrogen oxides requirements; provided that the designated representative of the affected source submitted a timely and complete acid rain permit application for nitrogen oxides in accordance with subsection 1 of section 33-15-21-02. Such reopening shall not affect the term of the acid rain portion of an operating permit.
 - (3) Each acid rain permit issued in accordance with paragraph 1 shall take effect by the later of January 1, 2000, or, if the permit governs a unit under paragraph 3 of subdivision a of subsection 3 of section 33-15-21-01, the deadline for monitor certification under title 40, Code of Federal Regulations, part 75.
 - (4) Each acid rain permit shall have a term of five years commencing on its effective date.
 - (5) An acid rain permit shall be binding on any new owner or operator or designated representative of any source or unit governed by the permit.
- e.
- (1) Each acid rain permit shall contain all applicable acid rain requirements, shall be a portion of the operating permit that is complete and segregable from all other air quality requirements, and shall not incorporate information contained in any other documents, other than documents that are readily available.
 - (2) Invalidation of the acid rain portion of an operating permit shall not affect the continuing validity of the rest of the operating permit, nor shall invalidation of any other portion of the operating permit affect the continuing validity of the acid rain portion of the permit.

5. Acid rain permit appeal procedures.

- a. Appeals of the acid rain portion of an operating permit issued by the department that do not challenge or involve decisions or actions of the administrator under title 40, Code of Federal Regulations, parts 72, 73, 75, 77, and 78 and sections 407 and 410 of the Act and regulations or rules implementing sections 407 and 410 shall be conducted according to North Dakota Century Code chapter 28-32 and article 33-22. Appeals of the acid rain portion of such a permit that challenge or involve such decisions or actions of the administrator shall follow the procedures under title 40, Code of Federal Regulations, part 78 and section

307 of the Act. Such decisions or actions include allowance allocations, determinations concerning alternative monitoring systems, and determinations of whether a technology is a qualifying repowering technology.

- b. No administrative appeal of the acid rain portion of an operating permit shall be allowed more than fifteen days following notice of issuance of the acid rain portion that is subject to administrative appeal. No judicial appeal of the acid rain portion of an operating permit shall be allowed more than thirty days following notice of the final agency action that is subject to judicial appeal.
- c. The administrator may intervene as a matter of right in any state administrative appeal of an acid rain permit or denial of an acid rain permit.
- d. No administrative appeal concerning an acid rain requirement shall result in a stay of the following requirements:
 - (1) The allowance allocations for any year during which the appeal proceeding is pending or is being conducted;
 - (2) Any standard requirement under subsection 6 of section 33-15-21-01;
 - (3) The emissions monitoring and reporting requirements applicable to the affected units at an affected source under title 40, Code of Federal Regulations, part 75;
 - (4) Uncontested provisions of the decision on appeal; and
 - (5) The terms of a certificate of representation submitted by a designated representative under subpart B of title 40, Code of Federal Regulations, part 72.
- e. The department will serve written notice on the administrator of any state administrative or judicial appeal concerning an acid rain provision of any operating permit or denial of an acid rain portion of any operating permit within thirty days of the filing of the appeal.
- f. The department will serve written notice on the administrator of any determination or order in a state administrative or judicial proceeding that interprets, modifies, voids, or otherwise relates to any portion of an acid rain permit. Following any such determination or order, the administrator will have an opportunity to

review and veto the acid rain permit or revoke the permit for cause in accordance with subsection 7 of section 33-15-14-06.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-02, 23-25-03

Law Implemented: NDCC 23-25-03, 23-25-04.1, 23-25-08

33-15-21-07. Permit revisions.

1. General.

- a. This section governs revisions to any acid rain permit issued by the department.
- b. A permit revision may be submitted for approval at any time. No permit revision shall affect the term of the acid rain permit to be revised. No permit revision shall excuse any violation of an acid rain program requirement that occurred prior to the effective date of the revision.
- c. The terms of the acid rain permit shall apply while the permit revision is pending.
- d. Any determination or interpretation by the state, including the department or a state court, modifying or voiding any acid rain permit provision shall be subject to review by the administrator in accordance with subdivision c of subsection 7 of section 33-15-14-06 as applied to permit modifications, unless the determination or interpretation is an administrative amendment approved in accordance with subsection 4.
- e. The standard requirements of subsection 6 of section 33-15-21-01 shall not be modified or voided by a permit revision.
- f. Any permit revision involving incorporation of a compliance option that was not submitted for approval and comment during the permit issuance process, or involving a change in a compliance option that was previously submitted, shall meet the requirements for applying for such compliance option under subsection 2 of section 33-15-21-04 and section 407 of the Act and regulations or rules implementing section 407 of the Act.
- g. For permit revisions not described in subsections 2 and 3, the department may determine which of these subsections is applicable.

2. Permit modifications.

- a. (1) Permit modifications shall follow the permit issuance requirements of section 33-15-21-06 and subparagraph b of paragraph 3 of subdivision e of subsection 6 of section 33-15-14-06.
- (2) For purposes of applying paragraph 1, a permit modification shall be treated as an acid rain permit application, to the extent consistent with section 33-15-21-07.
- b. The following permit revisions are permit modifications:
 - (1) Relaxation of an excess emission offset requirement after approval of the offset plan by the administrator;
 - (2) Incorporation of a final nitrogen oxides alternative emission limitation following a demonstration period;
 - (3) Determinations concerning failed repowering projects under subparagraph a of paragraph 1 of subdivision f of subsection 2 of section 33-15-21-04 and paragraph 2 of subdivision f of subsection 2 of section 33-15-21-04; and
 - (4) At the option of the designated representative submitting the permit revision, the permit revisions listed in subdivision b of subsection 3 of section 33-15-21-07.

3. Fast-tract modifications.

- a. Fast-tract modifications shall follow the following procedures:
 - (1) The designated representative shall serve a copy of the fast-tract modification on the administrator, the department, and any person entitled to a written notice under subdivision h of subsection 6 and subdivision b of subsection 7 of section 33-15-14-06. Within five business days of serving such copies, the designated representative shall also give public notice by publication in a newspaper of general circulation in the area where the source is located or in a state publication designed to give general public notice.
 - (2) The public shall have a period of thirty days, commencing on the date of publication of the notice, to comment on the fast-tract modification. Comments shall be submitted in writing to the department and to the designated representative.

- (3) The designated representative shall submit the fast-track modification to the department on or before commencement of the public comment period.
 - (4) Within thirty days of the close of the public comment period, the department will consider the fast-track modification and the comments received and approve, in whole or in part or with changes or conditions as appropriate, or disapprove the modification. In addressing the fast-track modification, the permitting authority may defer ruling on any compliance option for any year. A fast-track modification shall be effective immediately upon issuance, in accordance with subparagraph e of paragraph 1 of subdivision a of subsection 6 of section 33-15-14-06 as applied to significant modifications.
- b. The following permit revisions are, at the option of the designated representative submitting the permit revision, either fast-track modifications under this subsection or permit modifications under subsection 2 of section 33-15-21-07.

- (1) Incorporation of a compliance option that the designated representative did not submit for approval and comment during the permit issuance process;
- (2) Addition of a nitrogen oxides averaging plan to a permit; and
- (3) Changes in a repowering plan, nitrogen oxides averaging plan, or nitrogen oxides compliance deadline extension.

4. Administrative permit amendment.

- a. Administrative amendments shall follow the procedures set forth at paragraph 3 of subdivision d of subsection 6 of section 33-15-14-06. The department will submit the revised portion of the permit to the administrator within ten working days after the date of final action on the request for an administrative amendment.
- b. The following permit revisions are administrative amendments:
 - (1) Activation of a compliance option conditionally approved by the department; provided that all requirements for activation under subdivision c of subsection 1 and subsection 2 of section 33-15-21-04 are met;

- (2) Changes in the designated representative or alternative designated representative; provided that a new certificate of representation is submitted to the administrator in accordance with subpart B of title 40, Code of Federal Regulations, part 72, with a copy to the department;
- (3) Correction of typographical errors;
- (4) Changes in names, addresses, or telephone or facsimile numbers;
- (5) Changes in the owners or operators; provided that a new certificate of representation is submitted within thirty days to the administrator in accordance with subpart B of title 40, Code of Federal Regulations, part 72, with a copy to the department;
- (6) Termination of a compliance option in the permit; provided that all requirements for termination under subdivision d of subsection 1 of section 33-15-21-04 shall be met and this procedure shall not be used to terminate a repowering plan after December 31, 1999;
- (7) Changes in the date, specified in a new unit's acid rain permit, of commencement of operation or the deadline for monitor certification, provided that they are in accordance with subsection 6 of section 33-15-21-01;
- (8) The addition of or change in a nitrogen oxides alternative emissions limitation demonstration period, provided that the requirements of regulations or rules implementing section 407 of the Act are met; and
- (9) Incorporation of changes that the administrator has determined to be similar to those in paragraphs 1 through 8.

5. **Automatic permit amendment.** The following permit revisions shall be deemed to amend automatically, and become a part of the affected unit's acid rain permit by operation of law without any further review:

- a. Upon recordation by the administrator under title 40, Code of Federal Regulations, part 73, all allowance allocations to, transfers to, and deductions from an affected unit's allowance tracking system account; and
- b. Incorporation of an offset plan that has been approved by the administrator under title 40, Code of Federal Regulations, part 77.

6. Permit reopenings.

- a. As provided in subdivision f of subsection 6 of section 33-15-14-06 the department will reopen an acid rain permit for cause, including whenever additional requirements become applicable to any affected unit governed by the permit.
- b. In reopening an acid rain permit for cause, the department will issue a draft permit changing the provisions, or adding the requirements, for which the reopening was necessary. The draft permit shall be subject to the requirements of sections 33-15-21-05 and 33-15-21-06.
- c. Any reopening of an acid rain permit shall not affect the term of the permit.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03, 23-25-04.1

Law Implemented: NDCC 23-25-03, 23-25-04.1

33-15-21-08. Compliance certification.

1. Annual compliance certification report.

- a. Applicability and deadline. For each calendar year in which a unit is subject to the acid rain emissions limitations, the designated representative of the source at which the unit is located shall submit to the administrator and to the department, within sixty days after the end of the calendar year, an annual compliance certification report for the unit in compliance with title 40, Code of Federal Regulations, 72.90.
- b. The submission of complete compliance certifications in accordance with subdivision a of this subsection and title 40, Code of Federal Regulations, part 75, shall be deemed to satisfy the requirement to submit compliance certifications under subparagraph c of paragraph 5 of subdivision c of subsection 5 of section 33-15-14-06 with regard to the acid rain portion of the source's operating permit.

2. Units with repowering extension plans.

- a. Design and engineering and contract requirements. No later than January 1, 2000, the designated representative of a unit governed by an approved repowering plan shall submit to the administrator and the department:
 - (1) Satisfactory documentation of a preliminary design and engineering effort.

- (2) A binding letter agreement for the executed and binding contract, or for each in a series of executed and binding contracts, for the majority of the equipment to repower the unit using the technology conditionally approved by the administrator under title 40, Code of Federal Regulations, 72.44(d)(3).
 - (3) The letter agreement under paragraph 2 shall be signed and dated by each party and specify:
 - (a) The parties to the contract;
 - (b) The date each party executed the contract;
 - (c) The unit to which the contract applies;
 - (d) A brief list identifying each provision of the contract;
 - (e) Any dates to which the parties agree, including construction completion date;
 - (f) The total dollar amount of the contract; and
 - (g) A statement that a copy of the contract is onsite at the source and will be submitted upon written request of the administrator or the department.
- b. Removal from operation to repower. The designated representative of a unit governed by an approved repowering plan shall notify the administrator and the department in writing at least sixty days in advance of the date on which the existing unit is to be removed from operation so that the qualified repowering technology can be installed, or is to be replaced by another unit with the qualified repowering technology, in accordance with the plan.
- c. Commencement of operation. Not later than sixty days after the units repowered under an approved repowering plan commences operation at full load, the designated representative of the unit shall submit a report to the administrator and the department comparing the actual hourly emissions and percent removal of each pollutant controlled at the unit to the actual hourly emissions and percent removal at the existing unit under the plan prior to repowering, determined in accordance with title 40, Code of Federal Regulations, part 75.
- d. Decision to terminate. If at any time before the end of the repowering extension and before completion of construction and startup testing, the owners and operators

decide to terminate good faith efforts to design, construct, and test the qualified repowering technology on the unit to be repowered under an approved repowering plan, then the designated representative shall submit a notice to the administrator and the department by the earlier of the end of the repowering extension or a date within thirty days of such decision, stating the date on which the decision was made.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03, 23-25-04

Law Implemented: NDCC 23-25-04

33-15-21-09. Continuous emissions monitoring.

1. **General.** The monitoring, recordkeeping, and reporting of sulfur dioxide, nitrogen oxides, and carbon dioxide emissions, volumetric flow, and opacity data from affected units under the acid rain program shall be conducted in accordance with title 40, Code of Federal Regulations, part 75.
2. **Exceptions.** Those portions of title 40, Code of Federal Regulations, part 75, that are controlled and administered completely by the United States environmental protection agency will not be enforced by the state. This should not be construed as precluding the United States environmental protection agency from exercising its statutory authority under the Clean Air Act, as amended, or an affected source from complying with the authority or the requirements of the federal acid rain program.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03, 23-25-04, 23-25-04.1

33-15-21-10. Acid rain nitrogen oxides emission reduction program. [Reserved]

33-15-21-11. Sulfur dioxide opt-ins. [Reserved]

**CHAPTER 33-15-22
EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS
FOR SOURCE CATEGORIES**

Section	
33-15-22-01	Scope
33-15-22-02	Definition
33-15-22-03	Emission Standards

33-15-22-01. Scope. The subparts and appendices of title 40, Code of Federal Regulations, part 63, as they exist on May 1, 1994, which are listed in section 33-15-22-03 are incorporated into this chapter by reference. Any changes to the emission standard are listed below the title of the standard.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-22-02. Definition. For the purposes of this chapter, "administrator" means the department except for those duties that cannot be delegated by the United States environmental protection agency. For those duties that cannot be delegated, administrator means the department and the administrator of the United States environmental protection agency.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-22-03. Emission standards.

Subpart A - General provision. [Reserved]

Subpart B - [Reserved]

Subpart C - List of hazardous air pollutants, petitions process, lesser quantity designations, source category list. [Reserved]

Subpart D - Regulations governing compliance extensions for early reductions of hazardous air pollutants.

Subpart E - [Reserved]

Subpart F - National emission standards for organic hazardous air pollutants from the synthetic organic chemical manufacturing industry.

Subpart G - National emission standards for organic hazardous air pollutants from synthetic organic chemical manufacturing industry for process vents, storage vessels, transfer operations, and wastewater.

Subpart H - National emission standards for organic hazardous air pollutants for equipment leaks.

Subpart L - National emission standards for coke oven batteries.

Subpart M - National perchloroethylene air emission standards for drycleaning facilities.

History: Effective December 1, 1994.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

JANUARY 1995

CHAPTER 33-03-24

BASIC CARE FACILITIES

[Repealed effective January 1, 1995]

STAFF COMMENT: Chapter 33-03-24.1 contains all new material but is not underscored so as to improve readability.

**CHAPTER 33-03-24.1
BASIC CARE FACILITIES**

Section	
33-03-24.1-01	Definitions
33-03-24.1-02	Certificate of Need
33-03-24.1-03	Issuance of License
33-03-24.1-04	Waiver Provision
33-03-24.1-05	Plans of Correction
33-03-24.1-06	Enforcement Actions
33-03-24.1-07	Reconsideration of Enforcement Actions
33-03-24.1-08	Appeals
33-03-24.1-09	Governing Body
33-03-24.1-10	Fire Safety
33-03-24.1-11	Education Programs
33-03-24.1-12	Resident Assessments and Care Plans
33-03-24.1-13	Resident Records
33-03-24.1-14	Personal Care Services
33-03-24.1-15	Pharmacy and Medication Administration Services
33-03-24.1-16	Social Services
33-03-24.1-17	Nursing Services
33-03-24.1-18	Dietary Services
33-03-24.1-19	Activity Services
33-03-24.1-20	Housekeeping and Laundry Services
33-03-24.1-21	Adult Day Care Services
33-03-24.1-22	General Building Requirements

33-03-24.1-01. Definitions.

1. "Abuse" includes the willful infliction of mental, physical, sexual, and verbal abuse which could result in temporary or permanent mental, physical, emotional, or psychological injury or harm. Mental abuse includes humiliation, harassment, intimidation, threats of punishment, or deprivation. Physical abuse includes hitting, slapping, pinching, kicking, unreasonable confinement, and deprivation, by an individual, of goods or services that are necessary to attain or maintain physical, mental, and psychosocial well-being. It also includes controlling behavior through corporal punishment. Sexual abuse includes sexual harassment, sexual coercion, sexual contact, or sexual assault. Verbal abuse includes any use of oral, written, or gestured language that includes disparaging and derogatory terms to residents or their families, used within their hearing distance to describe the

- residents, regardless of their age, ability to comprehend, or disability.
2. "Activities of daily living" means those personal, functional activities required by an individual for continued well-being, including eating, nutrition, dressing, personal hygiene, mobility, toileting, and behavior management.
 - a. "Assistance" means the resident is able to help with most of an activity, but cannot do it entirely alone. The resident may need prompting, encouragement, or the minimal hands-on assistance of the personal care attendant.
 - b. "Independent" means the resident can perform the activities of daily living without help.
 3. "Activity staff" means an employee who is responsible for providing an activity program.
 4. "Adult day care services" means the provision of basic care facility services to meet the needs of individuals who do not remain in the facility overnight.
 5. "Basic care facility" means a facility licensed by the department under North Dakota Century Code chapter 23-09.3 whose focus is to provide room and board and health, social, and personal care to assist the residents to attain or maintain their highest level of functioning, consistent with the resident assessment and care plan, to five or more residents not related by blood or marriage to the owner or manager. These services shall be provided on a twenty-four-hour basis within the facility, either directly or through contract, and shall include assistance with activities of daily living and instrumental activities of daily living; provision of leisure, recreational, and therapeutic activities; and supervision of nutritional needs and medication administration.
 6. "Capable of self-preservation" means a resident's ability, with or without assistance, to evacuate the facility or relocate from the point of occupancy to a point of safety in case of fire in compliance with the requirements of this chapter.
 7. "Department" means the North Dakota state department of health and consolidated laboratories.
 8. "Facility" means a basic care facility.
 9. "Governing body" means the entity legally responsible for the operation of a basic care facility.

10. "Instrumental activities of daily living" includes preparing meals, shopping, managing money, housework, laundry, transportation, use of telephone, and mobility outside the basic care facility.
11. "Licensed health care practitioner" means an individual who is licensed or certified to provide medical, medically related, or advanced registered nursing care to individuals in North Dakota.
12. "Medication administration" means an act in which a drug or biological is given to a resident by an individual who is authorized in accordance with state laws and regulations governing such acts.
13. "Misappropriation of resident property" means the deliberate misplacement, exploitation, or wrongful temporary or permanent taking or use of a resident's belongings or money, or both.
14. "Neglect" includes failure to carry out resident services as directed or ordered by the licensed health care practitioner or other authorized personnel, or failure to give proper attention to residents.
15. "Personal care" means assistance with activities of daily living and instrumental activities of daily living and general supervision of physical or mental well-being.
16. "Resident" means an individual admitted and retained in a facility in order to receive room and board and health, social, and personal care who is capable of self-preservation, and whose condition does not require continuous, twenty-four-hour a day onsite availability of nursing or medical care.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3

33-03-24.1-02. Certificate of need.

1. A proposed facility shall obtain a certificate of need from the department prior to applying for a license.
2. A licensed facility shall obtain a certificate of need from the department prior to remodeling or expansion of its current facility.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-17.2

33-03-24.1-03. Issuance of license. A facility meeting the definition of a basic care facility as outlined in North Dakota Century Code chapter 23-09.3 and this chapter must obtain a license from the department in order to operate in North Dakota.

1. Application to operate a facility must be made to the department prior to opening a facility, prior to change in ownership, annually, and upon determination by the department that a facility meets the definition of a basic care facility.
2. Floor plans must be submitted to the department for review and approval prior to opening a facility and prior to making structural alterations, including those which increase or decrease resident bed capacity.
3. Upon receipt of an application for an initial license, the department may schedule an inspection. The department may request the assistance of the state fire marshal in the inspection. Upon completion of the inspection and consideration of the findings, the department may issue an initial or provisional license, or deny the application.
4. An initial license is valid for a period not to exceed one year and shall expire on December thirty-first of the year issued.
5. Licenses must be issued on a calendar year basis and expire on December thirty-first of each year. An application for licensure renewal must be received by the department with sufficient time prior to the beginning of the licensure period to process.
6. A provisional license may be issued to a facility that does not comply with this chapter if practices in the facility do not pose a danger to the health and safety of the residents, as determined by the department.
 - a. A provisional license must be accompanied by a written statement of the specific rules or statutes violated and the expiration date of the license, which is not to exceed three months from the date of issuance.
 - b. If compliance with the requirements has been determined by the department prior to the expiration of the provisional license, an annual license may be issued. If an acceptable plan of correction has been approved by the department but compliance has not yet been achieved, the provisional license may be renewed no more than one time for an additional period up to three months at the discretion of the department.
7. Once issued, the facility shall display the license in a conspicuous place. A license is not subject to sale,

assignment, or other transfer, voluntary or involuntary. A license is not valid for any premises other than those for which originally issued.

8. The department may, at any time, inspect a facility that the department determines meets the definition of a basic care facility as described in North Dakota Century Code chapter 23-09.3 and this chapter.
9. The department will perform, as deemed necessary, unannounced onsite surveys to determine compliance with this chapter.
10. The facility must provide the department access to any material and information necessary, as determined by the department, for determining compliance with these requirements.
11. Information regarding facilities is public information and is available upon request through the department.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04, 23-09.3-05

33-03-24.1-04. Waiver provision. The department may waive licensure requirements for specified periods of time in specific instances, provided compliance with the requirement would result in an unreasonable hardship upon the facility and lack of compliance does not adversely affect the health or safety of the residents.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-19

Law Implemented: NDCC 23-09.3-09

33-03-24.1-05. Plans of correction.

1. A basic care facility must submit a plan of correction within ten days of the receipt of the notification of deficiencies pursuant to this chapter.
2. The plan of correction must address how each deficiency will be corrected, what the facility will put in place to assure continued compliance, and the date upon which the corrective action will be completed.
3. The department may accept, reject, negotiate modifications to, or direct the plan of correction. A directed plan of correction is a plan of correction which has been developed in coordination with the department.

4. Correction of deficiencies must be completed within sixty days of the survey completion date, unless an alternative schedule of correction has been approved by the department.
5. The department shall determine, based on the review of the facility's plan of correction, what followup is necessary to verify the correction of deficiencies has been completed. Followup may occur by telephone, mail, or onsite revisit.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-05

33-03-24.1-06. Enforcement actions.

1. Facilities are subject to one or more enforcement actions, which include a ban or limitation on admissions, suspension or revocation of a license, or a denial to license, for the following reasons:
 - a. Noncompliance with the requirements of this chapter have been identified which:
 - (1) Present imminent danger to residents. These conditions or practices must be abated or eliminated immediately or within a fixed period of time as specified by the department;
 - (2) Have a direct or immediate negative relationship to the health, safety, or security of the residents; or
 - (3) Have a potential for jeopardizing resident health, safety, or security if left uncorrected.
 - b. Recurrence of the same or substantially same deficient practice in a thirty-six-month period.
 - c. Failure to provide an acceptable plan of correction or to correct any deficiency pursuant to an approved plan of correction.
 - d. Refusal to allow a survey of the facility by representatives of the department.
 - e. Gross incompetence, negligence, or misconduct in operating the facility as determined through department investigation or by a court of law.
 - f. Fraud, deceit, misrepresentation, or bribery in obtaining or attempting to obtain a license.

- g. Knowingly aiding and abetting in any way the improper granting of a license.
2. The effective date of the enforcement action must be ninety days from the date the department notifies the facility in writing of the department's decision to initiate an enforcement action, unless the department determines there is imminent danger to the residents.
 3. The notice to the facility must include the basis of the department's decision and the effective date of the enforcement action and must also advise the facility of their right to:
 - a. Request a review by the department.
 - (1) A request for a review by the department to verify correction of the deficient practices must be submitted by the facility to the department within forty-five days from the date the department notifies the facility in writing of its decision to initiate an enforcement action.
 - (2) The facility must submit written documentation to the department with the request for a review to verify correction of the deficient practices that were cited. The department shall determine, based on review of the documentation submitted, if an onsite revisit is warranted. The department review and onsite revisit, if conducted, must take place within sixty days of the date the department notified the facility in writing of its decision to initiate an enforcement action.
 - (3) If the department determines, based on the review of the facility documentation and the onsite revisit, if conducted, that the deficient practices have been corrected, the enforcement action may be halted. The department shall notify the facility in writing of the decision within ten days of this determination.
 - (4) If the department determines, based on the review of the facility documentation and the onsite revisit, if conducted, that the deficient practices were not corrected, the enforcement action will be imposed. If imposed, the enforcement action will, at a minimum, remain in effect until the department determines that the conditions leading to the enforcement action have been corrected.
 - b. Request a reconsideration of an enforcement action consistent with section 33-03-24.1-07.

4. If the department sustains the decision, the department shall publish a public notice in the local newspaper not less than fifteen days prior to the imposition of the enforcement action stating the name of the facility, the enforcement action to be imposed, the reason for the action, the date on which the enforcement action will be effective, and the length of time for which it will be imposed.
5. The department of human services and the county social service office in the county in which the facility is located will be notified in writing by the department regarding the enforcement action.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3

33-03-24.1-07. Reconsideration of enforcement actions. The facility has the right to request a reconsideration of decisions resulting in enforcement actions.

1. A written request for a reconsideration must be filed with the department within ten days of the date the department notified the facility in writing of the decision to initiate an enforcement action.
2. The facility requests for reconsideration must be accompanied by written documents, including:
 - a. A copy of the notice received from the department.
 - b. The reason or basis in fact for the dispute and request for reconsideration.
 - c. The statutes or rules relied upon with respect to each disputed issue and the factual basis for the facility's contention that the violation was erroneously determined.
 - d. The name, address, and telephone number of the person to whom all notices will be mailed or delivered regarding the request for reconsideration.
3. Within ten days after the receipt of the request for reconsideration, the department shall grant or deny the request.
4. A request for reconsideration will be denied unless it specifically identifies each disputed deficient practice and states the factual basis for the facility's contention that the deficient practice was erroneously determined. The correction of the factors that led to the determination of a

deficient practice may not be asserted as a basis for a request for reconsideration.

5. If the department denies the request for reconsideration, the department shall notify the facility in writing of that decision. If denial was for any reason other than a failure of the request to conform to the requirements of subsection 4, the notice must advise the facility of the right to appeal.
6. If the department determines to undertake reconsideration, the decision on reconsideration must be rendered within twenty days of receipt of the request for the reconsideration and the department must notify the facility in writing of the decision. The notice of the decision on the reconsideration must advise the facility of the right to appeal.
7. The reconsideration of an enforcement action does not delay the implementation of the enforcement action. The date of implementation of the enforcement action is effective unless otherwise determined.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-19

Law Implemented: NDCC 23-09.3-09

33-03-24.1-08. Appeals.

1. A facility dissatisfied with the decision on a request for reconsideration, which conforms to the requirements of subsection 4 of section 33-03-24.1-07, may appeal. An appeal may be initiated by mailing or delivering the information described in subdivisions a through d to the department, division on health facilities, state capitol, Bismarck, North Dakota, on or before 5:00 p.m. on the fortieth day from the date the department notified the facility in writing of the department's decision to initiate an enforcement action. Written documents including all of the following must accompany the appeal:
 - a. A copy of the notice received from the department regarding the department's decision on the request for reconsideration.
 - b. A statement of each disputed deficient practice and the reason or basis in fact for the dispute.
 - c. The authority in statute or rule upon which the facility relies for each disputed item.
 - d. The name, address, and telephone number of the person to whom all notices will be mailed or delivered regarding the appeal.

2. Except as otherwise provided in this section, the appeal must be considered as provided in article 98-02.
3. The appeal must be decided based on whether the deficient practice occurred, not whether the deficient practice has been corrected.
4. The hearing officer must make written findings of fact and conclusions of law and must recommend a decision to the department. The recommended decision must set forth the reasons for the decision and the evidence upon which the decision is based.
5. The department may accept, modify, or reject the recommended decision. If the department rejects the recommended decision, it may remand the matter to the office of administrative hearings with directions. The department may require, through its directions, the receipt of additional evidence and the submission of amended findings of fact and conclusions of law and recommend a decision that reflects consideration of the additional evidence. The department may require, through its direction, that the matter be referred to the same or a different hearing officer, and the office of administrative hearings shall comply with that direction unless compliance is impossible.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-19

Law Implemented: NDCC 23-09.3-09

33-03-24.1-09. Governing body.

1. The governing body is legally responsible for the quality of resident services; for resident health, safety, and security; and to ensure the overall operation of the facility is in compliance with all applicable federal, state, and local laws.
2. The governing body is responsible for approval and implementation of effective resident care and administrative policies and procedures for the operation of the facility. These policies and procedures must be in writing, signed, dated, reviewed annually, and revised as necessary, and shall address:
 - a. All services provided by the facility to meet the needs of the residents, including admission, transfer, discharge, discharge planning, and referral services.
 - b. Protocols developed by appropriately licensed professionals for use in the event of serious health threatening conditions, emergencies, or temporary illnesses. These protocols must include provisions for:

- (1) Designation of a licensed health care practitioner for each resident and arrangements to secure the services of another licensed health care practitioner if the resident's designated licensed health care practitioner is not available.
 - (2) Notification of an appropriately licensed professional in the event of an illness or injury of a resident.
- c. Provisions for pharmacy and medication services developed in consultation with a registered pharmacist, including:
- (1) Assisting residents in obtaining individually prescribed medications from a pharmacist of the resident's choice.
 - (2) Disposing of medications that are no longer used or are outdated, consistent with applicable federal and state laws.
 - (3) Allowing the resident to be totally responsible for the resident's own medication upon resident request and based on the assessment of the resident's capabilities with respect to this function by an appropriately licensed professional.
- d. Infection control practices, including provision of a sanitary environment and an active program for the prevention, investigation, management, and control of infections and communicable diseases in residents and staff members.
- e. Prohibition of resident abuse, neglect, and misappropriation of resident property, including investigation, reporting, and followup action.
- f. A process for handling complaints made by residents or on behalf of residents.
- g. Resident rights which comply with North Dakota Century Code chapter 50-10.2.
- h. Personnel policies to include checking state registries and licensure boards prior to employment for findings of inappropriate conduct, employment, disciplinary actions, and termination.
- i. Personnel records to include job descriptions, verification of credentials where applicable, and records of training and education.

3. If the facility provides any clinical laboratory testing services to an individual, regardless of the frequency or the complexity of the testing the governing body is responsible to obtain and maintain compliance with the applicable parts of the clinical laboratory improvement amendments of 1988, 42 CFR part 493.
4. The governing body shall appoint an administrator to be in charge of the general administration of the facility. Provisions must be made for a staff member to be identified in writing to be responsible for the onsite operation of the facility in the absence of the administrator.
5. The governing body shall ensure sufficient trained and competent staff are employed to meet the residents' needs. Staff must be in the facility, awake and prepared to assist residents twenty-four hours a day.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-10. Fire safety.

1. The facility shall comply with the national fire protection association life safety code, 1988 edition, chapter twenty-one, residential board and care occupancy, slow evacuation capability, or a greater level of fire safety.
2. Fire drills must be held monthly with a minimum of twelve per year, alternating with all workshifts. Residents and staff, as a group, shall either evacuate the building or relocate to an assembly point identified in the fire evacuation plan. At least once a year, a fire drill must be conducted during which all staff and residents evacuate the building.
3. Fire evacuation plans must be posted in a conspicuous place in the facility.
4. Written records of fire drills must be maintained. These records must include dates, times, duration, names of staff and residents participating and those absent and why, and a brief description of the drill including the escape path used and evidence of simulation of a call to the fire department.
5. Each resident shall receive an individual fire drill walk-through within five days of admission.
6. Any variation to compliance with the fire safety requirements must be coordinated with the department and approved in writing by the state fire marshal.

7. Residents of facilities meeting a greater level of fire safety must meet the fire drill requirements of that occupancy classification.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-19

Law Implemented: NDCC 23-09.3-09

33-03-24.1-11. Education programs.

1. The facility shall design, implement, and document educational programs to orient new employees and develop and improve employees' skills to carry out their job responsibilities.
2. On an annual basis, all employees shall receive inservice training in at least the following:
 - a. Fire and accident prevention and safety.
 - b. Mental and physical health needs of the residents, including behavior problems.
 - c. Prevention and control of infections, including universal precautions.
 - d. Resident rights.
3. The administrator shall attend at least twelve continuing education hours per year relating to care and services for residents.
4. The staff responsible for food preparation shall attend a minimum of two dietary educational programs per year.
5. The staff responsible for activities shall attend a minimum of two activity-related educational programs per year.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-12. Resident assessments and care plans.

1. An assessment is required for each resident within fourteen days of admission and as determined by an appropriately licensed professional thereafter, but no less frequently than quarterly.
2. The assessment must be completed in writing by an appropriately licensed professional. The assessment must include:

- a. A review of health, psychosocial, functional, nutritional, and activity status.
 - b. Personal care and other needs.
 - c. Health needs.
 - d. The capability of self-preservation.
 - e. Specific social and activity interests.
3. A care plan, based on the assessment and input from the resident or person with legal status to act on behalf of the resident, must be developed within twenty-one days of the admission date and consistently implemented in response to individual resident needs and strengths.
 4. The care plan must be updated as needed, but no less than quarterly.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-13. Resident records.

1. The facility shall provide for secure maintenance and storage of all resident records.
2. Resident records must include:
 - a. The resident's name, social security number, marital status, age, sex, previous address, religion, personal licensed health care practitioner, dentist, and designated representative or other responsible person.
 - b. The licensed health care practitioner's orders and report of an examination of the resident's current health status.
 - c. An admission note.
 - d. A copy of an initial and current assessment and care plan.
 - e. Documentation of resident observations by authorized staff.
 - f. Documentation of death, including cause and disposition of the resident's personal effects, money, or valuables deposited with the facility.
 - g. A quarterly progress note documenting the resident's current health condition, level of functioning, activity

involvement, nutritional status, psychosocial interactions, and needs.

- h. Documentation of review of prescribed diets.
 - i. Transfer forms that are completed, signed, and sent with the resident when transferred to another facility.
 - j. A medication administration record documenting medication administration consistent with applicable state laws, rules, and practice acts.
 - k. Documentation of an annual medication regimen review.
 - l. A written report of any funds kept at a resident's request. Such record shall show deposits to and withdrawals from the fund.
 - m. Documentation of a fire drill walk-through within five days of admission.
 - n. All agreements or contracts entered into between the facility and the resident or legal representative.
 - o. A discharge note.
3. The facility shall maintain resident records for a period of not less than five years from the date of discharge or death.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-03, 23-09.3-04

33-03-24.1-14. Personal care services. The facility shall provide personal care services to assist the resident to attain and maintain their highest level of functioning consistent with the resident assessments and care plans. These services must include assistance with:

- 1. Activities of daily living and instrumental activities of daily living and observation and documentation of changes in physical, mental, and emotional functioning, as needed.
- 2. Arrangements to seek health care when the resident shows signs or describes symptoms of an illness or abnormality for which treatment may be indicated.
- 3. Arrangements for appropriate transfer and transport as needed.
- 4. Functional aids or equipment, such as glasses, hearing aids, canes, crutches, walkers, or wheelchairs.

5. Clothing and other personal effects as well as maintenance of personal living quarters.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-03, 23-09.3-04

33-03-24.1-15. Pharmacy and medication administration services.

1. The facility shall provide assistance to the resident in obtaining necessary medications and medical supplies.
2. The facility shall provide a secure area for medication storage consistent with chapter 61-03-02.
 - a. A specific system must be identified for the accountability of keys issued for locked drug storage areas.
 - b. Residents who are responsible for their own medication administration must be provided a secure storage place for their medications.
3. Medication administration services must be available for residents.
4. All medications used by residents which are administered or supervised by staff must be:
 - a. Properly recorded by staff at the time of administration.
 - b. Kept and stored in original containers labeled consistently with state laws.
 - c. Properly administered.
5. The resident's licensed health care practitioner, another licensed health care professional consistent with applicable state practice acts, or a consulting pharmacist shall review the medication regimen of each resident as needed, but at least annually.
6. A medication record need not be kept for those residents for whom authorization has been given by the licensed health care professional to keep their medication in their rooms and to be fully responsible for taking the medication in the correct dosage and at the proper times.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-16. Social services. Social services must be available to meet the needs of the residents either by the facility directly or arranged by the facility through an appropriate agency offering social services.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-17. Nursing services. Nursing services must be available to meet the needs of the residents either by the facility directly or arranged by the facility through an appropriate individual or agency providing nursing services.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-18. Dietary services. The facility must meet the dietary needs of the residents and provide dietary services in conformance with the North Dakota sanitary requirements for food establishments. Dietary services must include:

1. A minimum of three meals each day. Meals must be nutritious and well-balanced in accordance with the recommended dietary allowances of the food and nutrition board of the national research council, national academy of sciences.
2. No more than a fourteen-hour span may exist between an evening meal and breakfast.
3. Snacks between meals and in the evening. These snacks must be listed on the daily menu. Vending machines may not be the only source of snacks.
4. Provisions for prescribed diets, if the facility accepts or retains individuals in need of such diets.
 - a. The facility shall provide for preparation and serving of prescribed diets.
 - b. Menus for prescribed diets must be planned and reviewed as needed by a professional consistent with North Dakota Century Code chapter 43-44.
5. Menus of food served, which must be kept for at least three months.
6. Preparation of food by methods that will conserve nutritive value and enhance flavor and appearance, and be served at the proper temperatures and in a form to meet individual needs.

7. Meals must be served to all residents in a dining room, except for residents with a temporary illness.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-19. Activity services. There must be a planned and meaningful activity program to meet the needs and interests of the residents and encourage self-care and continuity of normal activities. This program must:

1. Be developed based on the activity needs and interests of each resident identified through the initial and ongoing assessments.
2. Develop and post a monthly group activity calendar, based on the individual interests identified, which lists social, recreational, and other events available to residents.
3. Activities must be available and provided to meet the needs of all residents during the day, in the evening, and on the weekend.
4. Assist residents with arrangements to participate in social, recreational, religious, or other activities within the facility and the community in accordance with individual interests and capabilities.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-20. Housekeeping and laundry services. The facility shall maintain the interior and exterior of the facility in a safe, clean, and orderly manner and provide sanitary laundry services, including personal laundry services, for residents.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-21. Adult day care services.

1. A facility must obtain approval from the department to provide adult day care services.
2. Use of existing space and equipment to deliver adult day care services is acceptable if this does not diminish the services

provided to the residents of the facility and their needs being met.

3. Medications and treatments must be administered only by order of a licensed health care practitioner.
4. Records must be maintained of services provided to individuals participating in adult day care services.
5. An area allowing privacy for adult day care individuals must be developed to allow for rest periods.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

33-03-24.1-22. General building requirements. The facility must be operated in conformance with all state and local laws, rules, and ordinances concerning fire safety and sanitation.

1. Lounge and activity space must be provided at a minimum of fifteen square feet [1.39 square meters] per licensed bed for recreation, visiting, and an activity program. The lounge and activity area may be used to accommodate religious services and activities. Each lounge area for resident use must be provided with an adequate number of reading lamps, tables, and chairs or couches. These furnishings must be well-constructed and accommodate the needs of the residents.
2. All corridors and stairways used by residents must have sturdy handrails on one side to provide for safety with ambulation.
3. Kitchen. Dietary areas and equipment must be designed to accommodate the requirements for sanitary storage, processing, and handling.
4. Dining area.
 - a. A minimum of fifteen square feet [1.39 square meters] per licensed bed must be provided for dining. Activity and dining areas must be separate.
 - b. Dining room furnishings must be well-constructed, comfortable, in good repair, and must accommodate the needs of the residents. There must be a sufficient number of tables of suitable design to accommodate the needs of all residents using wheelchairs.
5. Resident bedrooms.
 - a. All bedrooms used for residents must be dry, well-ventilated, naturally lighted, and otherwise suitable

for occupancy. Each room must have direct access to a corridor and have an outside wall. Resident bedrooms licensed after the effective date of these rules must be at or above grade level.

- b. The glazed area of the window may not be less than one-tenth of the floor area of the room. Windows must be easily opened and must be provided with screens.
 - c. Room size will vary depending on the number of beds, but minimum floor dimensions may not be less than ten feet [3.05 meters]. In computing floor area, only usable floor space may be included. Single rooms must provide at least one hundred square feet [9.29 square meters]. Double rooms must provide at least eighty square feet [7.43 square meters] per bed. Rooms for three or more persons must provide at least seventy square feet [6.50 square meters] per bed.
 - d. Each resident must be provided with a bed. Cots, rollaways, or folding beds may not be used. Double beds may be used if requested by the resident and there is adequate space. Each bed must be provided with springs in good repair and a clean, firm, comfortable mattress of appropriate size for the bed, as well as a minimum of one clean, comfortable pillow.
 - e. Each bedroom window must have window shades, or an equivalent, in good repair.
 - f. Lighting levels to meet the needs of residents and to allow for reading and safety must be provided.
 - g. Each bedroom must be provided with a mirror unless there is a mirror in a toilet room opening into the bedroom. Each resident lavatory must be provided with a mirror.
 - h. For each bed there must be furnished a minimum of two adequately sized dresser drawers, a chair, a bedside table or stand, an individual towel rack, and closet, locker, or wardrobe space for hanging clothing within the room.
6. Toilet rooms and bathing facilities.
- a. At least one toilet for every four residents or fraction thereof must be provided.
 - b. Separate toilets for public use must be provided.
 - c. Facilities housing residents using wheelchairs must provide at least one toilet room for every four residents using wheelchairs which is in compliance with the

guidelines adopted in North Dakota Century Code section 54-21.3-04.1.

- d. A bathtub or shower equipped with grab bars must be available in a ratio of one for fifteen residents.
 - e. Each bath and toilet room must be well-lighted.
7. The facility shall provide for adequate ventilation throughout to assure an odor-free, comfortable environment.
 8. Office spaces and other areas must be furnished with desks, chairs, lamps, cabinets, benches, worktables, and other furnishings essential to the proper use of the area.

History: Effective January 1, 1995.

General Authority: NDCC 23-09.3-09, 28-32-02(1)

Law Implemented: NDCC 23-09.3-04

CHAPTER 33-06-01

33-06-01-01. Reportable diseases. All reportable diseases shall be confidential and not open to inspection. The following diseases are hereby declared to be reportable in this state.

1. Acquired immune deficiency syndrome (A.I.D.S.).
2. Amebiasis.
3. Anthrax.
4. Blastomycosis.
5. Botulism.
6. Brucellosis.
7. Campylobacter enteritis.
8. Chancroid.
9. Chickenpox (varicella).
10. Chlamydial infections.
11. Cholera.
12. Diphtheria.
13. E. coli 0157:H7 infection.
14. Encephalitis (specify etiology).
15. Foodborne or waterborne outbreaks.
16. Giardiasis.
17. Gonorrhoea.
18. Granuloma inguinale.
19. Hantavirus.
20. Haemophilus influenzae b.
21. Hemolytic uremic syndrome.
22. Hepatitis (specify type).
23. Herpes simplex (genital).

24. Histoplasmosis.
25. Human immunodeficiency virus infection.
26. Infantile group B streptococcal infection.
27. Influenza.
- ~~27-~~ 28. Lead poisoning.
- ~~28-~~ 29. Legionellosis.
- ~~29-~~ 30. Leprosy.
- ~~30-~~ 31. Leptospirosis.
- ~~31-~~ 32. Lyme disease.
- ~~32-~~ 33. Lymphogranuloma venereum.
- ~~33-~~ 34. Malaria.
- ~~34-~~ 35. Measles (rubeola).
- ~~35-~~ 36. Meningitis (specify etiology).
- ~~36-~~ 37. Mumps.
- ~~37-~~ 38. Nosocomial infections.
- ~~38-~~ 39. Ornithosis (Psittacosis).
- ~~39-~~ 40. Pertussis.
- ~~40-~~ 41. Plague.
- ~~41-~~ 42. Poliomyelitis.
- ~~42-~~ 43. Rabies.
- ~~43-~~ 44. Reye's syndrome.
- ~~44-~~ 45. Rocky Mountain spotted fever.
- ~~45-~~ 46. Rubella.
- ~~46-~~ 47. Salmonellosis.
- ~~47-~~ 48. Scabies (in institutions).
- ~~48-~~ 49. Shigellosis.
- ~~49-~~ 50. Syphilis.

- 50- 51. Tetanus.
- 51- 52. Toxic-shock syndrome.
- 52- 53. Trichinosis.
- 53- 54. Tuberculosis.
- 54- 55. Tularemia.
- 55- 56. Typhoid fever.

History: Amended effective May 1, 1984; December 1, 1986; January 1, 1988; January 1, 1989; October 1, 1990; January 1, 1991; February 1, 1992; May 1, 1994; January 1, 1995.

General Authority: NDCC 23-07-01

Law Implemented: NDCC 23-07-01

APRIL 1995

Chapter 33-09-03

33-09-03-03. Types of review - Procedures.

1. **Full review.** A full review must be conducted of each proposal found subject under North Dakota Century Code section 23-17.2-03, unless the proposal is found eligible for a special review under provisions of subsection 2 of this section.
 - a. Completed applications must be submitted to the department. Each application must be accompanied by a fee payable to the North Dakota state department of health and consolidated laboratories as prescribed by North Dakota Century Code section 23-17.2-09.
 - b. Applications received with appropriate fee will be reviewed for completeness by the department within fifteen working days of receipt. Each application must address the state health plan, each of the criteria for review and each of the policy issues stated in section 33-09-03-04, and must include documentation of assertions found in the application. Submissions of requested additional information will be reviewed for completeness within fifteen working days of receipt. The department must deem the application complete or request necessary additional information from the applicant by the fifteenth working day. Such additional information must include documentation of assertions found in the application. No information may be required of an applicant which is not reasonably related to the state health plan, criteria for

review, or policy issues specified in section 33-09-03-04 and necessary to perform review of the application.

- c. Written notice that an application has been deemed complete will be provided to the applicant and must be published in one or more newspapers of general circulation within the affected service area. The notice must include:
 - (1) The name and address of the applicant, and a description of the proposal and its estimated costs.
 - (2) The proposed schedule for review.
 - (3) The time and manner by which affected persons may request an informal local hearing to provide additional information concerning the application.
 - (4) The date of notice shall be the date of earliest publication or fourteen days following the date on which the application is deemed complete, whichever comes first.
- d. The department will have ninety days from the date of notice of completeness to conduct a review of the application based on criteria specified in section 33-09-03-04. The ninety-day-review period may be extended with concurrence of the applicant and the department. Recommendations of the department will be communicated to the applicant and to the health council.
- e. The health council may, at its option for the purpose of simultaneous consideration of like applications, delay consideration of certain applications. In such circumstances, the health council shall specify to the applicant a date certain by which the application will be considered. In no case will the health council cause consideration of any application to be delayed more than one hundred eighty days without the consent of the applicant.
- f. The health council will, except in cases described in subdivision e of subsection 1 of section 33-09-03-03, make its determination at the next scheduled meeting following completion of the department's review. The department will cause the determination and the basis for the determination to be communicated to the applicant in writing. This communication will be made within five working days of the date of determination. Written notice of the determination must be published in one or more newspapers of general circulation within the affected service area. The notice must include:

- (1) The name and address of the applicant and a description of the proposal and its proposed costs.
 - (2) The determination of the health council.
 - (3) The time and manner by which affected persons may request a hearing conducted under North Dakota Century Code chapters 28-32 and 23-17.2 for reconsideration of the health council's determination.
 - (4) The manner in which additional information concerning the application or the reconsideration process may be obtained.
 - (5) Affected persons will have a minimum of fifteen days to respond following earliest publication of the notice.
2. **Special review.** The department may issue, but not deny, certificates of need for proposals which qualify. Special reviews will be conducted based on information obtained through the notification of intent form and any supplemental information required by the department to verify qualification under the following circumstances:
- a. Emergency or circumstances beyond the control of the applicant.
 - b. Elimination or prevention of imminent safety hazards as defined by federal, state, or local fire, building, or life safety codes, rules, or regulations.
 - c. Compliance with state licensure, accreditation, or federal certification standards or building requirements for handicapped accessibility required to continue reimbursement for existing services under title XVIII or title XIX of the Social Security Act, or under North Dakota Century Code chapters 50-01 or 50-06.
 - d. Cost overruns experienced in implementation of a proposal which exceed by ten percent or more the capital expenditure approved and specified in any certificate of need and which are not precipitated by a change in the scope of the project.
 - e. Projects mandated by state law, with need established through the legislative process as indicated by the appropriation of funds for implementation.
 - f. Acquisition and installation of replacement equipment if the equipment to be replaced meets applicable standards for minimum utilization adopted by the health council.

- g. Refinancing of existing debt which does not create additional capital except debt service reserve held in restricted capital accounts or capitalized costs of bond issuance.
- h. Proposals for the expansion of the physical plant of long-term care facilities which do not require a capital expenditure exceeding fifty thousand dollars and which do not facilitate the addition or expansion of services offered by the applicant.

History: Effective November 1, 1987; amended effective May 1, 1992; April 1, 1995.

General Authority: NDCC 23-01-03, 23-17.2-05

Law Implemented: NDCC 23-17.2-05

JUNE 1995

ARTICLE 33-08

ADDICTION HOSPITALS AND RELATED FACILITIES

[Superseded by Article 75-09]

JULY 1995

CHAPTER 33-10-01

33-10-01-03. Authority. The North Dakota state department of health and ~~consolidated laboratories~~ has been authorized to provide and administer this article under the provisions of North Dakota Century Code chapter 23-20.1.

History: Amended effective July 1, 1995.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-01-04. Definitions. As used in this article, these terms have the definitions set forth below. Additional definitions used only in a certain section will be found in that section. Terms not defined in this article shall have the meaning given them in North Dakota Century Code chapter 23-20.1.

1. "A₁" means the maximum activity of special form radioactive material permitted in a type A package. "A₂" means the maximum activity of radioactive material, other than special form radioactive material, permitted in a type A package. These values are either listed in chapter 33-10-13, appendix A, table I, or may be derived in accordance with the procedure prescribed in chapter 33-10-13 appendix A.
2. "Absorbed dose" means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the gray (Gy) and the rad.
3. "Accelerator" means any machine capable of accelerating electrons, protons, deuterons, or other charged particles in a

vacuum and of discharging the resultant particulate or other radiation into a medium at energies usually in excess of one megaelectronvolt. For purposes of this definition, "particle accelerator" is an equivalent term.

4. "Accelerator produced material" means any material made radioactive by exposing it in a particle accelerator.
5. "Act" means North Dakota Century Code chapter 23-20.1.
6. "Activity" means the rate of disintegration or transformation or decay of radioactive material. The units of activity are the becquerel (Bq) and the curie (Ci).
7. "Adult" means an individual eighteen or more years of age.
8. "Agreement state" means any state with which the United States nuclear regulatory commission has entered into an effective agreement under section 274(b) of the Atomic Energy Act of 1954, as amended [73 Stat. 688; 42 U.S.C. 2021].
9. "Airborne radioactive material" means any radioactive material dispersed in the air in the form of dusts, fumes, particulates, mists, vapors, or gases.
10. "Airborne radioactivity area" means a room, enclosure, or area in which airborne radioactive materials exist in concentrations:
 - a. In excess of the derived air concentrations (DACs) specified in appendix B, table I of chapter 33-10-04.1, or
 - b. To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of six-tenths percent of the annual limit on intake (ALI) or twelve derived air concentrations-hours.
11. "Alert" means events may occur, are in progress, or have occurred that could lead to a release of radioactive material but that the release is not expected to require a response by an offsite response organization to protect persons offsite.
12. "As low as is reasonably achievable" (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in these rules as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in

relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

13. "Background radiation" means radiation from cosmic sources; naturally occurring radioactive materials, including radon, except as a decay product of source or special nuclear material, and including global fallout as it exists in the environment from the testing of nuclear explosive devices. "Background radiation" does not include sources of radiation from radioactive materials regulated by the department.
14. "Becquerel" (Bq) means the SI unit of activity. One becquerel is equal to one disintegration or transformation per second (dps or tps).
15. "Bioassay" means the determination of kinds, quantities, or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement, in vivo counting, or by analysis and evaluation of materials excreted or removed from the human body. For purposes of these rules, "radiobioassay" is an equivalent term.
16. "Brachytherapy" means a method of radiation therapy in which sealed sources are utilized to deliver a radiation dose at a distance of up to a few centimeters, by surface, intracavitary, or interstitial application.
17. "Byproduct material" means:
 - a. Any radioactive material, except special nuclear material, yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material; and
 - b. The tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content, including discrete surface wastes resulting from uranium or thorium solution extraction processes. Underground ore bodies depleted by these solution extraction operations do not constitute "byproduct material" within this definition.
18. "Calendar quarter" means not less than twelve consecutive weeks nor more than fourteen consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be so arranged such that no day is included in more than one calendar quarter and no day in any one year is omitted from inclusion within a calendar quarter. No licensee or registrant shall change the method observed by the licensee or registrant of determining calendar quarters for purposes of this article except at the beginning of a year.

19. "Calibration" means the determination of:
 - a. The response or reading of an instrument relative to a series of known radiation values over the range of the instrument; or
 - b. The strength of a source of radiation relative to a standard.
20. "CFR" means Code of Federal Regulations.
21. "Chelating agent" means amine polycarboxylic acids, hydroxycarboxylic acids, gluconic acid, and polycarboxylic acids.
22. "Collective dose" means the sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.
23. "Committed dose equivalent" ($H_{T,50}$) means the dose equivalent to organs or tissues of reference (T) that will be received from an intake of radioactive material by an individual during the fifty-year period following the intake.
24. "Committed effective dose equivalent" ($H_{E,50}$) is the sum of the products of the weighing factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to each of these organs or tissues ($H_{E,50} = \sum W_T, H_{T,50}$).
25. "Curie" means a unit of measurement of radioactivity activity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 3.7×10^{10} disintegrations or transformations per second (dps or tps).
26. "Decommission" means to remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of license.
27. "Deep dose equivalent" (H_d), which applies to external whole body exposure means the dose equivalent at a tissue depth of one centimeter (or a density thickness of 1000 mg/cm^2). This assumes a tissue density of one gram per cubic centimeter.
28. "Department" means the state North Dakota department of health and ~~consolidated-laboratories~~.
29. "Depleted uranium" means the source material uranium in which the isotope uranium-235 is less than 0.711 weight percent of the total uranium present. Depleted uranium does not include special nuclear material.

30. "Dose" is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, total organ dose equivalent, or total effective dose equivalent. For purposes of these rules, "radiation dose" is an equivalent term.
31. "Dose equivalent (H_T)" means the product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert (Sv) and rem.
32. "Dose limits" means the permissible upper bounds of radiation doses established in accordance with these rules. For purposes of these rules, "limits" is an equivalent term.
33. "Effective dose equivalent (H_E)" means the sum of the products of the dose equivalent to each organ or tissue (H_T) and the weighting factor (W_T) applicable to each of the body organs or tissues that are irradiated ($H_E = \sum W_T H_T$).
34. "Embryo/fetus" means the developing human organism from conception until the time of birth.
35. "Entrance or access point" means any opening through which an individual or extremity of an individual could gain access to radiation areas or to licensed or registered radioactive materials. This includes entry or exit portals of sufficient size to permit human entry, irrespective of their intended use.
36. "Explosive material" means any chemical compound, mixture, or device which produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame.
37. "Exposure" means being exposed to ionizing radiation or to radioactive material.
38. "External dose" means that portion of the dose equivalent received from any source of radiation outside the body.
39. "Extremity" means hand, elbow, arm below the elbow, foot, knee, and leg below the knee.
40. "Eye dose equivalent" means the external dose equivalent to the lens of the eye at a tissue depth of three-tenths centimeter (or a density thickness of 300 mg/cm^2). This assumes a tissue density of one gram per cubic centimeter.
41. "Former United States atomic energy commission or United States nuclear regulatory commission licensed facilities" means nuclear reactors, nuclear fuel reprocessing plants, uranium enrichment plants, or critical mass experimental

facilities where their atomic energy commission or nuclear regulatory commission licenses have been terminated.

42. "Generally applicable environmental radiation standards" means standards issued by the United States environmental protection agency under the authority of the Atomic Energy Act of 1954, as amended, that impose limits on radiation exposures or levels, or concentrations or quantities of radioactive material, in the general environment outside the boundaries of locations under the control of persons possessing or using radioactive material.
43. "Gray" (Gy) means the SI unit of absorbed dose. One gray is equal to an absorbed dose of one joule per kilogram [100 rad].
44. "Hazardous waste" means those wastes designated as hazardous by United States environmental protection agency regulations in 40 CFR part 261 and article 33-24 of the North Dakota Administrative Code.
45. "Healing arts" means diagnostic or healing treatment of human and animal maladies including, but not limited to, the following which are duly licensed by the state of North Dakota for the lawful practice of: medicine and its associated specialties, dentistry, veterinary medicine, osteopathy, chiropractic, and podiatry.
46. "High radiation area" means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of one hundred millirems [one millisievert] in one hour at thirty centimeters from any source of radiation or from any surface that the radiation penetrates.
47. "Human use" means the internal or external administration of radiation or radioactive material to human beings.
48. "Individual" means any human being.
49. "Individual monitoring" means the assessment of:
 - a. Dose equivalent by the use of individual monitoring devices or by the use of survey data; or
 - b. Committed effective dose equivalent by bioassay or by determination of the time-weighted air concentrations to which an individual has been exposed, that is, derived air concentration-hours. (See the definition of derived air concentration-hours in chapter 33-10-04.1).
50. "Individual monitoring devices" means devices designed to be worn by a single individual for the assessment of dose equivalent. For purposes of these rules, "personnel

dosimeter" and "dosimeter" are equivalent terms. Examples of individual monitoring devices are film badges, thermoluminescent dosimeters (TLDs), pocket ionization chambers, and personal air sampling devices.

51. "Inspection" means an official examination or observation including, but not limited to, tests, surveys, and monitoring to determine compliance with rules, regulations, orders, requirements, and conditions of the department.
52. "Interlock" means a device arranged or connected such that the occurrence of an event or condition is required before a second event or condition can occur or continue to occur.
53. "Internal dose" means that portion of the dose equivalent received from radioactive material taken into the body.
54. "License" means a general or specific license issued by the department in accordance with the regulations adopted by the department.
55. "Licensed material" means radioactive material received, possessed, used, transferred, or disposed of under a general or specific license issued by the department.
56. "Licensee" means any person who is licensed by the department in accordance with this article and North Dakota Century Code chapter 23-20.1.
57. "Licensing state" means any state with regulations equivalent to the Suggested State Regulations for Control of Radiation relating to, and an effective program for, the regulatory control of NARM and which has been granted final designation by the conference of radiation control program directors, incorporated.
58. "Limits" (see "dose limits").
59. "Lost or missing licensed (or registered) source of radiation" means licensed (or registered) source of radiation whose location is unknown. This definition includes licensed (or registered) material that has been shipped but has not reached its planned destination and whose location cannot be readily traced in the transportation system.
60. "Major processor" means a user processing, handling, or manufacturing radioactive material exceeding type A quantities as unsealed sources or material, or exceeding four times type B quantities as sealed sources, but does not include nuclear medicine programs, universities, industrial radiographers, or small industrial programs. The terms "type A quantity" and "type B quantity" are defined in chapter 33-10-13.

61. "Member of the public" means any individual except when that individual is receiving an occupational dose.
62. "Minor" means an individual less than eighteen years of age.
63. "Monitoring" means the measurement of radiation, radioactive material concentrations, surface area activities or quantities of radioactive material, and the use of the results of these measurements to evaluate potential exposures and doses. For purposes of these rules, "radiation monitoring" and "radiation protection monitoring" are equivalent terms.
64. "NARM" means any naturally occurring or accelerator-produced radioactive material. It does not include byproduct, source, or special nuclear material. (Note: For the purpose of meeting the definition of a licensing state by the conference of radiation control program directors, incorporated, naturally occurring or accelerator-produced radioactive material refers only to discrete sources of naturally occurring or accelerator-produced radioactive material. Diffuse sources of naturally occurring or accelerator-produced radioactive material are excluded from consideration by the conference of radiation control program directors, incorporated, for licensing state designation purposes.)
65. "Natural radioactivity" means radioactivity of naturally occurring nuclides.
66. "Nuclear regulatory commission (NRC)" means the United States nuclear regulatory commission or its duly authorized representatives.
67. "Occupational dose" means the dose received by an individual in the course of employment, while engaged in activities licensed or registered by the department, in which the individual's assigned duties involve exposure to sources of radiation, whether or not the sources are in the possession of the licensee, registrant, or other person. Occupational dose does not include dose received: from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.
68. "Ore refineries" means all processors of a radioactive material ore.
69. "Package" means the packaging together with its radioactive contents as presented for transport.
70. "Particle accelerator" (see "accelerator").
71. "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this state, any other

state or political subdivision or agency thereof, and any legal successor, representative, agent, or agency of the foregoing, other than the commission, or any successor thereto and other than federal government agencies licensed by the commission or any successor thereto.

72. "Personnel monitoring equipment" (see "individual monitoring devices").
73. "Pharmacist" means an individual licensed by this state to compound and dispense drugs, prescriptions, and poisons.
74. "Physician" means an individual licensed by this state to dispense drugs in the practice of medicine.
75. "Principal activities" means activities authorized by the license which are essential to achieving the purposes for which the license was issued or amended. Storage during which no licensed material is accessed for use or disposal and activities incidental to decontamination or decommissioning are not principal activities.
- 75- 76. "Public dose" means the dose received by a member of the public from ~~exposure to~~ sources of radiation ~~or radioactive material, or both, released by a licensee~~ from a licensed or registered operation. It does not include occupational dose, dose received from background radiation, dose received as a patient from medical practices, or dose from voluntary participation in medical research programs.
- 76- 77. "Pyrophoric ~~liquid~~ material" means any liquid that ignites spontaneously in dry or moist air at or below one hundred thirty degrees Fahrenheit [54.4 degrees Celsius], ~~or any solid material, other than one classed as an explosive, which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious transportation, handling, or disposal hazard. Included are spontaneously combustible and water-reactive materials.~~
- 77- 78. "Quality factor" (Q) means the modifying factor, listed in tables I and II of section 33-10-01-14, that is used to derive dose equivalent from absorbed dose.
- 78- 79. "Rad" means the special unit of absorbed dose. One rad is equal to an absorbed dose of one hundred erg per gram or one one-hundredths joule per kilogram [0.01 gray].
- 79- 80. "Radiation" means alpha particles, beta particles, gamma rays, x-rays, neutrons, high speed electrons, high speed protons, and other particles capable of producing ions. For purposes

of these rules, ionizing radiation is an equivalent term. Radiation, as used in these rules, does not include nonionizing radiation, such as radiowaves or microwaves, visible, infrared, or ultraviolet light.

- ~~80-~~ 81. "Radiation area" means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of five millirems [0.05 millisievert] in one hour at thirty centimeters from the source of radiation or from any surface that the radiation penetrates.
- ~~81-~~ 82. "Radiation dose" (see "dose").
- ~~82-~~ 83. "Radiation exposure" means the quotient of dQ by dm where " dQ " is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass " dm " are completely stopped in air. The SI unit of exposure is the coulomb per kilogram (C/kg). (See section 33-10-01-14 units of radiation exposure, dose, and activity for the special unit equivalent "roentgen" (R).)
- ~~83-~~ 84. "Radiation exposure rate" means the radiation exposure per unit of time, such as R/min, mR/h, etc.
- ~~84-~~ 85. "Radiation machine" means any device capable of producing radiation except, those devices with radioactive material as the only source of radiation.
- ~~85-~~ 86. "Radiation safety officer" means an individual who has the knowledge and responsibility to apply appropriate radiation protection requirements.
- ~~86-~~ 87. "Radioactive material" means any material (solid, liquid, or gas) which emits radiation spontaneously.
- ~~87-~~ 88. "Radioactivity" means the disintegration of unstable atomic nuclei by the emission of radiation.
- ~~88-~~ 89. "Radiobioassay" (see "bioassay").
- ~~89-~~ 90. "Registrant" means any person who is registered with the department and is legally obligated to register with the department pursuant to this article and North Dakota Century Code chapter 23-20.1.
- ~~90-~~ 91. "Registration" means the notification of the department of possession of a source of radiation and the furnishing of information with respect thereto, in accordance with North Dakota Century Code chapter 23-20.

- 91- 92. "Regulations of the United States department of transportation" means the regulations in 49 CFR, 100-189.
- 92- 93. "Rem" means the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 sievert (Sv)).
- 93- 94. "Research and development" means (a) theoretical analysis, exploration, or experimentation; or (b) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes. Research and development does not include the internal or external administration of radiation or radioactive material to human beings.
- 94- 95. "Restricted area" means an area, access to which is limited by the licensee or registrant for the purpose of protecting individuals against undue risks from exposure to sources of radiation. "Restricted area" does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.
- 95- 96. "Roentgen" (R) means the special unit of exposure. One roentgen equals 2.58×10^{-4} coulombs per kilogram of air. (See "exposure")
- 96- 97. "Sealed source" means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions which are likely to be encountered in normal use and handling.
- 97- 98. "Shallow dose equivalent" H_s , which applies to the external exposure of the skin or an extremity, means the dose equivalent at a tissue depth of seven one-thousandths centimeter (7 mg/cm^2) averaged over an area of one square centimeter.
- 98- 99. "SI" means the abbreviation for the international system of units.
- 99- 100. "Sievert" means the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100 rem).
- ~~100-~~101. "Site area emergency" means events may occur, are in progress, or have occurred that could lead to a significant release of radioactive material and that could require a response by offsite response organizations to protect persons offsite.

- 101-102. "Site boundary" means that line beyond which the land or property is not owned, leased, or otherwise controlled by the licensee or registrant.
- 102-103. "Source material" means: (a) uranium or thorium, or any combination thereof, in any physical or chemical form; or (b) ores that contain by weight one-twentieth of one percent (0.05 percent) or more of uranium, thorium, or any combination of uranium and thorium. Source
- 103-104. "Source material milling" means any activity that results in the production of byproduct material as defined in subdivision b of subsection 17.
- 104-105. "Source of radiation" means any radioactive material, or any device or equipment emitting or capable of producing radiation.
- 105-106. "Special form radioactive material" means radioactive material that satisfies the following conditions:
- a. It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule.
 - b. The piece or capsule has at least one dimension not less than five millimeters [0.2 inch].
 - c. It satisfies the test requirements specified by the United States nuclear regulatory commission. A special form encapsulation designed in accordance with the United States nuclear regulatory commission requirements in effect on June 30, 1983, and constructed prior to July 1, 1985, may continue to be used. A special form encapsulation either designed or constructed after June 30, 1985, must meet requirements of this definition applicable at the time of its design or construction.
- 106-107. "Special nuclear material" means:
- a. Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the United States nuclear regulatory commission, pursuant to the provisions of section 51 of the Atomic Energy Act of 1954, as amended, determined to be special nuclear material, but does not include source material; or
 - b. Any material artificially enriched by any of the foregoing but does not include source material.
- 107-108. "Special nuclear material in quantities not sufficient to form a critical mass" means uranium enriched in the isotope U-235 in quantities not exceeding three hundred fifty grams of

contained U-235, uranium-233 in quantities not exceeding two hundred grams; plutonium in quantities not exceeding two hundred grams; or any combination of them in accordance with the following formula: For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified above for the same kind of special nuclear material. The sum of such ratios for all of the kinds of special nuclear material in combination shall not exceed "1", i.e., unity. For example, the following quantities in combination would not exceed the limitation and are within the formula:

$$\frac{175 \text{ (grams contained U-235)}}{350} + \frac{50 \text{ (grams U-233)}}{200} + \frac{50 \text{ (grams Pu)}}{200} = 1$$

- ~~108-109.~~ "Survey" means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of sources of radiation. When appropriate, such evaluation includes tests, physical examination, and measurements of levels of radiation or concentration of radioactive material present.
- ~~109-110.~~ "Test" means a method for determining the characteristics or condition of sources of radiation or components thereof. "Test" may also mean the process of verifying compliance with this article.
- ~~110-111.~~ "These rules" means all parts of this article and any subsequent changes or additions thereto.
- ~~111-112.~~ "Total effective dose equivalent" (TEDE) means the sum of the deep dose equivalent for external exposures and the committed effective dose equivalent for internal exposures.
- ~~112-113.~~ "Total organ dose equivalent" (TODE) means the sum of the deep dose equivalent and the committed dose equivalent to the organ receiving the highest dose as described in chapter 33-10-04.1 of these rules.
- ~~113-114.~~ "United States department of energy" means the department of energy established by Public Law No. 95-91 [91 Stat. 565; 42 U.S.C. 7101 et seq.] to the extent that the department exercises functions formerly vested in the United States atomic energy commission, its chairman, members, officers, and components and transferred to the United States energy research and development administration and to the administrators thereof pursuant to sections 104(b), (c), and (d) of the Energy Reorganization Act of 1974 [Pub. L. 93-438; 88 Stat. 1237; 42 U.S.C. 5814, effective January 19, 1975] and transferred to the secretary of energy pursuant to subsection 301(a) of the Department of Energy Organization Act [Pub. L. 95-91; 91 Stat. 577-578; 42 U.S.C. 7151, effective October 1, 1977].

- ~~114~~-115. "Unrefined and unprocessed ore" means ore in its natural form prior to any processing, such as grinding, roasting, beneficiating, or refining.
- ~~115~~-116. "Unrestricted area" means an area, access to which is neither limited nor controlled by the licensee or registrant.
- ~~116~~-117. "Waste" means those low-level radioactive wastes that are acceptable for disposal in a land disposal facility. For the purposes of this definition, low-level waste has the same meaning as in the Low-Level Radioactive Waste Policy Act [Pub. L. 96-573; 94 Stat. 3347; 42 U.S.C. 2021b-2021j], as amended by Pub. L. 99-240 [99 Stat. 1842; 42 U.S.C. 2021b-2021j], effective January 15, 1986; that is, radioactive waste:
- a. Not classified as high-level radioactive waste, spent nuclear fuel, or byproduct material as defined in section 11e(2) of the Atomic Energy Act [Pub. L. 95-604; 92 Stat. 3033; 42 U.S.C. 2014(e)(2)] (uranium or thorium tailings and waste); and
 - b. Classified as low-level radioactive waste consistent with existing law and in accordance with subdivision a by the United States nuclear regulatory commission.
- ~~117~~-118. "Waste handling licensees" means persons licensed to receive and store radioactive wastes prior to disposal and/or persons licensed to dispose of radioactive waste.
- ~~118~~-119. "Week" means seven consecutive days starting on Sunday.
- ~~119~~-120. "Whole body" means, for purposes of external exposure, head, trunk including male gonads, arms above the elbow, or legs above the knee.
- ~~120~~-121. "Worker" means an individual engaged in work under a license or registration issued by the department and controlled by a licensee or registrant.
- ~~121~~-122. "Working level" (WL) means any combination of short-lived radon daughters in one liter of air that will result in the ultimate emission of $1.3E+5$ megaelectronvolt of potential alpha particle energy. The short-lived radon daughters are - for radon-222: polonium-218, lead-214, bismuth-214, and polonium-214; and for radon-220: polonium-216, lead-212, bismuth-212, and polonium-212.
- ~~122~~-123. "Working level month" (WLM) means an exposure to one working level for one hundred seventy hours - two thousand working hours per year divided by twelve months per year is approximately equal to one hundred seventy hours per month.

~~123-~~124. "Year" means the period of time beginning in January used to determine compliance with the provisions of these rules. The licensee or registrant may change the starting date of the year used to determine compliance by the licensee or registrant provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 28-32-02, 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-01-13. Communications. All communications and reports concerning this article and applications filed thereunder shall be addressed to the department as follows:

North Dakota State Department of Health
~~and-Consolidated-Laboratories~~
Division of Environmental Engineering
1200 Missouri Avenue, Room 304
Box 5520
Bismarck, North Dakota ~~58502-5520~~ 58506-5520
Telephone ~~(701)-221-5188~~ (701)328-5188
Facsimile (FAX) ~~(701)-221-5200~~ (701)328-5200

History: Amended effective June 1, 1986; June 1, 1992; July 1, 1995.

General Authority: NDCC 23-20.1-04, 28-32-02

Law Implemented: NDCC 23-20.1-04.3

33-10-01-14. Units of exposure, dose, and activity.

1. As used in these rules, the unit of exposure is the coulomb per kilogram (C/kg) of air. One roentgen is equal to 2.58E-4 coulomb per kilogram of air.
2. As used in these rules, the units of dose are:
 - a. Rad is the special unit of absorbed dose. One rad is equal to an absorbed dose of one hundred erg per gram or one one-hundredths (1/100) joule per kilogram (0.01 Gy).
 - b. Gray (Gy) is the SI unit of absorbed dose. One gray is equal to an absorbed dose of one joule per kilogram (100 rad).
 - c. Rem is the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor (1 rem = 0.01 Sv).

- d. Sievert is the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sievert is equal to the absorbed dose in gray multiplied by the quality factor (1 Sv = 100 rem).
3. As used in these rules, the quality factors for converting absorbed dose to dose equivalent are shown in table I.

Table I
QUALITY FACTORS AND ABSORBED DOSE EQUIVALENTS

TYPE OF RADIATION	Quality Factor (Q)	Absorbed Dose Equal to a Unit Dose Equivalent*
X, gamma, or beta radiation and high-speed electrons	1	1
Alpha particles, multiple-charged particles, fission fragments, and heavy particles of unknown charge	20	0.05
Neutrons of unknown energy	10	0.1
High-energy protons	10	0.1

*Absorbed dose in rad equal to one rem or the absorbed dose in gray equal to one sievert.

4. If it is more convenient to measure the neutron fluence rate than to determine the neutron dose equivalent rate in rem per hour or sievert per hour, as provided in subsection 3, one one-hundredth sievert [1 rem] of neutron radiation of unknown energies may, for purposes of these rules, be assumed to result from a total fluence of twenty-five million neutrons per square centimeter incident upon the body. If sufficient information exists to estimate the approximate energy distribution of the neutrons, the licensee or registrant may use the fluence rate per unit dose equivalent or the appropriate Q value from table II to convert a measured tissue dose in gray or rad to dose equivalent in rem or sievert.

Table II
MEAN QUALITY FACTORS, Q, AND FLUENCE PER UNIT DOSE EQUIVALENT FOR MONOENERGETIC NEUTRONS

Neutron Energy (MeV)	Quality Factor ^a (Q)	Fluence per Unit Dose Equivalent ^b (neutrons cm ⁻² rem ⁻¹)	Fluence per Unit Dose Equivalent ^b (neutrons cm ⁻² Sv ⁻¹)
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(thermal)	2.5E-8	2	980E+6	980E+8
	1E-7	2	980E+6	980E+8
	1E-6	2	810E+6	810E+8
	1E-5	2	810E+6	810E+8
	1E-4	2	840E+6	840E+8
	1E-3	2	980E+6	980E+8
	1E-2	2.5	1010E+6	1010E+8
	1E-1	7.5	170E+6	170E+8
	5E-1	11	39E+6	39E+8
	1	11	27E+6	27E+8
	2.5	9	29E+6	29E+8
	5	8	23E+6	23E+8
	7	7	24E+6	24E+8
	10	6.5	24E+6	24E+8
	14	7.5	17E+6	17E+8
	20	8	16E+6	16E+8
	40	7	14E+6	14E+8
	60	5.5	16E+6	16E+8
	1E+2	4	20E+6	20E+8
	2E+2	3.5	19E+6	19E+8
	3E+2	3.5	16E+6	16E+8
	4E+2	3.5	14E+6	14E+8

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

b Monoenergetic neutrons incident normally on a 30-centimeter diameter cylinder tissue-equivalent phantom.

5. For purposes of these rules, activity is expressed in the special unit of curie (Ci) or in the international system (SI) unit of becquerel (Bq), or their multiples, or disintegrations or transformations per unit of time.

a. One curie (Ci) = $3.7E+10$ disintegrations or transformations per second (dps or tps) = $3.7E+10$ becquerel (Bq) = $2.22E+12$ disintegrations or transformations per minute (dpm or tpm).

b. One becquerel (Bq) = one disintegration or transformation per second (dps or tps).

6. SI numerical prefix conversions. See ~~table below~~ table III for a listing of numerical prefixes to convert SI units or special units by appropriate multiples:

Table III
SI Numerical Prefix Conversion Table

Multiplication Factors

Prefix

Symbol

1 000 000 000 000 000 000 = 10 ¹⁸	exa	E
1 000 000 000 000 000 = 10 ¹⁵	peta	P
1 000 000 000 000 = 10 ¹²	tera	T
1 000 000 000 = 10 ⁹	giga	G
1 000 000 = 10 ⁶	mega	M
1 000 = 10 ³	kilo	k
100 = 10 ²	hecto	h
10 = 10 ¹	deka	da
0.1 = 10 ⁻¹	deci	d
0.01 = 10 ⁻²	centi	c
0.001 = 10 ⁻³	milli	m
0.000 001 = 10 ⁻⁶	micro	u
0.000 000 001 = 10 ⁻⁹	nano	n
0.000 000 000 001 = 10 ⁻¹²	pico	p
0.000 000 000 000 001 = 10 ⁻¹⁵	femto	f
0.000 000 000 000 000 001 = 10 ⁻¹⁸	atto	a

History: Effective June 1, 1992; amended effective March 1, 1994;
July 1, 1995.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-03

CHAPTER 33-10-02

33-10-02-03. Application for registration of radiation machine facilities. Each person having a radiation machine facility shall:

1. Apply for registration of such facility with the department prior to the operation of a radiation machine facility. Application for registration shall be completed on forms furnished by the department and shall contain all the information required by the form and accompanying instructions.
2. Designate on the application form an individual to be responsible for radiation protection.
3. Each registrant shall prohibit any person from furnishing radiation machine servicing or services as described in subsection 4 of section ~~33-10-02-05~~ 33-10-02-04, to the registrant's radiation machine facility until such person provides evidence that the service person has been registered with the department as a provider of services in accordance with section 33-10-02-04.
4. Each application for registration shall be accompanied by the fee prescribed in chapter 33-10-11.

History: Amended effective June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04, 23-20.1-04.5

Law Implemented: NDCC 23-20.1-03, 23-20.1-04.5

33-10-02-06. Expiration of notice of registration. Except as provided by subsection 2 of section 33-10-02-07, each notice of registration shall expire at the end of the specified first day in the month and year stated therein.

History: Amended effective June 1, 1992; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-02-10. Assembler ~~or transferor~~ and transferor obligation.

1. Any person who sells, leases, transfers, lends, disposes, assembles, or installs radiation machines in this state shall notify the department within fifteen days of:
 - a. The name and address of persons who have received these machines.

- b. The manufacturer, model, and serial number of each radiation machine transferred.
 - c. The date of transfer of each radiation machine.
2. No person shall make, sell, lease, transfer, lend, assemble, or install radiation machines or the supplies used in connection with such machines unless such supplies and equipment, when properly placed in operation and used, shall meet the requirements of this article.

History: Amended effective June 1, 1992; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

CHAPTER 33-10-03

33-10-03-04. General licenses.

1. General licenses - source material.

- a. A general license is hereby issued authorizing commercial and industrial firms, research, educational and medical institutions, and state and local government agencies to use and transfer not more than fifteen pounds [6.82 kilograms] of source material at any one time for research, development, educational, commercial, or operational purposes. A person authorized to use or transfer source material, pursuant to this general license, may not receive more than a total of one hundred fifty pounds [68.2 kilograms] of source material in any one calendar year.
- b. Persons who receive, possess, use, or transfer source material pursuant to the general license issued in subdivision a are exempt from the provisions of chapters 33-10-04.1 and 33-10-10 to the extent that such receipt, possession, use, or transfer is within the terms of such general license; provided, however, that this exemption shall not be deemed to apply to any such person who is also in possession of source material under a specific license issued pursuant to this chapter.
- c. Persons who receive, possess, use, or transfer source material pursuant to the general license in subdivision a are prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as may be authorized by the department in a specific license.
- d. A general license is hereby issued authorizing the receipt of title to source material without regard to quantity. This general license does not authorize any person to receive, possess, use, or transfer source material.
- e. Depleted uranium in industrial products and devices.
 - (1) A general license is hereby issued to receive, acquire, possess, use, or transfer, in accordance with paragraphs 2, 3, 4, and 5, depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of a product or device.
 - (2) The general license in paragraph 1 applies only to industrial products or devices which have been

manufactured either in accordance with a specific license issued to the manufacturer of the products or devices pursuant to subdivision a of subsection 5 of section 33-10-03-05 or in accordance with a specific license issued to the manufacturer by the United States nuclear regulatory commission or an agreement state which authorizes manufacture of the products or devices for distribution to persons generally licensed by the United States nuclear regulatory commission or an agreement state.

- (3) (a) Persons who receive, acquire, possess, or use depleted uranium pursuant to the general license established by paragraph 1 shall file form RAB 811 SFN 16092 "registration certificate - use of depleted uranium under general license" with the department. The form shall be submitted within thirty days after the first receipt or acquisition of such depleted uranium. The registrant shall furnish the following information and such other information as may be required by that form:

[1] Name and address of the registrant.

[2] A statement that the registrant has developed and will maintain procedures designed to establish physical control over the depleted uranium described in paragraph 1 and designed to prevent transfer of such depleted uranium in any form, including metal scrap, to persons not authorized to receive the depleted uranium.

[3] Name and title, address, and telephone number of the individual duly authorized to act for and on behalf of the registrant in supervising the procedures identified in item 2 of subparagraph a.

- (b) The registrant possessing or using depleted uranium under the general license established by paragraph 1 shall report in writing to the department any changes in information furnished by the registrant in form RAB-811 SFN 16092 "registration certificate - use of depleted uranium under general license". The report shall be submitted within thirty days after the effective date of such change.

- (4) A person who receives, acquires, possesses, or uses depleted uranium pursuant to the general license established by paragraph 1:

- (a) May not introduce such depleted uranium, in any form, into a chemical, physical, or metallurgical treatment or process, except a treatment or process for repair or restoration of any plating or other covering of the depleted uranium.
 - (b) May not abandon such depleted uranium.
 - (c) Shall transfer or dispose of such depleted uranium only by transfer in accordance with subsection 12 of section 33-10-03-05. In the case where the transferee receives the depleted uranium pursuant to the general license established by paragraph 1, the transferor shall furnish the transferee a copy of this article and a copy of form RAB-811 SFN 16092. In the case where the transferee receives the depleted uranium pursuant to a general license contained in the United States nuclear regulatory commission's or agreement state's regulation equivalent to paragraph 1, the transferor shall furnish the transferee a copy of this article and a copy of form RAB-811 SFN 16092 accompanied by a note explaining that use of the product or device is regulated by the United States nuclear regulatory commission or agreement state under requirements substantially the same as those in this article.
 - (d) Within thirty days of any transfer, shall report in writing to the department the name and address of the person receiving the depleted uranium pursuant to such transfer.
 - (e) May not export such depleted uranium except in accordance with a license issued by the United States nuclear regulatory commission pursuant to 10 CFR 110.
- (5) Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by paragraph 1 is exempt from the requirements of chapters 33-10-04.1 and 33-10-10 with respect to the depleted uranium covered by that general license.

2. General licenses - radioactive material other than source material.

- a. Certain devices and equipment. A general license is hereby issued to transfer, receive, acquire, own, possess, and use radioactive material incorporated in the following

devices or equipment which have been manufactured, tested, and labeled by the manufacturer in accordance with a specific license issued to the manufacturer by the United States nuclear regulatory commission for use pursuant to 10 CFR 31.3. This general license is subject to the provisions of sections 33-10-01-06 through 33-10-01-11, paragraph 2 of subdivision a of subsection 2 of section 33-10-03-02, subsections 7, 12, and 13 of section 33-10-03-05, and chapters 33-10-04.1, 33-10-10, and 33-10-13. (Attention is directed particularly to the provisions of chapter 33-10-04.1 which relate to the labeling of containers.)

- (1) Static elimination device. Devices designed for use as static eliminators which contain, as a sealed source or sources, radioactive material consisting of a total of not more than five hundred microcuries [18.5 megabecquerels] of polonium-210 per device.
- (2) Ion generating tube. Devices designed for ionization of air which contain, as a sealed source or sources, radioactive material consisting of a total of not more than five hundred microcuries [18.5 megabecquerels] of polonium-210 per device or a total of not more than fifty millicuries [1.85 gigabecquerels] of hydrogen-3 (tritium) per device.

b. Certain measuring, gauging, and controlling devices.

- (1) A general license is hereby issued to commercial and industrial firms and to research, educational, and medical institutions, individuals in the conduct of their business, and state or local government agencies to own, receive, acquire, possess, use, or transfer in accordance with the provisions of paragraphs 2, 3, and 4, radioactive material, excluding special nuclear material, contained in devices designed and manufactured for the purpose of detecting, measuring, gauging, or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.
- (2) The general license in paragraph 1 applies only to radioactive material contained in devices which have been manufactured and labeled in accordance with the specifications contained in a specific license issued by the department pursuant to subdivision d of subsection 5 of section 33-10-03-05 or in accordance with the specifications contained in a specific license issued by the United States nuclear regulatory commission, an agreement state, or a

licensing state which authorizes distribution of devices to persons generally licensed by the nuclear regulatory commission, an agreement state, or a licensing state. (Regulations under the Federal Food, Drug, and Cosmetic Act authorizing the use of radioactive control devices in food production require certain additional labeling thereon which is found in 21 CFR 179.21.)

- (3) Any person who owns, receives, acquires, possesses, uses, or transfers radioactive material in a device pursuant to the general license in paragraph 1:
- (a) Shall assure that all labels affixed to the device at the time of receipt, and bearing a statement that removal of the label is prohibited, are maintained thereon and shall comply with all instructions and precautions provided by such labels.
 - (b) Shall assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than six-month intervals or at such other intervals as are specified in the label; however:
 - [1] Devices containing only krypton need not be tested for leakage of radioactive material.
 - [2] Devices containing only tritium or not more than one hundred microcuries [3.7 megabecquerels] of other beta or gamma emitting material or ten microcuries [0.37 megabecquerels] of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose.
 - (c) Shall assure that other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:
 - [1] In accordance with the instructions provided by the labels; or
 - [2] By a person holding a specific license from the department, the United States nuclear regulatory commission, an agreement state, or a licensing state to perform such activities.

- (d) Shall maintain records showing compliance with the requirements of subparagraphs b and c. The records shall show the results of tests. The records also shall show the dates of performance of, and the names of persons performing, testing, installation servicing and removal from installation concerning the radioactive material, its shielding or containment. Records of tests for leakage of radioactive material required by subparagraph b must be maintained for two years after the required leak test is performed. Records of tests of the on-off mechanism and indicator required by subparagraph b must be maintained for two years after the required test of the on-off mechanism and indicator is performed. Records which are required by subparagraph c must be maintained for a period of two years from the date of the recorded event.
- (e) Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on-off mechanism or indicator, or upon the detection of five-thousandths microcurie [185 becquerels] or more removable radioactive material, shall immediately suspend operation of the device until it has been repaired by the manufacturer or other person holding a specific license from the department, the United States nuclear regulatory commission, an agreement state, or a licensing state to repair such devices, or disposed of by transfer to a person authorized by a specific license to receive the radioactive material contained in the device and, within thirty days, furnish to the department a report containing a brief description of the event and the remedial action taken.
- (f) Shall not abandon the device containing radioactive material.
- (g) Except as provided in subparagraph h, shall transfer or dispose of the device containing radioactive material only by transfer to a specific licensee of the department, the United States nuclear regulatory commission, an agreement state, or a licensing state whose specific license authorizes the person to receive the device and within thirty days after transfer of a device to a specific licensee shall furnish to the department a report

containing identification of the device by manufacturer's name and model number and the name and address of the person receiving the device. No report is required if the device is transferred to the specific licensee in order to obtain a replacement device.

(h) Shall transfer the device to another general licensee only:

[1] Where the device remains in use at a particular location. In such case the transferor shall give the transferee a copy of this chapter and any safety documents identified in the label on the device and within thirty days of the transfer, report to the department the manufacturer's name and model number of device transferred, the name and address of the transferee, and the name or position of an individual who may constitute a point of contact between the department and the transferee; or

[2] Where the device is held in storage in the original shipping container at its intended location of use prior to initial use by a general licensee.

(i) Shall comply with the provisions of subsections 1, 2, 3, and 5 of section 33-10-04.1-16 for reporting radiation incidents, theft, or loss of licensed material, but shall be exempt from the other requirements of chapters 33-10-04.1 and 33-10-10.

(4) The general license in paragraph 1 does not authorize the manufacture of devices containing radioactive material.

(5) The general license provided in paragraph 1 is subject to the provisions of sections 33-10-01-06 through 33-10-01-11, subsections 7, 12, and 13 of section 33-10-03-05, and chapter 33-10-13.

c. Luminous safety devices for aircraft.

(1) A general license is hereby issued to own, receive, acquire, possess, and use tritium or promethium-147 contained in luminous safety devices for use in aircraft, provided all of the following are met:

(a) Each device contains not more than ten curies [370 gigabecquerels] of tritium or three hundred

millicuries [11.1 gigabecquerels] of promethium-147.

- (b) Each device has been manufactured, assembled, or imported in accordance with a specific license issued by the United States nuclear regulatory commission, or each device has been manufactured or assembled in accordance with the specifications contained in a specific license issued by the department or any agreement state to the manufacturer or assembler of such device pursuant to licensing requirements equivalent to those in 10 CFR 32.53 of the regulations of the United States nuclear regulatory commission.
- (2) Persons who own, receive, acquire, possess, or use luminous safety devices pursuant to paragraph 1 shall comply with the provisions of subsections 1, 2, 3, and 5 of section 33-10-04.1-16 for reporting radiation incidents, theft, or loss of licensed material, but shall be exempt from the other requirements of chapters 33-10-04.1 and 33-10-10.
 - (3) This general license does not authorize the manufacture, assembly, or repair of luminous safety devices containing tritium or promethium-147.
 - (4) This general license does not authorize the ownership, receipt, acquisition, possession, or use of promethium-147 contained in instrument dials.
 - (5) This general license is subject to the provisions of sections 33-10-01-06 through 33-10-01-11, subsections 7, 12, and 13 of section 33-10-03-05, and chapter 33-10-13.
- d. Ownership of radioactive material. A general license is hereby issued to own radioactive material without regard to quantity. Notwithstanding any other provisions of this chapter, this general license does not authorize the manufacture, production, transfer, receipt, possession, or use of radioactive material.
- e. Calibration and reference sources.
- (1) A general license is hereby issued to those persons listed below to own, receive, acquire, possess, use, and transfer, in accordance with the provisions of paragraphs 4 and 5, americium-241 in the form of calibration or reference sources:
 - (a) Any person who holds a specific license issued by the department which authorizes the person to

receive, possess, use, and transfer radioactive material.

- (b) Any person who holds a specific license issued by the United States nuclear regulatory commission which authorizes the person to receive, possess, use, and transfer special nuclear material.
- (2) A general license is hereby issued to own, receive, possess, use, and transfer plutonium in the form of calibration or reference sources in accordance with the provisions of paragraphs 4 and 5 to any person who holds a specific license issued by the department which authorizes the person to receive, possess, use, and transfer radioactive material.
- (3) A general license is hereby issued to own, receive, possess, use, and transfer radium-226 in the form of calibration or reference sources in accordance with the provisions of paragraphs 4 and 5 to any person who holds a specific license issued by the department which authorizes the person to receive, possess, use, and transfer radioactive material.
- (4) The general licenses in paragraphs 1, 2, and 3 apply only to calibration or reference sources which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer or importer of the sources by the United States nuclear regulatory commission pursuant to 10 CFR 32.57 or 10 CFR 70.39 or which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer by the department, any agreement state or licensing state pursuant to licensing requirements equivalent to those contained in 10 CFR 32.57 or 10 CFR 70.39 of the regulations of the United States nuclear regulatory commission.
- (5) The general licenses provided in paragraphs 1, 2, and 3 are subject to the provisions of sections 33-10-01-06 through 33-10-01-11, subsections 7, 12, and 13 of section 33-10-03-05, and chapters 33-10-04.1, 33-10-10, and 33-10-13. In addition, persons who own, receive, acquire, possess, use, or transfer one or more calibration or reference sources pursuant to these general licenses:
- (a) Shall not possess at any one time, at any one location of storage or use, more than five microcuries [185 kilobecquerels] of americium-241, five microcuries [185

kilobecquerels] of plutonium, or five microcuries [185 kilobecquerels] of radium-226 in such sources.

- (b) Shall not receive, possess, use, or transfer such source unless the source, or the storage container, bears a label which includes the following statement or a substantially similar statement which contains the information called for in the following statement:

[1] The receipt, possession, use, and transfer of this source, Model _____, Serial No. _____, are subject to a general license and the regulations of the United States nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority. Do not remove this label.

CAUTION - RADIOACTIVE MATERIAL - THIS SOURCE CONTAINS (AMERICIUM-241). (PLUTONIUM) (Showing only the name of the appropriate material.) DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE.

Name of manufacturer or importer

[2] The receipt, possession, use, and transfer of this source, Model _____, Serial No. _____, are subject to a general license and the regulations of any licensing state. Do not remove this label.

CAUTION - RADIOACTIVE MATERIAL - THIS SOURCE CONTAINS RADIUM-226. DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE.

Name of manufacturer or importer

- (c) Shall not transfer, abandon, or dispose of such source except by transfer to a person authorized by a license from the department, the United States nuclear regulatory commission, an agreement state, or a licensing state to receive the source.
- (d) Shall store such source, except when the source is being used, in a closed container adequately designed and constructed to contain

americium-241, plutonium, or radium-226 which might otherwise escape during storage.

- (e) Shall not use such source for any purpose other than the calibration of radiation detectors or the standardization of other sources.
- (6) These general licenses do not authorize the manufacture of calibration or reference sources containing americium-241, plutonium, or radium-226.
- f. General license for use of radioactive material for certain in vitro clinical or laboratory testing. (The new drug provisions of the Federal Food, Drug, and Cosmetic Act also govern the availability and use of any specific diagnostic drugs in interstate commerce.)
 - (1) A general license is hereby issued to any physician, veterinarian, clinical laboratory, or hospital to receive, acquire, possess, transfer, or use, for any of the following stated tests, in accordance with the provisions of paragraphs 2, 3, 4, 5, and 6, the following radioactive materials in prepackaged units for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals:
 - (a) Carbon-14, in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (b) Cobalt-57, in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (c) Hydrogen-3 (tritium), in units not exceeding fifty microcuries [1.85 megabecquerels] each.
 - (d) Iodine-125, in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (e) Mock iodine-125 reference or calibration sources, in units not exceeding five-hundredths microcurie [185 becquerels] of iodine-129 and five-thousandths microcurie [185 becquerels] of americium-241 each.
 - (f) Iodine-131, in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (g) Iron-59, in units not exceeding twenty microcuries [740 kilobecquerels] each.

- (h) Selenium-75, in units not exceeding ten microcuries [370 kilobecquerels] each.
- (2) No person shall receive, acquire, possess, use, or transfer radioactive material pursuant to the general license established by paragraph 1 until the person has filed Department Form RAD-732 SFN 8423, "Certificate - In Vitro Testing with Radioactive Material Under General License", with the department and received from the department a validated copy of Department Form RAD-732 SFN 8423 with certification number assigned. The physician, veterinarian, clinical laboratory, or hospital shall furnish on Department Form RAD--732 SFN 8423 the following information and such other information as may be required by that form:
- (a) Name and address of the physician, veterinarian, clinical laboratory, or hospital.
 - (b) The location of use.
 - (c) A statement that the physician, veterinarian, clinical laboratory, or hospital has appropriate radiation measuring instruments to carry out in vitro clinical or laboratory tests with radioactive material as authorized under the general license in paragraph 1 and that such tests will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive material.
- (3) A person who receives, acquires, possesses, or uses radioactive material pursuant to the general license established by paragraph 1 shall comply with the following:
- (a) The general licensee shall not possess at any one time, pursuant to the general license in paragraph 1, at any one location of storage or use, a total amount of iodine-125, iodine-131, selenium-75, iron-59, or cobalt-57 in excess of two hundred microcuries [7.4 megabecquerels].
 - (b) The general licensee shall store the radioactive material, until used, in the original shipping container or in a container providing equivalent radiation protection.
 - (c) The general licensee shall use the radioactive material only for the uses authorized by paragraph 1.

- (d) The general licensee shall not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the department, the United States nuclear regulatory commission, any agreement state, or a licensing state, nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the supplier.
 - (e) The general licensee shall dispose of the mock iodine-125 reference or calibration sources described in subparagraph e of paragraph 1 as required by subsection 1 of section 33-10-04.1-14.
- (4) The general licensee shall not receive, acquire, possess, or use radioactive material pursuant to paragraph 1:
- (a) Except as prepackaged units which are labeled in accordance with the provisions of a specific license issued by the United States nuclear regulatory commission, any agreement state, or a licensing state which authorizes the manufacture and distribution of iodine-125, iodine-131, carbon-14, hydrogen-3 (tritium), iron-59, selenium-75, cobalt-57, or mock iodine-125 to persons generally licensed under this subdivision or its equivalent; and
 - (b) Unless one of the following statements, as appropriate, or a substantially similar statement which contains the information called for in one of the following statements, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

[1] This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of the United States nuclear regulatory commission or of a state with which the

commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

[2] This radioactive material shall be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of a licensing state.

Name of manufacturer

- (5) The physician, veterinarian, clinical laboratory, or hospital possessing or using radioactive material under the general license of paragraph 1 shall report, in writing, to the department, any changes in the information furnished by the physician, veterinarian, clinical laboratory, or hospital in the "Certificate - In Vitro Testing with Radioactive Material Under General License", Department Form RAB 732 SFN 8423. The report shall be furnished within thirty days after the effective date of such change.
- (6) Any person using radioactive material pursuant to the general license of paragraph 1 is exempt from the requirements of chapters 33-10-04.1 and 33-10-10 with respect to radioactive material covered by that general license. However, persons using mock iodine-125 reference or calibration sources described in subparagraph e of paragraph 1 shall comply with the provisions of subsection 1 of section 33-10-04.1-14 and subsections 1, 2, 3, and 5 of section 33-10-04.1-16.

g. Ice detection devices.

- (1) A general license is hereby issued to own, receive, acquire, possess, use, and transfer strontium-90 contained in ice detection devices, provided each device contains not more than fifty microcuries [1.85 megabecquerels] of strontium-90 and each device has been manufactured or imported in accordance with a specific license issued by the United States nuclear

regulatory commission or each device has been manufactured in accordance with the specifications contained in a specific license issued by the department or any agreement state to the manufacturer of such device pursuant to licensing requirements equivalent to those in 10 CFR 32.61.

- (2) Persons who own, receive, acquire, possess, use, or transfer strontium-90 contained in ice detection devices pursuant to the general license in paragraph 1:
 - (a) Shall, upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating to the device, discontinue use of the device until it has been inspected, tested for leakage and repaired by a person holding a specific license from the United States nuclear regulatory commission or an agreement state to manufacture or service such devices; or shall dispose of the device pursuant to the provisions of subsection 1 of section 33-10-04.1-14.
 - (b) Shall assure that all labels affixed to the device at the time of receipt, and which bear a statement which prohibits removal of the labels, are maintained thereon.
 - (c) Are exempt from the requirements of chapters 33-10-04.1 and 33-10-10 except that such persons shall comply with the provisions of subsection 1 of section 33-10-04.1-14, and subsections 1, 2, 3, and 5 of section 33-10-04.1-16.
- (3) This general license does not authorize the manufacture, assembly, disassembly, or repair of strontium-90 in ice detection devices.
- (4) This general license is subject to the provisions of sections 33-10-01-06 through 33-10-01-11, subsections 7, 12, and 13 of section 33-10-03-05, and chapter 33-10-13.

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General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-03-05. Specific licenses.

1. Filing application for specific licenses.

- a. Applications for specific licenses shall be filed on a form prescribed by the department.
 - b. The department may at any time after the filing of the original application, and before the expiration of the license, require further statements in order to enable the department to determine whether the application should be granted or denied or whether a license should be modified or revoked.
 - c. Each application shall be signed by the applicant or licensee or a person duly authorized to act for and on the applicant's behalf.
 - d. An application for a license may include a request for a license authorizing one or more activities.
 - e. In the application, the applicant may incorporate by reference information contained in previous applications, statements, or reports filed with the department provided such references are clear and specific.
 - f. Applications and documents submitted to the department shall be made available for public inspection except that the department may withhold any document or part thereof which is protected from disclosure by state and federal law or rule, including protection of trade secrets and individual medical records, as afforded by North Dakota Century Code section 23-20.1-09.1 from public inspection if disclosure of its content is not required in the public interest and would adversely affect the interest of a person concerned.
 - g. Each application for a specific license shall be accompanied by the fee prescribed in chapter 33-10-11.
2. **General requirements for the issuance of specific licenses.** A license application will be approved if the department determines all of the following:
- a. The applicant is qualified by reason of training and experience to use the material in question for the purpose requested in accordance with this article in such a manner as to minimize danger to public health and safety or property.
 - b. The applicant has a permanent in-state office.
 - c. The applicant's proposed equipment, facilities, and procedures are adequate to minimize danger to public health and safety or property.

- d. The issuance of the license will not be inimical to the health and safety of the public.
- e. The applicant satisfies any applicable special requirements in subsections 3, 4, 5, or 14, and in chapters 33-10-05, 33-10-07, and 33-10-12.
- f. Environmental report, commencement of construction. In the case of an application for a license to receive and possess radioactive material for commercial waste disposal by land burial, source material milling, or for the conduct of any other activity which the department determines will significantly affect the quality of the environment, the department, before commencement of construction of the plant or facility in which the activity will be conducted, has concluded, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. Commencement of construction prior to such conclusion shall be grounds for denial of a license to receive and possess radioactive material in such plant or facility. As used in this paragraph the term "commencement of construction" means any clearing of land, excavation, or other substantial action that would adversely affect the environment of a site. The term does not mean site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring or testing to establish background information related to the suitability of the site or the protection of environmental values.
- g. Financial surety arrangements for site reclamation.
 - (1) Pursuant to North Dakota Century Code section 23-20.1-04.2 and as otherwise provided, financial surety arrangements for site reclamation which may consist of surety bonds, cash deposits, certificates of deposit, deposits of government securities, letters or lines of credit, or any combination of the above for the categories of licensees listed in paragraph 4 shall be established to ensure the protection of the public health and safety in the event of abandonment, default, or other inability of the licensee to meet the requirements of the North Dakota Century Code and this article.
 - (a) The amount of funds to be ensured by such surety arrangements shall be based on department-approved cost estimates.

- (b) Self-insurance, or any arrangement which essentially constitutes self-insurance, will not satisfy the surety requirement since this provides no additional assurance other than that which already exists through license requirements.
- (2) The arrangements required in paragraph 1 shall be established prior to issuance of the license to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the facility.
 - (3) The following specific licensees are required to make financial surety arrangements:
 - (a) Major processors.
 - (b) Waste handling licensees.
 - (c) Former United States atomic energy commission or United States nuclear regulatory commission licensed facilities.
 - (d) Source material milling operations.
 - (e) All others except persons exempt pursuant to paragraph 5.
 - (4) For source material milling operations, the amount of funds to be ensured by such surety arrangements shall be based on department-approved cost estimates in an approved plan for (a) decontamination and decommissioning of mill buildings and the milling site to levels which would allow unrestricted use of these areas upon decommissioning, and (b) the reclamation of tailings or waste disposal areas in accordance with the technical criteria delineated in chapter 33-10-03. The licensee shall submit this plan in conjunction with an environmental report that addresses the expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and evaluates alternatives for mitigating these impacts. In addition, the surety shall cover the payment of the charge for long-term surveillance and control required by the department. In establishing specific surety arrangements, the licensee's cost estimates shall take into account total costs that would be incurred if an independent contractor were hired to perform the decommissioning and reclamation work. In order to avoid unnecessary duplication and expense, the department may accept financial sureties that have been consolidated with

financial or surety arrangements established to meet requirements of other federal or state agencies or local governing bodies for such decommissioning, decontamination, reclamation, and long-term site surveillance, provided such arrangements are considered adequate to satisfy these requirements and that portion of the surety which covers the decommission and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge are clearly identified. The licensee's surety mechanism will be reviewed annually by the department to assure that sufficient funds will be available for completion of the reclamation plan if the work had to be performed by an independent contractor. The amount of surety liability should be adjusted to recognize any increases or decreases resulting from inflation, changes in engineering plans, activities performed, and any other conditions affecting costs. Regardless of whether reclamation is phased through the life of the operation or takes place at the end of operations, an appropriate portion of surety liability shall be retained until final compliance with the reclamation plan is determined. This will yield a surety that is at least sufficient at all times to cover the costs of decommissioning and reclamation of the areas that are expected to be disturbed before the next license renewal. The term of the surety mechanism must be open ended, unless it can be demonstrated that another arrangement would provide an equivalent level of assurance. This assurance could be provided with a surety instrument which is written for a specified period of time, e.g., five years, yet which must be automatically renewed unless the surety notifies the beneficiary (the department) and the principal (the licensee) some reasonable time, e.g., ninety days, prior to the renewal date of their intention not to renew. In such a situation the surety requirement still exists and the licensee would be required to submit an acceptable replacement surety within a brief period of time to allow at least sixty days for the department to collect.

- (5) The following persons are exempt from the requirements of paragraph 1:
 - (a) All state, local, or other government agencies, unless they are subject to subparagraph b of paragraph 3.
 - (b) Persons authorized to possess no more than one thousand times the quantity specified in

Schedule B, exempt quantities, or combination of radioactive material listed therein as given in Schedule B.

- (c) Persons authorized to possess hydrogen-3 contained as hydrogen gas in a sealed source.
 - (d) Persons authorized to possess radioactive noble gases in sealed sources with no radioactive daughter product with half-life greater than thirty days.
- (6) As provided by subsection 14 of section 33-10-03-05, certain applications for specific licenses must contain a proposed decommissioning funding plan or a certificate of financial assurance for decommissioning. In the case of renewal applications submitted before January 1, 1994, this submittal may follow the renewal application but must be submitted on or before January 1, 1994.
- h. Long-term care requirements. Pursuant to North Dakota Century Code section 23-20.1-04.2, and as otherwise provided, a long-term care trust fund shall be established by the following specific licensees prior to the issuance of the license. (Long-term care funding may also be required for former United States atomic energy commission or United States nuclear regulatory commission licensed facilities.)
- (1) Waste handling licensees.
 - (2) Source material milling licensees.
- i. Continued surveillance requirements for source material mills.
- (1) The final disposition of tailings or wastes at source material milling sites should be such that the need for ongoing active maintenance is not necessary to preserve isolation. As a minimum, annual site inspections shall be conducted by the department retaining ultimate custody of the site where tailings or wastes are stored to confirm the integrity of the stabilized tailings or waste systems and to determine the need, if any, for maintenance or monitoring. Results of the inspection shall be reported to the United States nuclear regulatory commission within sixty days following each inspection, if, on the basis of a site-specific evaluation, such a need appears necessary due to the features of a particular tailings or waste disposal system.

- (2) A minimum charge of two hundred fifty thousand dollars (1978 dollars) to cover the costs of long-term surveillance shall be paid by each mill operator to the department prior to the termination of a uranium or thorium mill license. If site surveillance or control requirements at a particular site are determined, on the basis of a site-specific evaluation, to be significantly greater than those specified in paragraph 1, e.g., if fencing is determined to be necessary, variance in funding requirements may be specified by the department. The total charge to cover the costs of long-term surveillance shall be such that, with an assumed one percent annual real interest rate, the collected funds will yield interest in an amount sufficient to cover the annual costs of site surveillance. The charge will be adjusted annually prior to actual payments to recognize inflation. The inflation rate to be used is that indicated by the change in the consumer price index published by the United States department of labor, bureau of labor statistics.

3. Special requirements for issuance of certain specific licenses for radioactive material.

- a. Use of sealed sources in industrial radiography. In addition to the requirements set forth in subsection 2, a specific license for use of sealed sources in industrial radiography will be issued if all of the following are met:

- (1) The applicant will have an adequate program for training radiographic personnel and submits to the department a schedule or description of such program which specifies the:
 - (a) Initial training.
 - (b) Periodic training.
 - (c) On-the-job training.
 - (d) Means to be used by the licensee to determine the radiographic personnel's knowledge and understanding of and ability to comply with this article and licensing requirements, and the operating and emergency procedures of the applicant.
- (2) The applicant has established and submits to the department satisfactory written operating and emergency procedures described in subsection 2 of section 33-10-05-06.

- (3) The applicant will have an internal inspection system adequate to assure that this article, license provisions, and the applicant's operating and emergency procedures are followed by radiographic personnel; the inspection system must include the performance of internal inspections at intervals not to exceed three months and the retention of records of such inspections for two years.
 - (4) The applicant submits to the department a description of the applicant's overall organizational structure pertaining to the industrial radiography program, including specified delegations of authority and responsibility for operation of the program.
 - (5) The applicant who desires to conduct the applicant's own leak tests has established adequate procedures to be followed in testing sealed sources for possible leakage and contamination and submits to the department a description of such procedures including:
 - (a) Instrumentation to be used.
 - (b) Method of performing tests.
 - (c) Pertinent experience of the individual who will perform the test.
 - (6) The licensee shall conduct a program for inspection and maintenance of radiographic exposure devices and storage containers to assure proper functioning of components important to safety.
- b. Possession of radioactive materials in unsealed form on foils or plated sources or sealed in glass in excess of the quantities in Schedule E "quantities of radioactive materials requiring consideration of the need for an emergency plan for responding to a release". In addition to the requirements set forth in subsection 2, a specific license for the possession of large quantities of radioactive materials in unsealed form on foils or plated sources or sealed in glass will be issued if either of the following are submitted and approved by the department:
- (1) An evaluation showing that the maximum dose to a person offsite due to a release of radioactive materials should not exceed one rem effective dose equivalent or five rems to the thyroid; or
 - (2) An emergency plan for responding to a release of radioactive material.

- (3) One or more of the following factors may be used to support an evaluation submitted under paragraph 1:
- (a) The radioactive material is physically separated so that only a portion could be involved in an accident;
 - (b) All or part of the radioactive material is not subject to release during an accident because of the way it is stored or packaged;
 - (c) The release fraction in the respirable size range would be lower than the release fraction shown in Schedule E due to the chemical or physical form of material;
 - (d) The solubility of the radioactive material would reduce the dose received;
 - (e) Facility design or engineered safety features in the facility would cause the release fraction to be lower than shown in Schedule E;
 - (f) Operating restrictions or procedures would prevent a release fraction as large as that shown in Schedule E; or
 - (g) Other factors appropriate for the specific facility.
- (4) An emergency plan for responding to a release of radioactive material submitted under paragraph 2 must include the following information:
- (a) Facility description. A brief description of the licensee's facility and area near the site.
 - (b) Types of accidents. An identification of each type of radioactive materials accident for which protective actions may be needed.
 - (c) Classification of accidents. A classification system for classifying accidents as alerts or site area emergencies.
 - (d) Detection of accidents. Identification of the means of detecting each type of accident in a timely manner.
 - (e) Mitigation of consequences. A brief description of the means and equipment for mitigating the consequences of each type of accident, including those provided to protect workers onsite, and a

description of the program for maintaining the equipment.

- (f) Assessment of releases. A brief description of the methods and equipment to assess releases of radioactive materials.
- (g) Responsibilities. A brief description of the responsibilities of licensee personnel should an accident occur, including identification of personnel responsible for promptly notifying offsite response organizations and the department; also responsibilities for developing, maintaining, and updating the plan.
- (h) Notification and coordination. A commitment to a brief description of the means to promptly notify offsite response organizations and request offsite assistance, including medical assistance for the treatment of contaminated injured onsite workers when appropriate. A control point must be established. The notification and coordination must be planned so that unavailability of some personnel, parts of the facility, and some equipment will not prevent the notification and coordination. The licensee shall also commit to notify the department immediately after notification of the appropriate offsite response organizations and not later than one hour after the licensee declares an emergency.
- (i) Information to be communicated. A brief description of the type of information on facility status, radioactive releases, and recommended protective actions, if necessary, to be given to offsite response organizations and to the department.
- (j) Training. A brief description of the frequency, performance objectives, and plans for the training that the licensee will provide workers on how to respond to an emergency including any special instructions and orientation tours the licensee would offer to fire, police, medical, and other emergency personnel. The training shall familiarize personnel with site-specific emergency procedures. Also, the training shall thoroughly prepare site personnel for their responsibilities in the event of accident scenarios postulated as most probable for the specific site, including the use of team training for such scenarios.

- (k) Safe shutdown. A brief description of the means of restoring the facility to a safe condition after an accident.
 - (l) Exercises. Provisions for conducting quarterly communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies. Quarterly communications checks with offsite response organizations must include the check and update of all necessary telephone numbers. The licensee shall invite offsite response organizations to participate in the biennial exercises. Participation of offsite response organizations in biennial exercises although recommended is not required. Exercises must use accident scenarios postulated as most probable for the specific site and the scenarios shall not be known to most exercise participants. The licensee shall critique each exercise using individuals not having direct implementation responsibility for the plan. Critiques of exercises must evaluate the appropriateness of the plan, emergency procedures, facilities, equipment, training of personnel, and overall effectiveness of the response. Deficiencies found by the critiques must be corrected.
 - (m) Hazardous chemicals. A certification that the applicant has met its responsibilities under the Emergency Planning and Community Right-to-Know Act of 1986, title III, Pub. L. 99-499, if applicable to the applicant's activities at the proposed place of use of the byproduct material.
- (5) The licensee shall allow the offsite response organizations expected to respond in case of an accident sixty days to comment on the licensee's emergency plan before submitting it to the department. The licensee shall provide any comments received within the sixty days to the department with the emergency plan.

4. **Special requirements for specific licenses of broad scope.** This subsection prescribes requirements for the issuance of specific licenses of broad scope for radioactive material and certain rules governing holders of such licenses. (Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only

from the United States nuclear regulatory commission, Washington, D.C. 20555.)

a. The different types of broad licenses are set forth below:

- (1) A "type A specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use, and transfer of any chemical or physical form of the radioactive material specified in the license, but not exceeding quantities specified in the license, for any authorized purpose. The quantities specified are usually in the multicurie range.
- (2) A "type B specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use, and transfer of any chemical or physical form of radioactive material specified in Schedule C, for any authorized purpose. The possession limit for a type B license of broad scope, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in Schedule C, column I. If two or more radionuclides are possessed thereunder, the possession limit for each is determined as follows: For each radionuclide, determine the ratio of the quantity possessed to the applicable quantity specified in Schedule C, column I, for that radionuclide. The sum of the ratios for all radionuclides possessed under the license shall not exceed unity.
- (3) A "type C specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use, and transfer of any chemical or physical form of radioactive material specified in Schedule C, for any authorized purpose. The possession limit for a type C license of broad scope, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in Schedule C, column II. If two or more radionuclides are possessed thereunder, the possession limit is determined for each as follows: For each radionuclide determine the ratio of the quantity possessed to the applicable quantity specified in Schedule C, column II, for that radionuclide. The sum of the ratios for all radionuclides possessed under the license shall not exceed unity.

b. An application for a type A specific license of broad scope will be approved if all of the following are met:

- (1) The applicant satisfies the general requirements specified in subsection 2.
 - (2) The applicant has engaged in a reasonable number of activities involving the use of radioactive material.
 - (3) The applicant has established administrative controls and provisions relating to organization and management, procedures, recordkeeping, material control and accounting, and management review that are necessary to assure safe operations, including:
 - (a) The establishment of a radiation safety committee composed of such persons as a radiation safety officer, a representative of management, and persons trained and experienced in the safe use of radioactive material.
 - (b) The appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters.
 - (c) The establishment of appropriate administrative procedures to assure:
 - [1] Control of procurement and use of radioactive material.
 - [2] Completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures.
 - [3] Review, approval, and recording by the radiation safety committee of safety evaluation of proposed uses prepared in accordance with item 2 of this subparagraph prior to use of the radioactive material.
- c. An application for a type B specific license of broad scope will be approved if all of the following are met:
- (1) The applicant satisfies the general requirements specified in subsection 2.
 - (2) The applicant has established administrative controls and provisions relating to organization and management, procedures, recordkeeping, material

control and accounting, and management review that are necessary to assure safe operations, including:

- (a) The appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters.
 - (b) The establishment of appropriate administrative procedures to assure:
 - [1] Control of procurement and use of radioactive material.
 - [2] Completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures.
 - [3] Review, approval, and recording by the radiation safety officer of safety evaluations of proposed uses prepared in accordance with item 2 of this subparagraph prior to use of the radioactive material.
- d. An application for a type C specific license of broad scope will be approved if all of the following are met:
- (1) The applicant satisfies the general requirements specified in subsection 2.
 - (2) The applicant submits a statement that radioactive material will be used only by, or under the direct supervision of, individuals who have received all of the following:
 - (a) A college degree at the bachelor level, or equivalent training and experience, in the physical or biological sciences or in engineering.
 - (b) At least forty hours of training and experience in the safe handling of radioactive material, and in the characteristics of ionizing radiation, units of radiation dose and quantities, radiation detection instrumentation, and biological hazards of exposure to radiation appropriate to the type and forms of radioactive material to be used.

- (3) The applicant has established administrative controls and provisions relating to procurement of radioactive material, procedures, recordkeeping, material control and accounting, and management review necessary to assure safe operations.
- e. Specific licenses of broad scope are subject to the following conditions:
- (1) Unless specifically authorized, persons licensed pursuant to this subsection shall not:
 - (a) Conduct tracer studies in the environment involving direct release of radioactive material.
 - (b) Receive, acquire, own, possess, use, or transfer devices containing one hundred thousand curies [3.7 petabecquerels] or more of radioactive material in sealed sources used for irradiation of materials.
 - (c) Conduct activities for which a specific license issued by the department under subdivision a of subsection 3, subsection 5, or chapter 33-10-07, is required.
 - (d) Add or cause the addition of radioactive material to any food, beverage, cosmetic, drug, or other product designed for ingestion or inhalation by, or application to, a human being.
 - (2) Each type A specific license of broad scope issued under this subsection shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety committee.
 - (3) Each type B specific license of broad scope issued under this subsection shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety officer.
 - (4) Each type C specific license of broad scope issued under this subsection shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals who satisfy the requirements of subdivision d.

5. **Special requirements for specific license to manufacture, assemble, repair, or distribute commodities, products, or devices which contain radioactive material.**

a. Licensing the introduction of radioactive material into products in exempt concentrations.

(1) In addition to the requirements set forth in subsection 2, a specific license authorizing the introduction of radioactive material into a product or material owned by or in the possession of the licensee or another to be transferred to persons exempt under paragraph 1 of subdivision a of subsection 2 of section 33-10-03-02 will be issued if:

(a) The applicant submits a description of the product or material into which the radioactive material will be introduced, intended use of the radioactive material and the product or material into which it is introduced, method of introduction, initial concentration of the radioactive material in the product or material, control methods to assure that no more than the specified concentration is introduced into the product or material, estimated time interval between introduction and transfer of the product or material, and estimated concentration of the radioactive material in the product or material at the time of transfer.

(b) The applicant provides reasonable assurance that the concentrations of radioactive material at the time of transfer will not exceed the concentrations in Schedule A, that reconcentration of the radioactive material in concentrations exceeding those in Schedule A is not likely, that use of lower concentrations is not feasible, and that the product or material is not likely to be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

(2) Each person licensed under this subsection shall file an annual report with the department which shall identify the type and quantity of each product or material into which radioactive material has been introduced during the reporting period; name and address of the person who owned or possessed the product or material, into which radioactive material has been introduced, at the time of introduction; the type and quantity of radionuclide introduced into

each such product or material; and the initial concentrations of the radionuclide in the product or material at time of transfer of the radioactive material by the licensee. If no transfers of the radioactive material have been made pursuant to this subdivision during the reporting period, the report shall so indicate. The report shall cover the year ending June thirtieth, and shall be filed within thirty days thereafter.

b. Licensing the distribution of radioactive material in exempt quantities. (Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the United States nuclear regulatory commission, Washington, D.C. 20555.)

(1) An application for a specific license to distribute naturally occurring and accelerator-produced radioactive material to persons exempted from this article pursuant to subdivision b of subsection 2 of section 33-10-03-02 will be approved if all of the following are met:

(a) The radioactive material is not contained in any food, beverage, cosmetic, drug, or other commodity designed for ingestion or inhalation by, or application to, a human being.

(b) The radioactive material is in the form of processed chemical elements, compounds, or mixtures, tissue samples, bioassay samples, counting standards, plated or encapsulated sources, or similar substances, identified as radioactive and to be used for its radioactive properties, but is not incorporated into any manufactured or assembled commodity, product, or device intended for commercial distribution.

(c) The applicant submits copies of prototype labels and brochures and the department approves such labels and brochures.

(2) The license issued under paragraph 1 is subject to the following conditions:

(a) No more than ten exempt quantities shall be sold or transferred in any single transaction. However, an exempt quantity may be composed of fractional parts of one or more of the exempt

quantity provided the sum of the fractions shall not exceed unity.

- (b) Each exempt quantity shall be separately and individually packaged. No more than ten such packaged exempt quantities shall be contained in any outer package for transfer to persons exempt pursuant to subdivision b of subsection 2 of section 33-10-03-02. The outer package shall be such that the dose rate at the external surface of the package does not exceed one-half millirem [5 microsieverts] per hour.
 - (c) The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label which (1) identifies the radionuclide and the quantity of radioactivity, and (2) bears the words "radioactive material".
 - (d) In addition to the labeling information required by subparagraph c, the label affixed to the immediate container, or an accompanying brochure, shall (1) state that the contents are exempt from licensing state requirements; (2) bear the words "radioactive material - not for human use - introduction into foods, beverages, cosmetics, drugs, or medicinals, or into products manufactured for commercial distribution is prohibited - exempt quantities should not be combined"; and (3) set forth appropriate additional radiation safety precautions and instructions relating to the handling, use, storage, and disposal of the radioactive material.
- (3) Each person licensed under this subdivision shall maintain records identifying, by name and address, each person to whom radioactive material is transferred for use under subdivision b of subsection 2 of section 33-10-03-02 or the equivalent regulations of a licensing state, and stating the kinds and quantities of radioactive material transferred. An annual summary report stating the total quantity of each radionuclide transferred under the specific license shall be filed with the department. Each report shall cover the year ending June thirtieth, and shall be filed within thirty days thereafter. If no transfers of radioactive material have been made pursuant to this subdivision during the reporting period, the report shall so indicate.

- c. Licensing the incorporation of naturally occurring and accelerator-produced radioactive material into gas and aerosol detectors. An application for a specific license authorizing the incorporation of naturally occurring and accelerator-produced radioactive material into gas and aerosol detectors to be distributed to persons exempt under paragraph 3 of subdivision c of subsection 2 of section 33-10-03-02 will be approved if the application satisfies requirements equivalent to those contained in 10 CFR 32.26. The maximum quantity of radium-226 in each device may not exceed one-tenth microcurie [3.7 kilobecquerels].
- d. Licensing the manufacture and distribution of devices to persons generally licensed under subdivision b of subsection 2 of section 33-10-03-04.
 - (1) An application for a specific license to manufacture or distribute devices containing radioactive material, excluding special nuclear material, to persons generally licensed under subdivision b of subsection 2 of section 33-10-03-04 or equivalent regulations of the United States nuclear regulatory commission, an agreement state, or a licensing state will be approved if:
 - (a) The applicant satisfies the general requirements of subsection 2 of this section.
 - (b) The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control, labels, proposed uses, installation, servicing, leak testing, operating and safety instructions, and potential hazards of the device to provide reasonable assurance that:
 - [1] The device can be safely operated by persons not having training in radiological protection.
 - [2] Under ordinary conditions of handling, storage, and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in any period of one calendar year a dose in excess of ten percent of the limits specified in subsection 1 of section 33-10-04.1-06.

nuclear regulatory commission or a state with which the United States nuclear regulatory commission has entered into an agreement for the exercise of regulatory authority. (The model, serial number, and name of manufacturer or distributor may be omitted from this label provided the information is elsewhere specified in labeling affixed to the device.) This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION-RADIOACTIVE MATERIAL

(name of manufacturer or distributor)

[b] The receipt, possession, use, and transfer of this device Model _____, Serial No. _____, are subject to a general license or the equivalent and the regulations of a licensing state. (The model, serial number, and name of manufacturer or distributor may be omitted from this label provided the information is elsewhere specified in labeling affixed to the device.) This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION-RADIOACTIVE MATERIAL

(name of manufacturer or distributor)

- (2) In the event the applicant desires that the device be required to be tested at intervals longer than six months, either for proper operation of the on-off mechanism and indicator, if any, or for leakage of radioactive material or for both, the applicant shall include in the application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the device or similar devices and by design features which have a significant bearing on the probability or consequences of leakage of radioactive material from the device or failure of the on-off mechanism and indicator. In determining the acceptable interval for the test for leakage of radioactive material, the

department will consider information which includes, but is not limited to:

- (a) Primary containment or source capsule.
 - (b) Protection of primary containment.
 - (c) Method of sealing containment.
 - (d) Containment construction materials.
 - (e) Form of contained radioactive material.
 - (f) Maximum temperature withstood during prototype test.
 - (g) Maximum pressure withstood during prototype tests.
 - (h) Maximum quantity of contained radioactive material.
 - (i) Radiotoxicity of contained radioactive material.
 - (j) Operating experience with identical devices or similarly designed and constructed devices.
- (3) In the event the applicant desires that the general licensee under subdivision b of subsection 2 of section 33-10-03-04, or under equivalent regulations of the United States nuclear regulatory commission, an agreement state, or a licensing state, be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on-off mechanism and indicator, or remove the device from installation, the applicant shall include in the application written instructions to be followed by the general licensee, estimated calendar quarter doses associated with such activity or activities, and basis for such estimates. The submitted information shall demonstrate that performance of such activity or activities by an individual untrained in radiological protection, in addition to other handling, storage, and use of devices under the general license, is unlikely to cause that individual to receive a calendar year dose in excess of ten percent of the limits specified in subsection 1 of section 33-10-04.1-06.
- (4) Each person licensed under subdivision d to distribute devices to generally licensed persons shall:

- (a) Furnish a copy of the general license contained in subdivision b of subsection 2 of section 33-10-03-04 to each person to whom the person directly or through an intermediate person transfers radioactive material in a device for use pursuant to the general license contained in subdivision b of subsection 2 of section 33-10-03-04.
- (b) Furnish a copy of the general license contained in the United States nuclear regulatory commission's, agreement state's, or licensing state's regulation equivalent to subdivision b of subsection 2 of section 33-10-03-04, or alternatively, furnish a copy of the general license contained in subdivision b of subsection 2 of section 33-10-03-04 to each person to whom the person directly or through an intermediate person transfers radioactive material in a device for use pursuant to the general license of the United States nuclear regulatory commission, the agreement state, or the licensing state. If a copy of the general license in subdivision b of subsection 2 of section 33-10-03-04 is furnished to such a person, it shall be accompanied by a note explaining that the use of the device is regulated by the United States nuclear regulatory commission, agreement state or licensing state under requirements substantially the same as those in subdivision b of subsection 2 of section 33-10-03-04.
- (c) Report to the department all transfers of such devices to persons for use under the general license in subdivision b of subsection 2 of section 33-10-03-04. Such report shall identify each general licensee by name and address, an individual by name or position who may constitute a point of contact between the department and the general licensee, the type and model number of device transferred, and the quantity and type of radioactive material contained in the device. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. If no transfers have been made to persons generally licensed under subdivision b of subsection 2 of section 33-10-03-04 during the reporting period,

the report shall so indicate. The report shall cover each calendar quarter and shall be filed within thirty days thereafter.

(d) Furnish reports to other agencies.

[1] Report to the United States nuclear regulatory commission all transfers of such devices to persons for use under the United States nuclear regulatory commission general license in 10 CFR 31.5.

[2] Report to the responsible state agency all transfers of devices manufactured and distributed pursuant to subdivision d for use under a general license in that state's regulations equivalent to subdivision b of subsection 2 of section 33-10-03-04.

[3] Such reports shall identify each general licensee by name and address, an individual by name or position who may constitute a point of contact between the department and the general licensee, the type and model of the device transferred, and the quantity and type of radioactive material contained in the device. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. The report shall be submitted within thirty days after the end of each calendar quarter in which such a device is transferred to the generally licensed person.

[4] If no transfers have been made to United States nuclear regulatory commission licensees during the reporting period, this information shall be reported to the United States nuclear regulatory commission.

[5] If no transfers have been made to general licensees within a particular state during the reporting period, this information shall be reported to the responsible state agency upon request of the agency.

(e) Keep records showing the name, address, and the point of contact for each general licensee to

whom the licensee directly or through an intermediate person transfers radioactive material in devices for use pursuant to the general license provided in subdivision b of subsection 2 of section 33-10-03-04, or equivalent regulations of the United States nuclear regulatory commission or an agreement state or a licensing state. The records should show the date of each transfer, the radionuclide and the quantity of radioactivity in each device transferred, the identity of any intermediate person, and compliance with the report requirements of this paragraph.

- e. Special requirements for the manufacture, assembly, or repair of luminous safety devices for use in aircraft. An application for a specific license to manufacture, assemble, or repair luminous safety devices containing tritium or promethium-147 for use in aircraft, for distribution to persons generally licensed under subdivision c of subsection 2 of section 33-10-03-04 will be approved if:
 - (1) The applicant satisfies the general requirements specified in subsection 2 of this section.
 - (2) The applicant satisfies the requirements of 10 CFR 32.53, 32.54, 32.55, 32.56, and 32.101 or their equivalent.

- f. Special requirements for license to manufacture calibration sources containing americium-241, plutonium, or radium-226 for distribution to persons generally licensed under subdivision e of subsection 2 of section 33-10-03-04. An application for a specific license to manufacture calibration and reference sources containing americium-241, plutonium, or radium-226 to persons generally licensed under subdivision e of subsection 2 of section 33-10-03-04 will be approved if:
 - (1) The applicant satisfies the general requirement of subsection 2 of this section.
 - (2) The applicant satisfies the requirements of 10 CFR 32.57, 32.58, 32.59, and 32.102 and 10 CFR 70.39 or their equivalent.

- g. Manufacture and distribution of radioactive material for certain in vitro clinical or laboratory testing under general license. An application for a specific license to manufacture or distribute radioactive material for use under the general license of subdivision f of subsection 2 of section 33-10-03-04 will be approved if:

- (1) The applicant satisfies the general requirements specified in subsection 2 of this section.
- (2) The radioactive material is to be prepared for distribution in prepackaged units of:
 - (a) Carbon-14 in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (b) Cobalt-57 in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (c) Hydrogen-3 (tritium) in units not exceeding fifty microcuries [1.85 megabecquerels] each.
 - (d) Iodine-125 in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (e) Mock iodine-125 in units not exceeding five-hundredths microcurie [1.85 kilobecquerels] of iodine-129 and five-thousandths microcurie [185 becquerels] of americium-241 each.
 - (f) Iodine-131 in units not exceeding ten microcuries [370 kilobecquerels] each.
 - (g) Iron-59 in units not exceeding twenty microcuries [740 kilobecquerels] each.
 - (h) Selenium-75 in units not exceeding ten microcuries [370 kilobecquerels] each.
- (3) Each prepackaged unit bears a durable, clearly visible label:
 - (a) Identifying the radioactive contents as to chemical form and radionuclide, and indicating that the amount of radioactivity does not exceed ten microcuries [370 kilobecquerels] of iodine-125, iodine-131, carbon-14, cobalt-57, or selenium-75; fifty microcuries [1.85 megabecquerels] of hydrogen-3 (tritium); twenty microcuries [740 kilobecquerels] of iron-59; or mock iodine-125 in units not exceeding five-hundredths microcurie [1.85 kilobecquerels] of iodine-129 and five-thousandths microcurie [185 becquerels] of americium-241 each.
 - (b) Displaying the radiation caution symbol described in subdivision a of subsection 1 of section 33-10-04.1-13 and the words, "CAUTION, RADIOACTIVE MATERIAL", and "Not for Internal or External Use in Humans or Animals".

(4) One of the following statements, as appropriate, or a substantially similar statement which contains the information called for in the following statements, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

(a) This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of the United States nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

(b) This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of a licensing state.

Name of manufacturer

(5) The label affixed to the unit, or the leaflet or brochure which accompanies the package, contains adequate information as to the precautions to be observed in handling and storing such radioactive material. In the case of the mock iodine-125 reference or calibration source, the information accompanying the source must also contain directions to the licensee regarding the waste disposal requirements set out in subsection 1 of section 33-10-04.1-14.

h. Licensing the manufacture and distribution of ice detection devices. An application for a specific license

to manufacture and distribute ice detection devices to persons generally licensed under subdivision g of subsection 2 of section 33-10-03-04 will be approved if: (1) the applicant satisfies the general requirements of subsection 2 of this section and, (2) the criteria of 10 CFR 32.61, 32.62, and 32.103 are met.

i. Manufacture and distribution of radiopharmaceuticals containing radioactive material for medical use under group licenses.

(1) An application for a specific license to manufacture and distribute radiopharmaceuticals containing radioactive material for use by persons licensed pursuant to this chapter for the uses listed in subsection 1 of section 33-10-07-06, subsection 1 of section 33-10-07-07, or subsection 1 of section 33-10-07-08 will be approved if:

(a) The applicant satisfies the general requirements specified in subsection 2.

(b) The applicant submits evidence that:

[1] The radiopharmaceutical containing radioactive material will be manufactured, labeled, and packed in accordance with the Federal Food, Drug, and Cosmetic Act or the Public Health Service Act, such as a new drug application approved by the United States food and drug administration or a "Notice of Claimed Investigational Exemption for a New Drug" that has been accepted by the United States food and drug administration; or

[2] The manufacture and distribution of the radiopharmaceutical containing radioactive material is not subject to the Federal Food, Drug, and Cosmetic Act and the Public Health Service Act.

(c) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material which is appropriate for safe handling and storage of radiopharmaceuticals by group licensees.

(d) [1] The label affixed to each package of the radiopharmaceutical contains information on the radionuclide, quantity, and date of

assay and the label affixed to each package, or the leaflet or brochure which accompanies each package, contains a statement that the radiopharmaceutical is licensed by the department for distribution to persons licensed pursuant to this chapter for the uses listed in subsection 1 of section 33-10-07-06, subsection 1 of section 33-10-07-07, and subsection 1 of section 33-10-07-08, or under equivalent licenses of the United States nuclear regulatory commission, an agreement state, or a licensing state.

[2] The labels, leaflets, or brochures required by this subparagraph are in addition to the labeling required by the United States food and drug administration and they may be separate from or, with the approval of the United States food and drug administration, may be combined with the labeling required by the United States food and drug administration.

j. Manufacture and distribution of generators or reagent kits for preparation of radiopharmaceuticals containing radioactive material. An application for a specific license to manufacture and distribute generators or reagent kits containing radioactive material for preparation of radiopharmaceuticals by persons licensed pursuant to this chapter for the uses listed in subsection 1 of section 33-10-07-07 will be approved if:

(1) The applicant satisfies the general requirements specified in subsection 2.

(2) The applicant submits evidence that:

(a) The generator or reagent kit is to be manufactured, labeled, and packaged in accordance with the Federal Food, Drug, and Cosmetic Act or the Public Health Service Act, such as a new drug application approved by the United States food and drug administration, or a "Notice of Claimed Investigational Exemption for a New Drug" that has been accepted by the United States food and drug administration; or

(b) The manufacture and distribution of the generator or reagent kit are not subject to the Federal Food, Drug, and Cosmetic Act and the Public Health Service Act.

- (3) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material contained in the generator or reagent kit.
- (4) The label affixed to the generator or reagent kit contains information on the radionuclide, quantity, and date of assay.
- (5) The label affixed to the generator or reagent kit, or the leaflet or brochure which accompanies the generator or reagent kit, contains:
 - (a) Adequate information, from a radiation safety standpoint, on the procedures to be followed and the equipment and shielding to be used in eluting the generator or processing radioactive material with the reagent kit.
 - (b) A statement that this generator or reagent kit (as appropriate) is approved for use by persons licensed by the department pursuant to subsection 1 of section 33-10-07-07 or under equivalent licenses of the United States nuclear regulatory commission, an agreement state, or a licensing state. The labels, leaflets, or brochures required by this subdivision are in addition to the labeling required by the United States food and drug administration and they may be separate from or, with the approval of the United States food and drug administration, may be combined with the labeling required by the United States food and drug administration.

Note: Although the department does not regulate the manufacture and distribution of reagent kits that do not contain radioactive material, it does regulate the use of such reagent kits for the preparation of radiopharmaceuticals containing radioactive material as part of its licensing and regulation of the users of radioactive material. Any manufacturer of reagent kits that do not contain radioactive material who desires to have the reagent kits approved by the department for use by persons licensed pursuant to subsection 1 of section 33-10-07-07 may submit the pertinent information specified in this subdivision.

- k. Manufacture and distribution of sources or devices containing radioactive material for medical use. An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed pursuant to chapter 33-10-07

for use as a calibration or reference source or for the uses listed in subsection 1 of section 33-10-07-09 and subsection 1 of section 33-10-07-10 will be approved if:

- (1) The applicant satisfies the general requirements in subsection 2.
- (2) The applicant submits sufficient information regarding each type of source or device pertinent to an evaluation of its radiation safety, including:
 - (a) The radioactive material contained, its chemical and physical form, and amount.
 - (b) Details of design and construction of the source or device.
 - (c) Procedures for, and results of, prototype tests to demonstrate that the source or device will maintain its integrity under stresses likely to be encountered in normal use and accidents.
 - (d) For devices containing radioactive material, the radiation profile of a prototype device.
 - (e) Details of quality control procedures to assure that production sources and devices meet the standards of the design and prototype tests.
 - (f) Procedures and standards for calibrating sources and devices.
 - (g) Legend and methods for labeling sources and devices as to their radioactive content.
 - (h) Instructions for handling and storing the source or device from the radiation safety standpoint; these instructions are to be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device; provided, that instructions which are too lengthy for such label may be summarized on the label and printed in detail on a brochure which is referenced on the label.
- (3) The label affixed to the source or device, or to the permanent storage container for the source or device, contains information on the radionuclide, quantity, and date of assay, and a statement that the source or device is licensed by the department for distribution to persons licensed pursuant to chapter 33-10-07, subsection 1 of section 33-10-07-09, and subsection 1

of section 33-10-07-10, or under equivalent licenses of the United States nuclear regulatory commission, an agreement state, or a licensing state; provided, that such labeling for sources which do not require long-term storage may be on a leaflet or brochure which accompanies the source.

- (4) If the applicant desires that the source or device be required to be tested for leakage of radioactive material at intervals longer than six months, the applicant shall include in the application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source.
 - (5) In determining the acceptable interval for test of leakage of radioactive material, the department will consider information that includes, but is not limited to:
 - (a) Primary containment or source capsule.
 - (b) Protection of primary containment.
 - (c) Method of sealing containment.
 - (d) Containment construction materials.
 - (e) Form of contained radioactive material.
 - (f) Maximum temperature withstood during prototype tests.
 - (g) Maximum pressure withstood during prototype tests.
 - (h) Maximum quantity of contained radioactive material.
 - (i) Radiotoxicity of contained radioactive material.
 - (j) Operating experience with identical sources or devices or similarly designed and constructed sources or devices.
1. Requirements for license to manufacture and distribute industrial products containing depleted uranium for mass-volume applications.

- (1) An application for a specific license to manufacture industrial products and devices containing depleted uranium for use pursuant to subdivision e of subsection 1 of section 33-10-03-04 or equivalent regulations of the United States nuclear regulatory commission or an agreement state will be approved if:
 - (a) The applicant satisfies the general requirements specified in subsection 2 of this section.
 - (b) The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control procedures, labeling or marking, proposed uses, and potential hazards of the industrial product or device to provide reasonable assurance that possession, use, or transfer of the depleted uranium in the product or device is not likely to cause any individual to receive in any period of one calendar year a radiation dose in excess of ten percent of the limits specified in subsection 1 of section 33-10-04.1-06.
 - (c) The applicant submits sufficient information regarding the industrial product or device and the presence of depleted uranium for a mass-volume application in the product or device to provide reasonable assurance that unique benefits will accrue to the public because of the usefulness of the product or device.
- (2) In the case of an industrial product or device whose unique benefits are questionable, the department will approve an application for a specific license under this subdivision only if the product or device is found to combine a high degree of utility and low probability of uncontrolled disposal and dispersal of significant quantities of depleted uranium into the environment.
- (3) The department may deny any application for a specific license under this subdivision if the end uses of the industrial product or device cannot be reasonably foreseen.
- (4) Each person licensed pursuant to paragraph 1 shall:
 - (a) Maintain the level of quality control required by the license in the manufacture of the industrial product or device, and in the installation of the depleted uranium into the product or device.

(b) Label or mark each unit to:

[1] Identify the manufacturer of the product or device and the number of the license under which the product or device was manufactured, the fact that the product or device contains depleted uranium, and the quantity of depleted uranium in each product or device; and

[2] State that the receipt, possession, use, and transfer of the product or device are subject to a general license or the equivalent and the regulations of the United States nuclear regulatory commission or of an agreement state.

(c) Assure that the depleted uranium before being installed in each product or device has been impressed with the following legend clearly legible through any plating or other covering: "Depleted Uranium".

(d) [1] Furnish a copy of the general license contained in subdivision e of subsection 1 of section 33-10-03-04 and a copy of Department Form RAB-811 SFN 16092 to each person to whom the licensee transfers depleted uranium in a product or device for use pursuant to the general license contained in subdivision e of subsection 1 of section 33-10-03-04; or

[2] Furnish a copy of the general license contained in the United States nuclear regulatory commission's or agreement state's regulation equivalent to subdivision e of subsection 1 of section 33-10-03-04 and a copy of the United States nuclear regulatory commission's or agreement state's certificate, or alternatively, furnish a copy of the general license contained in subdivision e of subsection 1 of section 33-10-03-04 and a copy of Department Form RAB-811 SFN 16092 to each person to whom the licensee transfers depleted uranium in a product or device for use pursuant to the general license of the United States nuclear regulatory commission or an agreement state, with a note explaining that use of the product or device is regulated by the United States nuclear regulatory commission

or an agreement state under requirements substantially the same as those in subdivision e of subsection 1 of section 33-10-03-04.

- (e) Report to the department all transfers of industrial products or devices to persons for use under the general licensee in subdivision e of subsection 1 of section 33-10-03-04. Such report must identify each general licensee by name and address, an individual by name and position who may constitute a point of contact between the department and the general licensee, the type and model number of device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within thirty days after the end of each calendar quarter in which such a product or device is transferred to the generally licensed person. If no transfers have been made to persons generally licensed under subdivision e of subsection 1 of section 33-10-03-04 during the reporting period, the report shall so indicate.
- (f) [1] Report to the United States nuclear regulatory commission all transfers of industrial products or devices to persons for use under the United States nuclear regulatory commission general license in 10 CFR 40.25.
- [2] Report to the responsible state agency all transfers of devices manufactured and distributed pursuant to this subdivision for use under a general license in that state's regulations equivalent to subdivision e of subsection 1 of section 33-10-03-04.
- [3] Such report shall identify each general licensee by name and address, an individual by name and position who may constitute a point of contact between the department and the general licensee, the type and model number of the device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within thirty days after the end of each calendar quarter in which such product or device is transferred to the generally licensed person.

[4] If no transfers have been made to United States nuclear regulatory commission licensees during the reporting period, this information shall be reported to the United States nuclear regulatory commission.

[5] If no transfers have been made to general licensees within a particular agreement state during the reporting period, this information shall be reported to the responsible agreement state agency upon the request of that agency.

(g) Keep records showing the name, address, and point of contact for each general licensee to whom the licensee transfers depleted uranium in industrial products or devices for use pursuant to the general license provided in subdivision e of subsection 1 of section 33-10-03-04 or equivalent regulations of the United States nuclear regulatory commission or of an agreement state. The records shall be maintained for a period of two years and shall show the date of each transfer, the quantity of depleted uranium in each product or device transferred, and compliance with the report requirements of this subsection.

m. Special requirements for issuance of specific licenses for source material milling. In addition to the requirements set forth in subsection 2, a specific license for source material milling will be issued if the applicant submits to the department a satisfactory application as described herein and meets the other conditions specified below:

(1) An application for a license to receive title to, receive, possess, and use source material for milling or byproduct material shall address the following:

(a) Description of the proposed project or action.

(b) Area/site characteristics including geology, topography, hydrology, and meteorology.

(c) Radiological and nonradiological impacts of the proposed project or action, including waterway and ground water impacts.

(d) Environmental effects of accidents.

(e) Long-term impacts including decommissioning, decontamination, and reclamation.

(f) Site and project alternatives.

(Note: In this paragraph, "byproduct material" means the tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.)

- (2) Pursuant to subdivision f of subsection 2, the applicant may not commence construction of the project until the department has weighed the environmental, economic, technical, and other benefits against the environmental costs and has concluded that the issuance of the license is appropriate.
- (3) At least one full year prior to any major site construction, a preoperational monitoring program shall be conducted to provide complete baseline data on a milling site and its environs. Throughout the construction and operating phases of the mill, an operational monitoring program shall be conducted to measure or evaluate performance of control systems and procedures; to evaluate environmental impacts of operation; and to detect potential long-term effects.
- (4) Prior to issuance of the license, the mill operator shall establish financial surety arrangements consistent with the requirements of subdivision g of subsection 2.
 - (a) The amount of funds to be ensured by financial surety arrangements shall be based on department-approved cost estimates in an approved plan for decontamination and decommissioning of mill buildings and the milling site to levels which would allow unrestricted use of these areas upon decommissioning, and the reclamation of tailings and/or waste disposal areas. The licensee shall submit this plan in conjunction with an environmental report that addresses the expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and that evaluates alternatives for mitigating these impacts. In establishing specific surety arrangements, the licensee's cost estimates shall take into account total costs that would be incurred if an independent contractor were hired to perform the decommissioning and reclamation work. In order to avoid unnecessary duplication and expense, the department may accept financial sureties that have been consolidated with financial surety arrangements

established to meet requirements of other federal or state agencies and/or local governing bodies for such decommissioning, decontamination, reclamation, and long-term site surveillance, provided such arrangements are considered adequate to satisfy these requirements and that portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge are clearly identified. The licensee's surety mechanism will be reviewed annually by the department to assure that sufficient funds will be available for completion of the reclamation plan if the work had to be performed by an independent contractor. The amount of surety liability should be adjusted to recognize any increases or decreases resulting from inflation, changes in engineering plans, activities performed, and any other conditions affecting costs. Regardless of whether reclamation is phased through the life of the operation or takes place at the end of operations, an appropriate portion of surety liability shall be retained until final compliance with the reclamation plan is determined. This will yield a surety that is at least sufficient at all times to cover the costs of decommissioning, decontamination, and reclamation of the areas that are expected to be disturbed before the next license renewal. The term of the surety mechanism must be open ended, unless it can be demonstrated that another arrangement would provide an equivalent level of assurance. This assurance could be provided with a surety instrument which is written for a specified period of time, e.g., five years, which must be automatically renewed unless the surety agent notifies the beneficiary (the state regulatory agency) and the principal (the licensee) some reasonable time, e.g., ninety days, prior to the renewal date of their intention not to renew. In such a situation, the surety requirement still exists and the licensee would be required to submit an acceptable replacement surety within a brief period of time to allow at least sixty days for the regulatory agency to collect.

- (b) The total amount of funds for reclamation or long-term surveillance and control shall be transferred to the United States if title and custody of such material and its disposal site is transferred to the United States upon

termination of a license. Such funds include, but are not limited to, sums collected for long-term surveillance and control. Such funds do not, however, include moneys held as surety where no default has occurred, and the reclamation or other bonded activity has been performed.

(5) The applicant shall provide procedures describing the means employed to meet the following requirements during the operational phase of any project.

(a) Milling operations shall be conducted so that all effluent releases are reduced to as low as is reasonably achievable below the limits of chapter 33-10-04.1.

(b) The mill operator shall conduct daily inspection of any tailings or waste retention systems. Records of such inspections shall be maintained for review by the department.

(c) The mill operator shall immediately notify the department of the following:

[1] Any failure in a tailings or waste retention system which results in a release of tailings or waste into unrestricted areas.

[2] Any unusual conditions (conditions not contemplated in the design of the retention system) which if not corrected could lead to failure of the system and result in a release of tailings or waste into unrestricted areas.

(6) Continued surveillance requirements for source material mills having reclaimed residues.

(a) The final disposition of tailings or wastes at source material milling sites should be such that the need for ongoing active maintenance is not necessary to preserve isolation. As a minimum, annual site inspections shall be conducted by the government agency retaining ultimate custody of the site where tailings or wastes are stored to confirm the integrity of the stabilized tailings or waste systems and to determine the need, if any, for maintenance and/or monitoring. Results of the inspection shall be reported to the United States nuclear regulatory commission within sixty days

following each inspection. The United States nuclear regulatory commission may require more frequent site inspections, if, on the basis of a site-specific evaluation, such a need appears necessary due to the features of a particular tailings or waste disposal system.

- (b) A minimum charge of two hundred fifty thousand dollars in 1978 dollars to cover the costs of long-term surveillance shall be paid by each mill operator to the department prior to the termination of a uranium or thorium mill license. If site surveillance or control requirements at a particular site are determined, on the basis of a site-specific evaluation, to be significantly greater than those specified in subparagraph a, additional funding requirements may be specified by the department. The total charge to cover the costs of long-term surveillance shall be such that, with an assumed one percent annual real interest rate, the collected funds will yield interest in an amount sufficient to cover the annual costs of site surveillance. The charge will be reviewed annually to recognize or adjust for inflation.
- (7) An application for a license to own, receive, possess, and use byproduct material as defined in section 33-10-01-04 shall contain proposed specifications relating to the emissions control and disposition of the byproduct material to achieve the requirements and objectives set forth in the criteria listed in Schedule D of chapter 33-10-03.

6. Issuance of specific licenses.

- a. Upon a determination that an application meets the requirements of North Dakota Century Code chapter 23-20.1 and this article, the department will issue a specific license authorizing the proposed activity in such form and containing such conditions and limitations as it deems appropriate or necessary.
- b. The department may incorporate in any license at the time of issuance, or thereafter by appropriate rule or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use, and transfer of radioactive material subject to this chapter as it deems appropriate or necessary in order to:
 - (1) Minimize danger to public health and safety or property.

- (2) Require such reports and the keeping of such records, and to provide for such inspections of activities under the license as may be appropriate or necessary.
- (3) Prevent loss or theft of material subject to this chapter.

7. Specific terms and conditions of licenses.

- a. Each license issued pursuant to this chapter shall be subject to all the provisions of North Dakota Century Code chapter 23-20.1, now or hereafter in effect, and to all applicable rules and orders of the department.
- b. No license issued or granted under this chapter and no right to possess or utilize radioactive material granted by any license issued pursuant to this chapter shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person unless the department shall, after securing full information find that the transfer is in accordance with the provisions of North Dakota Century Code chapter 23-20.1, now or hereafter in effect, and to all valid rules and orders of the department, and shall give its consent in writing.
- c. Each person licensed by the department pursuant to this chapter shall confine use and possession of the material licensed to the locations and purposes authorized in the license.
- d. Licensees required to submit emergency plans under subdivision b of subsection 3 shall follow the emergency plan approved by the department. The licensee may change the proved plan without department approval only if the changes do not decrease the effectiveness of the plan. The licensee shall furnish the change to the department and to affected onsite response organizations within six months after the change is made. Proposed changes that decrease or potentially decrease the effectiveness of the approved emergency plan may not be implemented without prior application to and prior approval by the department.
- e. Each licensee shall notify the department in writing when the licensee decides to permanently discontinue all activities involving materials authorized under the license.
- f. Each licensee shall notify the department, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any chapter of

title 11 (bankruptcy) of the United States Code by or against:

- (1) The licensee;
- (2) An entity (as that term is defined in 11 U.S.C. 101(14) [Pub. L. 95-598; 92 Stat. 2549]) controlling the licensee or listing the license or licensee as property of the estate; or
- (3) An affiliate (as that term is defined in 11 U.S.C. 101(2) [Pub.L. 95-598; 92 Stat. 2549]) of the licensee.

This notification must indicate the bankruptcy court in which the petition for bankruptcy was filed and the date of the filing of the petition.

~~8.--Expiration-and-termination-of-licenses.~~

- ~~a.--Except--as--provided--in--subdivision-b--of--subsection-9,--each--specific--license--shall--expire--at--the--end--of--the--specified--day,--in--the--month--and--year--stated--therein.~~
- ~~b.--Each--licensee--shall--notify--the--department--immediately,--in--writing,--and--request--termination--of--the--license--when--the--licensee--decides--to--terminate--all--activities--involving--radioactive--material--authorized--under--the--license.---This--notification--and--request--for--termination--of--the--license--must--include--the--required--statement--and--radiation--survey--report--specified--in--paragraph-1--of--subdivision-d--and--a--plan--for--completion--of--decommissioning--if--required--by--license--condition--or--by--paragraph-4--of--subdivision-d.~~
- ~~e.--No--less--than--thirty--days--before--the--expiration--date--specified--in--the--license,--the--licensee--shall--either:~~
 - ~~(1)--Submit--an--application--for--license--renewal--under--subsection-9;--or~~
 - ~~(2)--Notify--the--department,--in--writing,--if--the--licensee--decides--not--to--renew--the--license.~~
- ~~d.--(1)--If--a--licensee--does--not--submit--an--application--for--license--renewal--under--subsection-9,--the--licensee--shall,--on--or--before--the--expiration--date--specified--in--the--license:~~
 - ~~(a)--Terminate--use--of--radioactive--material;~~
 - ~~(b)--Remove--radioactive--contamination--to--the--extent--practicable;~~

(c)--Properly dispose of radioactive material;

(d)--Submit a statement certifying proper disposition of radioactive material using RCP Form 1; and

(e)--Submit a radiation survey report to confirm the absence of radioactive material or to establish the levels of residual radioactive contamination, unless the licensee demonstrates the absence of residual radioactive contamination in some other manner. The licensee shall, as appropriate:

[1]--Report levels of radiation in units of microrads per hour of beta and gamma radiation at one centimeter and gamma radiation at one meter from surfaces and report levels of radioactivity, including alpha, in units of transformations per minute (or microcuries) for one hundred square centimeters removable and fixed on surfaces, microcuries per milliliter in water, and picocuries per gram in contaminated solids such as soils or concrete; and

[2]--Specify the instrumentation used and certify that each instrument was properly calibrated and tested.

(2)--If no residual radioactive contamination attributable to activities conducted under the license is detected, the licensee shall submit a certification that no detectable radioactive contamination was found. The department will notify the licensee, in writing, of the termination of the license.

(3)--(a)--If detectable levels of residual radioactive contamination attributable to activities conducted under the license are found, the license continues in effect beyond the expiration date, if necessary, with respect to possession of residual radioactive material present as contamination until the department notifies the licensee, in writing, that the license is terminated. During this time the licensee is subject to the provisions of subdivision e.

(b)--In addition to the required statement and radiation survey report submitted under subdivision d, the licensee shall submit a plan for decontamination, if required, as regards

residual--radioactive-contamination-remaining-at
the-time-the-license-expires.

(4)--(a)--In--addition--to--the-information-required-under
subparagraphs-d--and--e--of--paragraph-1;--the
licensee--shall--submit-a-plan-for-completion-of
decommissioning-if-the-procedures--necessary--to
carry--out--decommissioning--have--not--been
previously-approved-by-the-department-and--could
increase--potential-health-and-safety-impacts-to
workers-or-to-the-public-such-as-in-any--of--the
following-cases:

[1]--Procedures--would--involve--techniques--not
applied--routinely--during--cleanup--or
maintenance-operations;

[2]--Workers--would--be--entering--areas--not
normally--occupied--where--surface
contamination--and--radiation--levels--are
significantly--higher--than--routinely
encountered-during-operation;

[3]--Procedures--could--result--in-significantly
greater--airborne--concentrations--of
radioactive--materials--than--are--present
during-operation;--or

[4]--Procedures--could--result--in-significantly
greater-releases-of-radioactive-material-to
the--environment--than--those-associated-with
operation.

(b)--Procedures--with--potential--health--and--safety
impacts--may--not--be--carried-out-prior-to-approval
of-the-decommissioning-plan.

(c)--The--proposed--decommissioning-plan;--if--required
by-subparagraph-a-or-by-license-condition;--must
include:

[1]--Description--of--planned--decommissioning
activities;

[2]--Description--of--methods--used--to--assure
protection-of-workers-and--the--environment
against--radiation--hazards--during
decommissioning;

[3]--A--description--of--the--planned--final
radiation-survey;

{4}--The--information--required--in--paragraph--3--of--subdivision--g--of--subsection--14,--and--any--other--information--required--by--subdivision--g--of--subsection--14--that--is--considered--necessary--to--support--the--adequacy--of--the--decommissioning--plan--for--approval;--and

{5}--An--updated--detailed--cost--estimate--for--decommissioning,--comparison--of--that--estimate--with--present--funds--set--aside--for--decommissioning,--and--plan--for--assuring--the--availability--of--adequate--funds--for--completion--of--decommissioning.

{d}--The--proposed--decommissioning--plan--will--be--approved--by--the--department--if--the--information--therein--demonstrates--that--the--decommissioning--will--be--completed--as--soon--as--is--reasonable--and--that--the--health--and--safety--of--workers--and--the--public--will--be--adequately--protected.

{5}--Upon--approval--of--the--decommissioning--plan--by--the--department,--the--licensee--shall--complete--decommissioning--in--accordance--with--the--approved--plan. As--a--final--step--in--decommissioning,--the--licensee--shall--again--submit--the--information--required--in--subparagraph--e--of--paragraph--1,--shall--certify--the--disposition--of--accumulated--wastes--from--decommissioning,--and--shall--include--a--list--containing--the--location--and--description--of--all--equipment--to--remain--onsite--after--license--termination--that--was--contaminated--when--final--decommissioning--was--initiated.

e.--Each--licensee--who--possesses--residual--radioactive--material--under--paragraph--3--of--subdivision--d,--following--the--expiration--date--specified--in--the--license--shall:

{1}--Limit--actions--involving--radioactive--material--to--those--related--to--decontamination--and--other--activities--related--to--preparation--for--release--for--unrestricted--use;--and

{2}--Continue--to--control--entry--to--restricted--areas--until--they--are--suitable--for--release--for--unrestricted--use--and--the--department--notifies--the--licensee--in--writing--that--the--license--is--terminated.

8. Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas.

a. Each specific license expires at the end of the day on the expiration date stated in the license unless the licensee

has filed an application for renewal under subsection 9 not less than thirty days before the expiration date stated in the existing license. If an application for renewal has been filed at least thirty days prior to the expiration date stated in the existing license, the existing license shall not expire until final action is taken on the renewal application by the department, or shall expire at the end of the day on which the department makes a final determination to deny the renewal application or, if the determination states an expiration date, the expiration date stated in the determination.

- b. Each specific license revoked by the department expires at the end of the day on the date of the department's final determination to revoke the license, or on the expiration date stated in the determination, or as otherwise provided by department order.
- c. Each specific license continues in effect, beyond the expiration date if necessary, with respect to possession of radioactive material until the department notifies the licensee in writing that the license is terminated. During this time, the licensee shall:
 - (1) Limit actions involving radioactive material to those related to decommissioning; and
 - (2) Continue to control entry to restricted areas until they are suitable for release in accordance with requirements in article 33-10.
- d. Within sixty days of the occurrence of any of the following, consistent with the administrative directions in section 33-10-01-13, each licensee shall provide notification to the department in writing of such occurrence, and either begin decommissioning its site, or any separate building or outdoor area that contains residual radioactivity so that the building or outdoor area is suitable for release in accordance with requirements in article 33-10, or submit within twelve months of notification a decommissioning plan, if required by paragraph 1 of subdivision f, and begin decommissioning upon approval of that plan if:
 - (1) The license has expired pursuant to subdivision a or b;
 - (2) The licensee has decided to permanently cease principal activities, as defined in section 33-10-01-04, at the entire site or in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area

is unsuitable for release in accordance with requirements in article 33-10;

(3) No principal activities under the license have been conducted for a period of twenty-four months; or

(4) No principal activities have been conducted for a period of twenty-four months in any separate building or outdoor area that contains residual radioactivity such that the building or outdoor area is unsuitable for release in accordance with requirements in article 33-10.

e. The department may grant a request to extend the time periods established in subdivision d if the department determines that this relief is not detrimental to the public health and safety and is otherwise in the public interest. The request must be submitted no later than thirty days before notification pursuant to subdivision d. The schedule for decommissioning set forth in subdivision d may not commence until the department has made a determination on the request.

f. (1) A decommissioning plan must be submitted if required by license condition or if the procedures and activities necessary to carry out decommissioning of the site or separate building or outdoor area have not been previously approved by the department and these procedures could increase potential health and safety impacts to workers or to the public, such as in any of the following cases:

(a) Procedures would involve techniques not applied routinely during cleanup or maintenance operations;

(b) Workers would be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered during operation;

(c) Procedures could result in significantly greater airborne concentrations of radioactive materials than are present during operation; or

(d) Procedures could result in significantly greater releases of radioactive material to the environment than those associated with operation.

(2) The department may approve an alternate schedule for submittal of a decommissioning plan required pursuant to subdivision d if the department determines that

the alternative schedule is necessary to the effective conduct of decommissioning operations and presents no undue risk from radiation to the public health and safety and is otherwise in the public interest.

(3) Procedures such as those listed in paragraph 1 of subdivision f with potential health and safety impacts may not be carried out prior to approval of the decommissioning plan.

(4) The proposed decommissioning plan for the site or separate building or outdoor area must include:

(a) A description of the conditions of the site or separate building or outdoor area sufficient to evaluate the acceptability of the plan;

(b) A description of planned decommissioning activities;

(c) A description of methods used to ensure protection of workers and the environment against radiation hazards during decommissioning;

(d) A description of the planned final radiation survey; and

(e) An updated detailed cost estimate with present funds set aside for decommissioning, comparison of that estimate with present funds set aside for decommissioning, and a plan for assuring the availability of adequate funds for completion of decommissioning.

(f) For decommissioning plans calling for completion of decommissioning later than twenty-four months after plan approval, the plan must include a justification for the delay based on the criteria in subdivision h.

(5) The proposed decommissioning plan will be approved by the department if the information therein demonstrates that the decommissioning will be completed as soon as practicable and that the health and safety of workers and the public will be adequately protected.

g. (1) Except as provided in subdivision h, licensees shall complete decommissioning of the site or separate building or outdoor area as soon as practicable but

no later than twenty-four months following the initiation of decommissioning.

(2) Except as provided in subdivision h, when decommissioning involves the entire site, the licensee shall request license termination as soon as practicable but no later than twenty-four months following the initiation of decommissioning.

h. The department may approve a request for an alternative schedule for completion of decommissioning of the site or separate building or outdoor area, and license termination if appropriate, if the department determines that the alternative is warranted by consideration of the following:

(1) Whether it is technically feasible to complete decommissioning within the allotted twenty-four-month period;

(2) Whether sufficient waste disposal capacity is available to allow completion of decommissioning within the allotted twenty-four-month period;

(3) Whether a significant volume reduction in wastes requiring disposal will be achieved by allowing short-lived radionuclides to decay;

(4) Whether a significant reduction in radiation exposure to workers can be achieved by allowing short-lived radionuclides to decay; and

(5) Other site-specific factors which the department may consider appropriate on a case-by-case basis, such as the regulatory requirements of other government agencies, lawsuits, ground water treatment activities, monitored natural ground water restoration, actions that could result in more environmental harm than deferred cleanup, and other factors beyond the control of the licensee.

i. As the final step in decommissioning, the licensee shall:

(1) Certify the disposition of all licensed material, including accumulated wastes, by submitting a completed radiation control program form 1 or equivalent information; and

(2) Conduct a radiation survey of the premises where the licensed activities were carried out and submit a report of the results of this survey unless the licensee demonstrates that the premises are suitable

for release in some other manner. The licensee shall, as appropriate:

(a) Report levels of gamma radiation in units of millisieverts (millirem) per hour at one meter from surfaces, and report levels of radioactivity, including alpha and beta, in units of megabecquerels (disintegrations per minute or microcuries) per one hundred square centimeters, removable and fixed, for surfaces, megabecquerels (microcuries) per milliliter for water, and becquerels (picocuries) per gram for solids such as soils or concrete; and

(b) Specify the survey instruments used and certify that each instrument is properly calibrated and tested.

j. Specific licenses, including expired licenses, will be terminated by written notice to the licensee when the department determines that:

(1) Radioactive material has been properly disposed;

(2) Reasonable effort has been made to eliminate residual radioactive contamination, if present; and

(3) (a) A radiation survey has been performed which demonstrates that the premises are suitable for release in accordance with requirements in article 33-10;

(b) Other information submitted by the licensee is sufficient to demonstrate that the premises are suitable for release in accordance with requirements in article 33-10.

9. **Renewal of licenses.**

a. Applications for renewal of specific licenses shall be filed in accordance with subsection 1.

~~b. In any case in which a licensee, not less than thirty days prior to expiration of the licensee's existing license, has filed an application in proper form for renewal or for a new license authorizing the same activities, such existing license shall not expire until final action by the department.~~

10. **Amendment of licenses at request of licensee.** Applications for amendment of a license shall be filed in accordance with subsection 1 and shall specify the respects in which the

licensee desires the license to be amended and the grounds for such amendment.

11. **Department action on applications to renew or amend.** In considering an application by a licensee to renew or amend the license, the department will apply the criteria set forth in subsection 2, 3, 4, 5, or 14, and chapters 33-10-05, 33-10-07, or 33-10-12, as applicable.
12. **Transfer of material.**
 - a. No licensee shall transfer radioactive material except as authorized pursuant to this subsection.
 - b. Except as otherwise provided in one's license and subject to the provisions of subdivisions c and d, any licensee may transfer radioactive material:
 - (1) To the department. (A licensee may transfer material to the department only after receiving prior approval from the department.)
 - (2) To the United States department of energy.
 - (3) To any person exempt from this article to the extent permitted under such exemption.
 - (4) To any person authorized to receive such material under terms of a general license or its equivalent, or a specific license or equivalent licensing document, issued by the department, the United States nuclear regulatory commission, any agreement state, or any licensing state, or to any person otherwise authorized to receive such material by the federal government or any agency thereof, the department, an agreement state, or a licensing state.
 - (5) As otherwise authorized by the department in writing.
 - c. Before transferring radioactive material to a specific licensee of the department, the United States nuclear regulatory commission, an agreement state, or a licensing state, or to a general licensee who is required to register with the department, the United States nuclear regulatory commission, an agreement state, or a licensing state prior to receipt of the radioactive material, the licensee transferring the material shall verify that the transferee's license authorizes the receipt of the type, form, and quantity of radioactive material to be transferred.
 - d. Any of the following methods for the verification required by subdivision c is acceptable:

- (1) The transferor may possess and read, a current copy of the transferee's specific license or registration certificate.
 - (2) The transferor may possess a written certification by the transferee that the transferee is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date.
 - (3) For emergency shipments, the transferor may accept oral certification by the transferee that the transferee is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date; provided, that the oral certification is confirmed, in writing, within ten days.
 - (4) The transferor may obtain other information compiled by a reporting service from official records of the department, the United States nuclear regulatory commission, an agreement state, or a licensing state regarding the identity of licensees and the scope and expiration dates of licenses and registration.
 - (5) When none of the methods of verification described in paragraphs 1 through 4 are readily available or when a transferor desires to verify that information received by one of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the department, the United States nuclear regulatory commission, an agreement state, or a licensing state that the transferee is licensed to receive the radioactive material.
- e. Shipment and transport of radioactive material shall be in accordance with the provisions of chapter 33-10-13.

13. Modification and revocation of licenses.

- a. The terms and conditions of all licenses shall be subject to amendment, revision, or modification or the license may be suspended or revoked by reason of amendments to North Dakota Century Code chapter 23-20.1, or by reason of this article, and orders issued by the department.
- b. Any license may be revoked, suspended, or modified, in whole or in part, for any material false statement in the application or any statement of fact required under

provisions of North Dakota Century Code chapter 23-20.1, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means which would warrant the department to refuse to grant a license on an original application, or for violation of, or failure to observe any of the terms and conditions of North Dakota Century Code chapter 23-20.1, or of the license, or of this article, or any order of the department.

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

14. Financial assurance and recordkeeping for decommissioning.

- a. Each applicant for a specific license authorizing the possession and use of unsealed radioactive material of half-life greater than one hundred twenty days and in quantities exceeding one hundred thousand times the applicable quantities set forth in Schedule F of this chapter shall submit a decommissioning funding plan as described in subdivision e. The decommissioning funding plan must also be submitted when a combination of isotopes is involved if R divided by one hundred thousand is greater than one (unity rule), where R is defined here as the sum of the ratios of the quantity of each isotope to the applicable value in Schedule F of this chapter.
- b. Each applicant for a specific license authorizing possession and use of radioactive material of half-life greater than one hundred twenty days and in quantities specified in subdivision d shall either:
 - (1) Submit a decommissioning funding plan as described in subdivision e; or
 - (2) Submit a certification that financial assurance for decommissioning has been provided in the amount prescribed by subdivision d using one of the methods described in subdivision f. For an applicant, this certification may state that the appropriate assurance will be obtained after the application has been approved and the license issued but prior to the receipt of licensed material. As part of the certification, a copy of the financial instrument

obtained to satisfy the requirements of subdivision f is to be submitted to the department.

- c. (1) Each holder of a specific license issued on or after January 1, 1994, which is of a type described in subdivision a or b, shall provide financial assurance for decommissioning in accordance with the criteria set forth in this subsection.
 - (2) Each holder of a specific license issued before January 1, 1994, and of a type described in subdivision a shall submit, on or before January 1, 1994, a decommissioning funding plan or a certification of financial assurance for decommissioning in an amount at least equal to seven hundred fifty thousand dollars in accordance with the criteria set forth in this subsection. If the licensee submits the certification of financial assurance rather than a decommissioning funding plan at this time, the licensee shall include a decommissioning funding plan in any application for license renewal.
 - (3) Each holder of a specific license issued before January 1, 1994, and of a type described in subdivision b shall submit, on or before January 1, 1994, a certification of financial assurance for decommissioning or a decommissioning funding plan in accordance with the criteria set forth in this subsection.
- d. Table of required amounts of financial assurance for decommissioning by quantity of material.

Greater than ten thousand but less than or equal to one hundred thousand times the applicable quantities of Schedule F in unsealed form. (For a combination of isotopes, if R, as defined in subdivision a, divided by ten thousand is greater than one but R divided by one hundred thousand is less than or equal to one) \$750,000

Greater than one thousand but less than or equal to ten thousand times the applicable quantities of Schedule F in unsealed form. (For a combination of isotopes, if R, as defined in subdivision a, divided by one thousand is greater than one but R divided by ten thousand is

less than or equal to one) \$150,000

Greater than ten billion times the applicable quantities of Schedule F in sealed sources or plated foils. (For a combination of isotopes, if R, as defined in subdivision a, divided by ten billion is greater than one) \$75,000

- e. Each decommissioning funding plan must contain a cost estimate for decommissioning and a description of the method of assuring funds for decommissioning from subdivision f, including means of adjusting cost estimates and associated funding levels periodically over the life of the facility.
- f. Financial assurance for decommissioning must be provided by one or more of the following methods:
- (1) Prepayment. Prepayment is the deposit prior to the start of operation into an account segregated from licensee assets and outside the licensee's administrative control of cash or liquid assets such that the amount of funds would be sufficient to pay decommissioning costs. Prepayment may be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities.
 - (2) A surety method, insurance, or other guarantee method. These methods guarantee that decommissioning costs will be paid ~~should the licensee default~~. A surety method may be in the form of a surety bond, letter of credit, or line of credit. A parent company guarantee of funds for decommissioning costs based on a financial test may be used if the guarantee and test are as contained in Schedule G. A parent company guarantee may not be used in combination with other financial methods to satisfy the requirements of this subsection. A guarantee of funds by the applicant or licensee for decommissioning costs based on a financial test may be used if the guarantee and test are as contained in schedule H. A guarantee by the applicant or licensee may not be used in combination with any other financial methods to satisfy the requirements of this subsection or in any situation where the applicant or licensee has a parent company holding majority control of the voting stock of the company. Any surety method or insurance used to provide financial assurance for decommissioning must contain the following conditions:

- (a) The surety method or insurance must be open-ended or, if written for a specified term, such as five years, must be renewed automatically unless ninety days or more prior to the renewal date, the issuer notifies the department, the beneficiary, and the licensee of its intention not to renew. The surety method or insurance must also provide that the full face amount be paid to the beneficiary automatically prior to the expiration without proof of forfeiture if the licensee fails to provide a replacement acceptable to the department within thirty days after receipt of notification of cancellation.
 - (b) The surety method or insurance must be payable to a trust established for decommissioning costs. The trustee and trust must be acceptable to the department. An acceptable trustee includes an appropriate state or federal government agency or an entity which has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency.
 - (c) The surety method or insurance must remain in effect until the department has terminated the license.
- (3) An external sinking fund in which deposits are made at least annually, coupled with a surety method or insurance, the value of which may decrease by the amount being accumulated in the sinking fund. An external sinking fund is a fund established and maintained by setting aside funds periodically in an account segregated from licensee assets and outside the licensee's administrative control in which the total amount of funds would be sufficient to pay decommissioning costs at the time termination of operation is expected. An external sinking fund may be in the form of a trust, escrow account, government fund, certificate of deposit, or deposit of government securities. The surety or insurance provisions must be as stated in paragraph 2 of subdivision f.
- (4) In the case of state or local government licensees, a statement of intent containing a cost estimate for decommissioning or an amount based on the table in subdivision d, and indicating that funds for decommissioning will be obtained when necessary.

g. Each person licensed shall keep records of information important to the safe and effective decommissioning of the facility in an identified location until the license is terminated by the department. If records of relevant information are kept for other purposes, reference to these records and their locations may be used. Information the department considers important to decommissioning consists of:

- (1) Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment, or site. These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas as in the case of possible seepage into porous materials such as concrete. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations.
- (2) As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used or stored, and of locations of possible inaccessible contamination such as buried pipes which may be subject to contamination. If required drawings are referenced, each relevant document need not be indexed individually. If drawings are not available, the licensee shall substitute appropriate records of available information concerning these areas and locations.
- (3) Except for areas containing only sealed sources (provided the sources have not leaked or no contamination remains after any leak) or radioactive materials having only half-lives of less than sixty-five days, a list contained in a single document and updated every two years, of the following:
 - (a) All areas designated and formerly designated as restricted areas as defined in section 33-10-01-04;
 - (b) All areas outside of restricted areas that require documentation under paragraph 1 of subdivision g;
 - (c) All areas outside of restricted areas where current and previous wastes have been buried as documented under subsection 9 of section 33-10-04.1-15; and

(d) All areas outside of restricted areas which contain material such that, if the license expired, the licensee would be required to either decontaminate the area to unrestricted release levels or apply for approval for disposal under subsection 2 of section 33-10-04.1-14.

(4) Records of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and records of the funding method used for assuring funds if either a funding plan or certification is used.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04, 23-20.1-04.1, 23-20.1-04.2, 23-20.1-04.5

Law Implemented: NDCC 23-20.1-03, 23-20.1-04, 23-20.1-04.1, 23-20.1-04.2, 23-20.1-04.5

SCHEDULE A
EXEMPT CONCENTRATIONS

Element (Atomic Number)	Radionuclide	Column I Gas Concentration $\mu\text{Ci/ml}_1$	Column II Liquid and Solid Concentration $\mu\text{Ci/ml}_2$
Antimony (51)	Sb-122		3×10^{-4}
<u>Antimony (51)</u>	Sb-124		2×10^{-4}
	Sb-125		1×10^{-3}
Argon (18)	Ar-37	1×10^{-3}	
	Ar-41	4×10^{-7}	
Arsenic (33)	As-73		5×10^{-3}
	As-74		5×10^{-4}
	As-76		2×10^{-4}
	As-77		8×10^{-4}
Barium (56)	Ba-131		2×10^{-3}
	Ba-140		3×10^{-4}
Beryllium (4)	Be-7		2×10^{-2}
Bismuth (83)	Bi-206		4×10^{-4}
Bromine (35)	Br-82	4×10^{-7}	3×10^{-3}
Cadmium (48)	Cd-109		2×10^{-3}
	Cd-115m		3×10^{-4}
	Cd-115		3×10^{-4}
Calcium (20)	Ca-45		9×10^{-5}
	Ca-47		5×10^{-4}
Carbon (6)	C-14	1×10^{-6}	8×10^{-3}
Cerium (58)	Ce-141		9×10^{-4}
	Ce-143		4×10^{-4}
	Ce-144		1×10^{-4}
Cesium (55)	Cs-131		2×10^{-2}
	Cs-134m		6×10^{-2}
	Cs-134		9×10^{-5}
Chlorine (17)	Cl-38	9×10^{-7}	4×10^{-3}
Chromium (24)	Cr-51		2×10^{-2}
Cobalt (27)	Co-57		5×10^{-3}
	Co-58		1×10^{-3}
	Co-60		5×10^{-4}
Copper (29)	Cu-64		3×10^{-3}
Dysprosium (66)	Dy-165		4×10^{-3}
	Dy-166		4×10^{-4}
Erbium (68)	Er-169		9×10^{-4}
	Er-171		1×10^{-3}
Europium (63)	Eu-152		6×10^{-4}
	($T_r=9.2$ h)		
	Eu-155		2×10^{-3}
Fluorine (9)	F-18	2×10^{-6}	8×10^{-3}
Gadolinium (64)	Gd-153		2×10^{-3}
	Gd-159		8×10^{-4}
Gallium (31)	Ga-72		4×10^{-4}

Germanium (32)	Ge-71		2×10^{-2}
Gold (79)	Au-196		2×10^{-3}
	Au-198		5×10^{-4}
	Au-199		2×10^{-3}
	Hf-181		7×10^{-4}
Hafnium (72)	Hf-181		7×10^{-4}
Hydrogen (1)	H-3	5×10^{-6}	3×10^{-2}
Indium (49)	In-113m		1×10^{-2}
	In-114m		2×10^{-4}
Iodine (53)	I-126	3×10^{-9}	2×10^{-5}
	I-131	3×10^{-9}	2×10^{-5}
	I-132	8×10^{-8}	6×10^{-4}
	I-133	1×10^{-8}	7×10^{-5}
	I-134	2×10^{-7}	1×10^{-3}
Iridium (77)	Ir-190		2×10^{-3}
	Ir-192		4×10^{-4}
	Ir-194		3×10^{-4}
Iron (26)	Fe-55		8×10^{-3}
	Fe-59		6×10^{-4}
Krypton (36)	Kr-85m	1×10^{-6}	
	Kr-85	3×10^{-6}	
Lanthanum (57)	La-140		2×10^{-4}
Lead (82)	Pb-203		4×10^{-3}
Lutetium (71)	Lu-177		1×10^{-3}
Manganese (25)	Mn-52		3×10^{-4}
	Mn-54		1×10^{-3}
	Mn-56		1×10^{-3}
	Hg-197m		2×10^{-3}
Mercury (80)	Hg-197		3×10^{-3}
	Hg-203		2×10^{-4}
	Mo-99		2×10^{-3}
Molybdenum (42)	Mo-99		2×10^{-3}
Neodymium (60)	Nd-147		6×10^{-4}
	Nd-149		3×10^{-3}
Nickel (28)	Ni-65		1×10^{-3}
Niobium (Columbium) (41)	Nb-95		1×10^{-3}
	Nb-97		9×10^{-3}
Osmium (76)	Os-185		7×10^{-4}
	Os-191m		3×10^{-2}
	Os-191		2×10^{-3}
	Os-193		6×10^{-4}
	Pd-103		3×10^{-3}
Palladium (46)	Pd-109		9×10^{-4}
	P-32		2×10^{-4}
Phosphorus (15)	P-32		2×10^{-4}
Platinum (78)	Pt-191		1×10^{-3}
	Pt-193m		1×10^{-2}
	Pt-197m		1×10^{-2}
	Pt-197		1×10^{-3}
	K-42		3×10^{-3}
Potassium (19)	K-42		3×10^{-3}
Praseodymium (59)	Pr-142		3×10^{-4}
	Pr-143		5×10^{-4}
Promethium (61)	Pm-147		2×10^{-3}
	Pm-149		4×10^{-4}
Rhenium (75)	Re-183		6×10^{-3}

	Re-186		9x10 ⁻⁴
	Re-188		6x10 ⁻⁴
Rhodium (45)	Rh-103m		1x10 ⁻¹
	Rh-105		1x10 ⁻³
Rubidium (37)	Rb-86		7x10 ⁻⁴
Ruthenium (44)	Ru-97		4x10 ⁻³
	Ru-103		8x10 ⁻⁴
	Ru-105		1x10 ⁻³
	Ru-106		1x10 ⁻⁴
Samarium (62)	Sm-153		8x10 ⁻⁴
Scandium (21)	Sc-46		4x10 ⁻⁴
	Sc-47		9x10 ⁻⁴
	Sc-48		3x10 ⁻⁴
Selenium (34)	Se-75		3x10 ⁻³
Silicon (14)	Si-31		9x10 ⁻³
Silver (47)	Ag-105		1x10 ⁻³
	Ag-110m		3x10 ⁻⁴
	Ag-111		4x10 ⁻⁴
Sodium (11)	Na-24		2x10 ⁻³
Strontium (38)	Sr-85		1x10 ⁻³
	Sr-89		1x10 ⁻⁴
	Sr-91		7x10 ⁻⁴
	Sr-92		7x10 ⁻⁴
Sulfur (16)	S-35	9x10 ⁻⁸	6x10 ⁻⁴
Tantalum (73)	Ta-182		4x10 ⁻⁴
Technetium (43)	Tc-96m		1x10 ⁻¹
	Tc-96		1x10 ⁻³
Tellurium (52)	Te-125m		2x10 ⁻³
	Te-127m		6x10 ⁻⁴
	Te-127		3x10 ⁻³
	Te-129m		3x10 ⁻⁴
	Te-131m		6x10 ⁻⁴
	Te-132		3x10 ⁻⁴
Terbium (65)	Tb-160		4x10 ⁻⁴
Thallium (81)	Tl-200		4x10 ⁻³
	Tl-201		3x10 ⁻³
	Tl-202		1x10 ⁻³
	Tl-204		1x10 ⁻³
Thulium (69)	Tm-170		5x10 ⁻⁴
	Tm-171		5x10 ⁻³
Tin (50)	Sn-113		9x10 ⁻⁴
	Sn-125		2x10 ⁻⁴
Tungsten (Wolfram) (74)	W-181		4x10 ⁻³
	W-187		7x10 ⁻⁴
Vanadium (23)	V-48		3x10 ⁻⁴
Xenon (54)	Xe-131m	4x10 ⁻⁶	
	Xe-133	3x10 ⁻⁶	
	Xe-135	1x10 ⁻⁶	
Ytterbium (70)	Yb-175		1x10 ⁻³
Yttrium (39)	Y-90		2x10 ⁻⁴
	Y-91m		3x10 ⁻²
	Y-91		3x10 ⁻⁴
	Y-92		6x10 ⁻⁴

Zinc (30)	Y-93	3x10 ⁻⁴
	Zn-65	1x10 ⁻³
	Zn-69m	7x10 ⁻⁴
	Zn-69	2x10 ⁻²
Zirconium (40)	Zr-95	6x10 ⁻⁴
	Zr-97	2x10 ⁻⁴

Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years.

1x10⁻¹⁰

1x10⁻⁶

NOTE 1: Many radionuclides transform into other radionuclides. In expressing the concentrations in Schedule A, the activity stated is that of the parent radionuclide and takes into account the radioactive decay products.

NOTE 2: For purposes of subsection 2 of section 33-10-03-02 where there is involved a combination of radionuclides, the limit for the combination should be derived as follows: Determine for each radionuclide in the product the ratio between the radioactivity concentration present in the product and the exempt radioactivity concentration established in Schedule A for the specific radionuclide when not in combination. The sum of such ratios may not exceed "1".

EXAMPLE:

$$\frac{\text{Concentration of Radionuclide A in Product} +}{\text{Exempt concentration of Radionuclide A}}$$

$$\frac{\text{Concentration of Radionuclide B in Product} _1}{\text{Exempt concentration of Radionuclide B}}$$

NOTE 3: To convert $\mu\text{Ci/ml}$ to SI units of megabecquerels per liter, multiply the above values by 37.

EXAMPLE: Zirconium (40) Zr-97 ($2 \times 10^{-4} \mu\text{Ci/ml}$ multiplied by 37 is equivalent to 74×10^{-4} megabecquerels per liter).

1/ Values are given in Column I only for those materials normally used as gases.

2/ $\mu\text{Ci/g}$ for solids.

History: Amended effective June 1, 1992; July 1, 1995.

SCHEDULE G
CRITERIA RELATING TO USE OF FINANCIAL
TESTS AND PARENT COMPANY GUARANTEES FOR
PROVIDING REASONABLE ASSURANCE OF
FUNDS FOR DECOMMISSIONING
(SUBSECTION 14 of SECTION 33-10-03-05)

I. INTRODUCTION

An applicant or licensee may provide reasonable assurance of the availability of funds for decommissioning based on obtaining a parent company guarantee that funds will be available for decommissioning costs and on a demonstration that the parent company passes a financial test. This ~~appendix~~ schedule establishes criteria for passing the financial test and for obtaining the parent company guarantee.

II. FINANCIAL TEST

- A. To pass the financial test, the parent company must meet the criteria of either paragraph A.1 or A.2 of this section:
1. The parent company must have:
 - a. Two of the following three ratios: A ratio of total liabilities to net worth less than 2.0; a ratio of the sum of net income plus depreciation, depletion, and amortization to total liabilities greater than 0.1; and a ratio of current assets to current liabilities greater than 1.5; and
 - b. Net working capital and tangible net worth each at least six times the current decommissioning cost estimates (or prescribed amount if a certification is used); and
 - c. Tangible net worth of at least \$10 million; and
 - d. Assets located in the United States amounting to at least ninety percent of total assets or at least six times the current decommissioning cost estimates (or prescribed amount if a certification is used).
 2. The parent company must have:
 - a. A current rating for its most recent bond issuance of AAA, AA, A, or BBB as issued by Standards and Poor's or Aaa, Aa, A, or Baa as issued by Moody's; and
 - b. Tangible net worth at least six times the current decommissioning cost estimate (or prescribed amount if a certification is used); and
 - c. Tangible net worth of at least \$10 million; and

- d. Assets located in the United States amounting to at least ninety percent of total assets or at least six times the current decommissioning cost estimates (or prescribed amount if certification is used).
- B. The parent company's independent certified public accountant must have compared the data used by the parent company in the financial test, which is derived from the independently audited, yearend financial statements for the latest fiscal year, with the amounts in such financial statement. In connection with that procedure the licensee shall inform the department within ninety days of any matters coming to the auditor's attention which cause the auditor to believe that the data specified in the financial test should be adjusted and that the company no longer passes the test.
 - C.
 1. After the initial financial test, the parent company must repeat the passage of the test within ninety days after the close of each succeeding fiscal year.
 2. If the parent company no longer meets the requirements of paragraph A of this section, the licensee must send notice to the department of intent to establish alternate financial assurance as specified in the department's rules. The notice must be sent by certified mail within ninety days after the end of the fiscal year for which the yearend financial data show that the parent company no longer meets the financial test requirements. The licensee must provide alternate financial assurance within one hundred twenty days after the end of such fiscal year.

III. PARENT COMPANY GUARANTEE

The terms of a parent company guarantee which an applicant or licensee obtains must provide that:

- A. The parent company guarantee will remain in force unless the guarantor sends notice of cancellation by certified mail to the licensee and the department. Cancellation may not occur, however, during the one hundred twenty days beginning on the date of receipt of the notice of cancellation by both the licensee and the department, as evidenced by the return receipts.
- B. If the licensee fails to provide alternate financial assurance as specified in the department's rules within ninety days after receipt by the licensee and the department of a notice of cancellation of the parent company guarantee from the guarantor, the guarantor will provide such alternative financial assurance in the name of the licensee.
- C. The parent company guarantee and financial test provisions must remain in effect until the department has terminated the license.

- D. If a trust is established for decommissioning costs, the trustee and trust must be acceptable to the department. An acceptable trustee includes an appropriate state or federal government agency or an entity which has the authority to act as a trustee and whose trust operations are regulated and examined by a federal or state agency.

History: Effective March 1, 1994; amended effective July 1, 1995.

SCHEDULE H
CRITERIA RELATING TO USE OF FINANCIAL
TESTS AND SELF-GUARANTEES FOR
PROVIDING REASONABLE ASSURANCE OF
FUNDS FOR DECOMMISSIONING
(SUBSECTION 14 of SECTION 33-10-03-05)

I. INTRODUCTION

An applicant or licensee may provide reasonable assurance of the availability of funds for decommissioning based on obtaining a parent company guarantee that funds will be available for decommissioning costs and on a demonstration that the company passes the financial test of section II of this schedule. The terms of the self-guarantee are in section III of this schedule. This schedule establishes criteria for passing the financial test for the self-guarantee and establishes the terms for a self-guarantee.

II. FINANCIAL TEST

A. To pass the financial test, a company must meet all of the following criteria:

1. Tangible net worth at least ten times the total current decommissioning cost estimate (or the current amount required if certification is used) for all decommissioning activities for which the company is responsible as self-guaranteeing licensee and as parent-guarantor.
2. Assets located in the United States amounting to at least ninety percent of total assets or at least ten times the total current decommissioning cost estimate (or the current amount required if certification is used) for all decommissioning activities for which the company is responsible as self-guaranteeing licensee and as parent-guarantor.
3. A current rating for its most recent bond issuance of AAA, AA, or A as issued by Standard and Poors (S&P), or Aaa, Aa, or A as issued by Moodys.

B. To pass the financial test, a company must meet all of the following additional requirements:

1. The company must have at least one class of equity securities registered under the Securities Exchange Act of 1934 [Pub. L. 73-291; 48 Stat. 881; 15 U.S.C. 77b et seq.].
2. The company's independent certified public accountant must have compared the data used by the company in the financial test which is derived from the independently audited, yearend financial statements for the latest fiscal year, with the amounts in such financial statement. In connection with that procedure, the licensee shall inform the department within

ninety days of any matters coming to the attention of the auditor that cause the auditor to believe that the data specified in the financial test should be adjusted and that the company no longer passes the test.

3. After the initial financial test, the company must repeat passage of the test within ninety days after the close of each succeeding fiscal year.

C. If the licensee no longer meets the requirements of section II.A. of this appendix, the licensee must send immediate notice to the department of its intent to establish alternate financial assurance as specified in chapter 33-10-03 within one hundred twenty days of such notice.

III. COMPANY SELF-GUARANTEE

The terms of a self-guarantee which an applicant or licensee furnishes must provide that:

A. The guarantee will remain in force unless the licensee sends notice of cancellation by certified mail to the department. Cancellation may not occur, however, during the one hundred twenty days beginning on the date of receipt of the notice of cancellation by the department, as evidenced by the return receipt.

B. The licensee shall provide alternative financial assurance as specified in chapter 33-10-03 within ninety days following receipt by the department of a notice of cancellation of the guarantee.

C. The guarantee and financial test provisions must remain in effect until the department has terminated the license or until another financial assurance method acceptable to the department has been put in effect by the licensee.

D. The licensee will promptly forward to the department and the licensee's independent auditor all reports covering the latest fiscal year filed by the licensee with the Securities and Exchange Commission pursuant to the requirements of section 13 of the Securities Exchange Act of 1934 [Pub. L. 73-291, §13; 48 Stat. 894-895; 15 U.S.C. 78m].

E. If, at any time, the licensee's most recent bond issuance ceases to be rated in any category of "A" or above by either Standard and Poors or Moodys, the licensee will provide notice in writing of such fact to the department within twenty days after publication of the change by the rating service. If the licensee's most recent bond issuance ceases to be rated in any category of A or above by both Standard and Poors and Moodys, the licensee no longer meets the requirements of section II.A. of this schedule.

F. The applicant or licensee must provide to the department a written guarantee (a written commitment by a corporate officer) which states that the licensee will fund and carry out the required decommissioning activities or, upon issuance of an order by the department, the licensee will set up and fund a trust in the amount of the current cost estimates for decommissioning.

History: Effective July 1, 1995.

CHAPTER 33-10-04.1

33-10-04.1-01. Purpose.

1. This chapter establishes standards for protection against ionizing radiation resulting from activities conducted pursuant to licenses or registrations issued by the department.
2. The requirements of this chapter 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 this chapter. However, nothing in this chapter shall be construed as limiting actions that may be necessary to protect health and safety in an emergency.

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-04.1-06. Occupational dose limits.

1. Occupational dose limits for adults.

- a. The licensee or registrant shall control the occupational dose to individual adults, except for planned special exposures pursuant to subsection 6, to the following dose limits:
 - (1) An annual limit, which is the more limiting of:
 - (a) The total effective dose equivalent being equal to five-hundredths sievert [5 rem]; or
 - (b) 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 five-tenths sievert [50 rem].
 - (2) The annual limits to the lens of the eye, to the skin, and to the extremities which are:
 - (a) An eye dose equivalent of fifteen-hundredths sievert [15 rem]; and
 - (b) A shallow dose equivalent of five-tenths sievert [50 rem] to the skin or to any extremity.

- b. Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, shall be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime. See paragraphs 1 and 2 of subdivision e of subsection 6.
 - c. The assigned deep dose equivalent and shallow dose equivalent shall be for the portion of the body receiving the highest exposure determined as follows:
 - (1) The deep dose equivalent, eye 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.
 - (2) Reserved.
 - d. Derived air concentration and annual limit on intake values are presented in table I of appendix B and may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits. See subsection 7 of section 33-10-04.1-15.
 - e. Notwithstanding the annual dose limits, the licensee shall limit the soluble uranium intake by an individual to ten milligrams in a week in consideration of chemical toxicity. See footnote 3 of appendix B.
 - f. The licensee or registrant shall reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person. See subdivision e of subsection 5.
2. **Compliance with requirements for summation of external and internal doses.**
- a. If the licensee or registrant is required to monitor pursuant to both subdivision a and subdivision b of subsection 2 of section 33-10-04.1-09, the licensee or registrant shall demonstrate compliance with the dose limits by summing external and internal doses. If the licensee or registrant is required to monitor only pursuant to subdivision a of subsection 2 of section 33-10-04.1-09 or only pursuant to subdivision b of subsection 2 of section 33-10-04.1-09, then summation is not required to demonstrate compliance with the dose limits. The licensee or registrant may demonstrate compliance with the requirements for summation of external

and internal doses pursuant to subdivision b, subdivision c, and subdivision d. The dose equivalents for the lens of the eye, the skin, and the extremities are not included in the summation, but are subject to separate limits.

b. Intake by inhalation. If the only intake of radionuclides is by inhalation, the total effective dose equivalent limit is not exceeded if the sum of the deep dose equivalent divided by the total effective dose equivalent limit, and one of the following, does not exceed unity:

(1) The sum of the fractions of the inhalation annual limit on intake for each radionuclide, or

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

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

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

d. Intake through wounds or absorption through skin. The licensee or registrant shall evaluate and, to the extent practical, account for intakes through wounds or skin absorption. The intake through intact skin has been included in the calculation of derived air concentration for hydrogen-3 and does not need to be evaluated or accounted for pursuant to this subdivision.

3. Determination of external dose from airborne radioactive material.

a. Licensees or registrants shall, when determining the dose from airborne radioactive material, include the contribution to the deep dose equivalent, eye dose

equivalent, and shallow dose equivalent from external exposure to the radioactive cloud. See appendix B, footnotes 1 and 2.

- b. Airborne radioactivity measurements and derived air concentration values shall 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 shall be based upon measurements using instruments or individual monitoring devices.

4. Determination of internal exposure.

- a. For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee or registrant shall, when required pursuant to subsection 2 of section 33-10-04.1-09, take suitable and timely measurements of:

- (1) Concentrations of radioactive materials in air in work areas;
- (2) Quantities of radionuclides in the body;
- (3) Quantities of radionuclides excreted from the body;
or
- (4) Combinations of these measurements.

- b. Unless respiratory protective equipment is used, as provided in subsection 3 of section 33-10-04.1-11, or the assessment of intake is based on bioassays, the licensee or registrant shall assume that an individual inhales radioactive material at the airborne concentration in which the individual is present.

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

- (1) Use that information to calculate the committed effective dose equivalent, and, if used, the licensee or registrant shall document that information in the individual's record;
- (2) Upon prior approval of the department, adjust the derived air concentration or annual limit on intake values to reflect the actual physical and chemical

characteristics of airborne radioactive material, for example, aerosol size distribution or density; and

- (3) Separately assess the contribution of fractional intakes of class D, W, or Y compounds of a given radionuclide to the committed effective dose equivalent. See appendix B.
- d. If the licensee or registrant chooses to assess intakes of class Y material using the measurements given in paragraph 2 or 3 of subdivision a, the licensee or registrant may delay the recording and reporting of the assessments for periods up to seven months, unless otherwise required by subsection 2 or 3 of section 33-10-04.1-16. This delay permits the licensee or registrant to make additional measurements basic to the assessments.
 - e. If the identity and concentration of each radionuclide in a mixture are known, the fraction of the derived air concentration applicable to the mixture for use in calculating derived air concentration-hours shall be either:
 - (1) The sum of the ratios of the concentration to the appropriate derived air concentration value, that is, D, W, or Y, from appendix B for each radionuclide in the mixture; or
 - (2) The ratio of the total concentration for all radionuclides in the mixture to the most restrictive derived air concentration value for any radionuclide in the mixture.
 - f. If the identity of each radionuclide in a mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the derived air concentration for the mixture shall be the most restrictive derived air concentration of any radionuclide in the mixture.
 - g. When a mixture of radionuclides in air exists, a licensee or registrant may disregard certain radionuclides in the mixture if:
 - (1) The licensee or registrant uses the total activity of the mixture in demonstrating compliance with the dose limits in subsection 1 and in complying with the monitoring requirements in subdivision b of subsection 2 of section 33-10-04.1-09, and

- (2) The concentration of any radionuclide disregarded is less than ten percent of its derived air concentration, and
 - (3) The sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed thirty percent.
- h. When determining the committed effective dose equivalent, the following information may be considered:
- (1) In order to calculate the committed effective dose equivalent, the licensee or registrant may assume that the inhalation of one annual limit on intake, or an exposure of two thousand derived air concentration-hours, results in a committed effective dose equivalent of five-hundredths sievert [5 rem] for radionuclides that have their annual limit on intakes or derived air concentrations based on the committed effective dose equivalent.
 - (2) For an annual limit on intake and the associated derived air concentration determined by the nonstochastic organ dose limit of five-tenths sievert [50 rem], the intake of radionuclides that would result in a committed effective dose equivalent of five-hundredths sievert [5 rem], that is, the stochastic annual limit on intake, is listed in parentheses in table I of appendix B. As a simplifying assumption, the licensee or registrant may use the stochastic annual limit on intake to determine committed effective dose equivalent. However, if the licensee or registrant uses the stochastic annual limit on intake, the licensee or registrant shall also demonstrate that the limit in subparagraph 2 of paragraph 1 of subdivision a of subsection 1 is met.

5. Determination of prior occupational dose.

- a. For each individual who is likely to receive, in a year, an occupational dose requiring monitoring pursuant to subsection 2 of section 33-10-04.1-09, the licensee or registrant shall:
- (1) Determine the occupational radiation dose received during the current year; and
 - (2) Attempt to obtain the records of cumulative occupational radiation dose.

- b. Prior to permitting an individual to participate in a planned special exposure, the licensee or registrant shall determine:
 - (1) The internal and external doses from all previous planned special exposures;
 - (2) All doses in excess of the limits, including doses received during accidents and emergencies, received during the lifetime of the individual; and
 - (3) All lifetime cumulative occupational radiation dose.
- c. In complying with the requirements of subdivision a, a licensee or registrant may:
 - (1) Accept, as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's most recent employer for work involving radiation exposure, that discloses the nature and the amount of any occupational dose that the individual received during the current year;
 - (2) Accept, as the record of cumulative radiation dose, an up-to-date department's occupational radiation exposure history form (SFN 19443) 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; and
 - (3) Obtain reports of the individual's dose equivalent from the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee or registrant, by telephone, telegram, facsimile, or letter. The licensee or registrant shall request a written verification of the dose data if the authenticity of the transmitted report cannot be established.
- d. (1) The licensee or registrant shall record the exposure history, as required by subdivision a, on the department's occupational radiation exposure history form (SFN 19443), or other clear and legible record, of all the information required on that form. The form or record shall show each period in which the individual received occupational exposure to radiation or radioactive material and shall be signed by the individual who received the exposure. For each period for which the licensee or registrant

obtains reports, the licensee or registrant shall use the dose shown in the report in preparing the department's occupational radiation exposure history form (SFN 19443) or equivalent. For any period in which the licensee or registrant does not obtain a report, the licensee or registrant shall place a notation on the department's occupational radiation exposure history form (SFN 19443) or equivalent indicating the periods of time for which data are not available.

- (2) Licensees or registrants are not required to reevaluate the separate external dose equivalents and internal committed dose equivalents or intakes of radionuclides assessed pursuant to the rules in chapter 33-10-04 in effect before January 1, 1994. Further, occupational exposure histories obtained and recorded on the department's occupational radiation exposure history form (SFN 19443) or equivalent before January 1, 1994, would not have included effective dose equivalent, but may be used in the absence of specific information on the intake of radionuclides by the individual.
- e. If the licensee or registrant is unable to obtain a complete record of an individual's current and previously accumulated occupational dose, the licensee or registrant shall assume:
- (1) In establishing administrative controls pursuant to subdivision f of subsection 1 for the current year, that the allowable dose limit for the individual is reduced by twelve and five-tenths millisieverts [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
 - (2) That the individual is not available for planned special exposures.
- f. The licensee or registrant shall retain the records on the department's occupational radiation exposure history form (SFN 19443) or equivalent until the department terminates each pertinent license or registration requiring this record. The licensee or registrant shall retain records used in preparing the department's occupational radiation exposure history form (SFN 19443) or equivalent for three years after the record is made.
6. **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 subsection 1 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 higher exposure are unavailable or impractical.
- b. The licensee or registrant, and employer if the employer is not the licensee or registrant, specifically authorizes the planned special exposure, in writing, before the exposure occurs.
- c. Before a planned special exposure, the licensee or registrant ensures that each individual involved is:
 - (1) Informed of the purpose of the planned operation;
 - (2) Informed of the estimated doses and associated potential risks and specific radiation levels or other conditions that might be involved in performing the task; and
 - (3) Instructed in the measures to be taken to keep the dose as low as reasonably achievable 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 subdivision b of subsection 5 during the lifetime of the individual for each individual involved.
- e. Subject to subdivision b of subsection 1, the licensee or registrant shall not authorize a planned special exposure that would cause an individual to receive a dose from all planned special exposures and all doses in excess of the limits to exceed:
 - (1) The numerical values of any of the dose limits in subdivision a of subsection 1 in any year; and
 - (2) Five times the annual dose limits in subdivision a of subsection 1 during the individual's lifetime.
- f. The licensee or registrant maintains records of the conduct of a planned special exposure in accordance with subsection 6 of section 33-10-04.1-15 and submits a written report in accordance with subsection 4 of section 33-10-04.1-16.
- 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 thirty days from the date of the planned special exposure. The dose from planned special exposures shall not be considered in controlling future occupational dose of the individual pursuant to subdivision a of subsection 1 but shall be included in evaluations required by subdivisions d and e.

7. **Occupational dose limits for minors.** The annual occupational dose limits for minors are ten percent of the annual occupational dose limits specified for adult workers in subsection 1.
8. **Dose to an embryo or fetus.**
 - a. The licensee or registrant shall ensure that the dose to an embryo or fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed five millisievert [0.5 rem]. See subsection 7 of section 33-10-04.1-15 for recordkeeping requirements.
 - b. The licensee or registrant shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in subdivision a (the national council on radiation protection and measurements recommended in NCRP report No. 91 "Recommendations on Limits for Exposure to Ionizing Radiation" (June 1, 1987) that no more than five-tenths millisievert [0.05 rem] to the embryo or fetus be received in any one month).
 - c. The dose to an embryo or fetus shall be taken as the sum of:
 - (1) The deep dose equivalent to the declared pregnant woman; and
 - (2) The dose to the embryo or fetus from radionuclides in the embryo or fetus and radionuclides in the declared pregnant woman.
 - d. If by the time the woman declares pregnancy to the licensee or registrant, the dose to the embryo or fetus has exceeded four and five-tenths millisievert [0.45 rem], the licensee or registrant shall be deemed to be in compliance with subdivision a of subsection 8 of section 33-10-04.1-06 if the additional dose to the embryo or fetus does not exceed five-tenths millisievert [0.05 rem] during the remainder of the pregnancy.

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-04.1-08. Testing for leakage or contamination of sealed sources.

1. Testing for leakage or contamination of sealed sources.
 - a. The licensee or registrant in possession of any sealed source shall assure that:
 - (1) Each sealed source, except as specified in subdivision b of subsection 1, is tested for leakage or contamination and the test results are received before the sealed source is put into use unless the licensee or registrant has a certificate from the transferor indicating that the sealed source was tested within six months before transfer to the licensee or registrant.
 - (2) Each sealed source that is not designed to emit alpha particles is tested for leakage or contamination at intervals not to exceed six months or at alternative intervals approved by the department, after evaluation of information specified by paragraphs 4 and 5 of subdivision k of subsection 5 of section 33-10-03-05, an agreement state, a licensing state, or the United States nuclear regulatory commission.
 - (3) Each sealed source that is designed to emit alpha particles is tested for leakage or contamination at intervals not to exceed three months or at alternative intervals approved by the department, after evaluation of information specified by paragraphs 4 and 5 of subdivision k of subsection 5 of section 33-10-03-05, an agreement state, a licensing state, or the United States nuclear regulatory commission.
 - (4) For each sealed source that is required to be tested for leakage or contamination, at any other time there is reason to suspect that the sealed source might have been damaged or might be leaking, the licensee or registrant shall assure that the sealed source is tested for leakage or contamination before further use.
 - (5) Tests for leakage for all sealed sources, except brachytherapy sources manufactured to contain radium, shall be capable of detecting the presence of one hundred eighty-five becquerels [0.005 μ Ci] of radioactive material on a test sample. Test samples shall be taken from the sealed source or from the surfaces of the container in which the sealed source is stored or mounted on which one might expect contamination to accumulate. For a sealed source

contained in a device, test samples are obtained when the source is in the "off" position.

- (6) The test for leakage for brachytherapy sources manufactured to contain radium shall be capable of detecting an absolute leakage rate of thirty-seven becquerels [0.001 μ Ci] of radon-222 in a twenty-four-hour period when the collection efficiency for radon-222 and its daughters has been determined with respect to collection method, volume, and time.
 - (7) Tests for contamination from radium daughters shall be taken on the interior surface of brachytherapy source storage containers and shall be capable of detecting the presence of one hundred eighty-five becquerels [0.005 μ Ci] of a radium daughter which has a half-life greater than four days.
- b. A licensee or registrant need not perform test for leakage or contamination on the following sealed sources:
- (1) Sealed sources containing only radioactive material with a half-life of less than thirty days;
 - (2) Sealed sources containing only radioactive material as a gas;
 - (3) Sealed sources containing three and seven-tenths megabecquerels [100 μ Ci] or less of beta or photon-emitting material or three hundred seventy kilobecquerels [10 μ Ci] or less of alpha-emitting material;
 - (4) Sealed sources containing only hydrogen-3;
 - (5) Seeds of iridium-192 encased in nylon ribbon; and
 - (6) Sealed sources, except teletherapy and brachytherapy sources, which are stored, not being used and identified as in storage. The licensee or registrant shall, however, test each such sealed source for leakage or contamination and receive the test results before any use or transfer unless it has been tested for leakage or contamination within six months before the date of use or transfer.
- c. Tests for leakage or contamination from sealed sources shall be performed by persons specifically authorized by the department, an agreement state, a licensing state, or the United States nuclear regulatory commission to perform such services.

- d. Test results shall be kept in units of becquerel or microcurie and maintained for inspection by the department. Records of test results for sealed sources shall be made pursuant to subsection 4 of section 33-10-04.1-15.
- e. The following shall be considered evidence that a sealed source is leaking:
 - (1) The presence of one hundred eighty-five becquerels (0.005 μ Ci) or more of removable contamination on any test sample.
 - (2) Leakage of thirty-seven becquerels [0.001 μ Ci] of radon-222 per twenty-hour hours for brachytherapy sources manufactured to contain radium.
 - (3) The presence of removable contamination resulting from the decay of one hundred eighty-five becquerels [0.005 μ Ci] or more of radium.
- f. The licensee or registrant shall immediately withdraw a leaking sealed source from use and shall take action to prevent the spread of contamination. The leakage sealed source shall be repaired or disposed of in accordance with this section.
- g. Reports of test results for leaking or contaminated sealed sources shall be made pursuant to subsection 8 of section 33-10-04.1-16.

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-04.1-09. Survey and monitoring.

1. General.

- a. Each licensee or registrant shall make, or cause to be made, surveys that:
 - (1) Are necessary for the licensee or registrant to comply with this chapter; and
 - (2) Are necessary under the circumstances to evaluate:
 - (a) Radiation levels;
 - (b) Concentrations or quantities of radioactive material; and

- (c) The potential radiological hazards that could be present.
 - b. The licensee or registrant shall ensure that instruments and equipment used for quantitative radiation measurements, for example, dose rate and effluent monitoring, are calibrated at intervals not to exceed twelve months for the radiation measured except when a more frequent interval is specified in another applicable section of these rules or a license condition.
 - c. All personnel dosimeters, except for direct and indirect reading pocket ionization chambers and those dosimeters used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees and registrants to comply with subsection 1 of section 33-10-04.1-06, with other provisions of this article, or with conditions specified in a license or registration shall be processed and evaluated by a dosimetry processor:
 - (1) Holding current personnel dosimetry accreditation from the national voluntary laboratory accreditation program (NVLAP) of the national institute of standards and technology; and
 - (2) Approved in this accreditation process for the type of radiation or radiations included in the national voluntary laboratory accreditation program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored.
 - d. The licensee or registrant shall ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.
2. **Conditions requiring individual monitoring of external and internal occupational dose.** Each licensee or registrant shall monitor exposures from sources of radiation at levels sufficient to demonstrate compliance with the occupational dose limits of this chapter. At a minimum:
- a. Each licensee or registrant shall monitor occupational exposure to radiation and shall supply and require the use of individual monitoring devices by:
 - (1) Adults likely to receive, in one year from sources external to the body, a dose in excess of ten percent of the limits in subdivision a of subsection 1 of section 33-10-04.1-06;

- (2) Minors and declared pregnant women likely to receive, in one year from sources external to the body, a dose in excess of ten percent of any of the applicable limits in subsections 7 or 8 of section 33-10-04.1-06; and
 - (3) Individuals entering a high or very high radiation area.
 - (4) Reserved.
- b. Each licensee or registrant shall monitor, to determine compliance with subsection 4 of section 33-10-04.1-06, the occupational intake of radioactive material by and assess the committed effective dose equivalent to:
- (1) Adults likely to receive, in one year, an intake in excess of ten percent of the applicable annual limit on intake in table I, columns 1 and 2, of appendix B; and
 - (2) Minors and declared pregnant women likely to receive, in one year, a committed effective dose equivalent in excess of five-tenths millisievert [0.05 rem].

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-04.1-11. Respiratory protection and controls to restrict internal exposure in restricted areas.

1. **Use of process or other engineering controls.** The licensee or registrant shall use, to the extent practicable, process or other engineering controls, such as, containment or ventilation, to control the concentrations of radioactive material in air.
2. **Use of other controls.** When it is not practicable 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, consistent with maintaining the total effective dose equivalent as low as is reasonably achievable, shall 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.

3. Use of individual respiratory protection equipment.

a. If the licensee or registrant uses respiratory protection equipment to limit intakes pursuant to subsection 2:

(1) Except as provided in paragraph 2, the licensee or registrant shall use only respiratory protection equipment that is tested and certified or had certification extended by the national institute for occupational safety and health and the mine safety and health administration.

(2) ~~If--the~~ The licensee or registrant ~~wishes-to~~ may use equipment that has not been tested or certified by the national institute for occupational safety and health and the mine safety and health administration, has not had certification extended by the national institute for occupational safety and health and the mine safety and health administration, or for which there is no schedule for testing or certification, provided the licensee or registrant ~~shall-submit~~ has submitted to the department and the department has approved an application for authorized use of that equipment, including a demonstration by testing, or a demonstration on the basis of ~~reliable~~ test information, that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use.

(3) The licensee or registrant shall implement and maintain a respiratory protection program that includes:

(a) Air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate exposures;

(b) Surveys and bioassays, as appropriate, to evaluate actual intakes;

(c) Testing of respirators for operability immediately prior to each use;

(d) Written procedures regarding selection, fitting, issuance, maintenance, and testing of respirators, including testing for operability immediately prior to each use; supervision and training of personnel; monitoring, including air sampling and bioassays; and recordkeeping; and

- (e) Determination by a physician prior to initial fitting of respirators, and at least every twelve months thereafter, that the individual user is physically able to use the respiratory protection equipment.
 - (4) The licensee or registrant shall issue a written policy statement on respirator usage covering:
 - (a) The use of process or other engineering controls, instead of respirators;
 - (b) The routine, nonroutine, and emergency use of respirators; and
 - (c) The length of periods of respirator use and relief from respirator use.
 - (5) The licensee or registrant shall advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other conditions that might require such relief.
 - (6) The licensee or registrant shall use respiratory protection equipment within the equipment manufacturer's expressed limitations for type and mode of use and shall provide proper visual, communication, and other special capabilities, such as adequate skin protection, when needed.
- b. When estimating exposure of individuals to airborne radioactive materials, the licensee or registrant may make allowance for respiratory protection equipment used to limit intakes pursuant to subsection 2, provided that the following conditions, in addition to those in subdivision a are satisfied:
- (1) The licensee or registrant selects respiratory protection equipment that provides a protection factor, specified in appendix A, greater than the multiple by which peak concentrations of airborne radioactive materials in the working area are expected to exceed the values specified in appendix B, table I, column 3. However, if the selection of respiratory protection equipment with a protection factor greater than the peak concentration is inconsistent with the goal specified in subsection 2 of keeping the total effective dose equivalent as low as is reasonably achievable, the licensee or registrant may select respiratory

protection equipment with a lower protection factor provided that such a selection would result in a total effective dose equivalent that is as low as is reasonably achievable. The concentration of radioactive material in the air that is inhaled when respirators are worn may be initially estimated by dividing the average concentration in air, during each period of uninterrupted use, by the protection factor. If the exposure is later found to be greater than initially estimated, the corrected value shall be used; if the exposure is later found to be less than initially estimated, the corrected value may be used.

- (2) The licensee or registrant shall obtain authorization from the department before assigning respiratory protection factors in excess of those specified in appendix A. The department may authorize a licensee or registrant to use higher protection factors on receipt of an application that:
 - (a) Describes the situation for which a need exists for higher protection factors; and
 - (b) Demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.
- c. In an emergency, the licensee or registrant shall use as emergency equipment only respiratory protection equipment that has been specifically certified or had certification extended for emergency use by the national institute for occupational safety and health and the mine safety and health administration.
- d. The licensee or registrant shall notify the department in writing at least twenty days before the date that respiratory protection equipment is first used pursuant to either subdivision a or subdivision b.

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

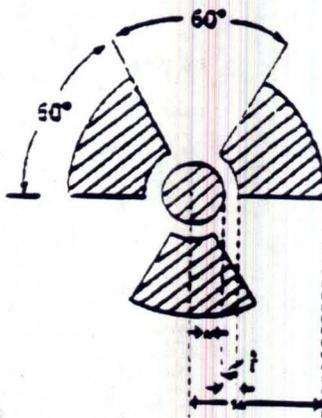
33-10-04.1-13. Precautionary procedures.

1. Caution signs.

- a. Standard radiation symbol. Unless otherwise authorized by the department, the symbol prescribed by this subsection shall use the colors magenta, or purple, or black on yellow background. The symbol prescribed is the three-bladed design as follows:

RADIATION SYMBOL

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



- b. Exception to color requirements for standard radiation symbol. Notwithstanding the requirements of subdivision a, 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.
 - c. Additional information on signs and labels. In addition to the contents of signs and labels prescribed in this chapter, the licensee or registrant shall provide, on or near the required signs and labels, additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures.
2. **Posting requirements.**
- a. Posting of radiation areas. The licensee or registrant shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA".
 - b. Posting of high radiation areas. The licensee or registrant shall post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA".

- c. Posting of very high radiation areas. The licensee or registrant shall post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA".
- d. Posting of airborne radioactivity areas. The licensee or registrant shall post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA".
- e. Posting of areas or rooms in which licensed or registered material is used or stored. The licensee or registrant shall 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 C with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)".

3. Exceptions to posting requirements.

- a. A licensee or registrant is not required to post caution signs in areas or rooms containing sources of radiation for periods of less than eight hours, if each of the following conditions is met:
 - (1) The sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in this chapter; and
 - (2) The area or room is subject to the licensee's or registrant's control.
- b. Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs pursuant to subsection 2 provided that the patient could be released from confinement pursuant to chapter 33-10-07.
- c. A room or area is not required to be posted with a caution sign because of the presence of a sealed source provided the radiation level at thirty centimeters from the surface of the sealed source container or housing does not exceed five hundredths millisievert [0.005 rem] per hour.
- d. A room or area is not required to be posted with a caution sign because of the presence of radiation machines used solely for diagnosis in the healing arts.

4. Labeling containers and radiation machines.

- a. The licensee or registrant shall 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 shall 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.
 - b. Each licensee or registrant shall, 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.
 - c. Each registrant shall ensure that each radiation machine is labeled in a conspicuous manner which cautions individuals that radiation is produced when it is energized.
5. **Exemptions to labeling requirements.** A licensee or registrant is not required to label:
- a. Containers holding licensed or registered material in quantities less than the quantities listed in appendix C;
 - b. Containers holding licensed or registered material in concentrations less than those specified in table III of appendix B;
 - c. Containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by this chapter;
 - d. Containers when they are in transport and packaged and labeled in accordance with the rules of the United States department of transportation (Labeling of packages containing radioactive materials is required by the United States 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 United States department of transportation rules 49 CFR 173.403(m) and (w) and 173.421-424.);
 - e. 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 shall be retained as long as the containers are in use for the purpose indicated on the record; or

- f. Installed manufacturing or process equipment, such as piping and tanks.

6. Procedures for receiving and opening packages.

- a. Each licensee or registrant who expects to receive a package containing quantities of radioactive material in excess of a type A quantity, as defined in section 33-10-13-02 and appendix A of chapter 33-10-13, shall make arrangements to receive:

- (1) The package when the carrier offers it for delivery; or
- (2) The notification of the arrival of the package at the carrier's terminal and to take possession of the package expeditiously.

- b. Each licensee or registrant shall:

- (1) Monitor the external surfaces of a labeled package for radioactive contamination unless the package contains only radioactive material in the form of gas or in special form as defined in section 33-10-01-04. Labeled package means posted with a radioactive white I, yellow II, or yellow III label as specified in United States department of transportation rules 49 CFR 172.403 and 172.436-440;
- (2) Monitor the external surfaces of a labeled package for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the type A quantity, as defined in section 33-10-13-02 and appendix A ~~to~~ of chapter 33-10-13. Labeled package means posted with a radioactive white I, yellow II, or yellow III label as specified in United States department of transportation rules 49 CFR 172.403 and 172.436-440; and
- (3) Monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet, or damaged.

- c. The licensee or registrant shall perform the monitoring required by subdivision b as soon as practicable 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~~ if there is evidence of degradation of package integrity such as a package that is crushed, wet, or damaged. If a package is received after working hours and has no evidence of degradation of package integrity the package shall be monitored no later than three hours from the beginning of the next working day if it is received--after working hours.
- d. The licensee or registrant shall immediately notify the final delivery carrier and, by telephone and telegram, mailgram, or facsimile, the department when:
 - (1) Removable radioactive surface contamination exceeds the limits of subsection 8 of section 33-10-13-15; or
 - (2) External radiation levels exceed the limits of subsections 9 and 10 of section 33-10-13-15.
- e. Each licensee or registrant shall:
 - (1) Establish, maintain, and retain written procedures for safely opening packages in which radioactive material is received; and
 - (2) Ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.
- f. Licensees or registrants transferring special form sources in vehicles owned or operated by the licensee or registrant to and from a worksite are exempt from the contamination monitoring requirements of subdivision b, but are not exempt from the monitoring requirement in subdivision b for measuring radiation levels that ensures that the source is still properly lodged in its shield.

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-04.1-14. Waste disposal.

1. General requirements.

- a. A licensee or registrant shall dispose of licensed or registered material only:

- (1) By transfer to an authorized recipient as provided in subsection 6 or in chapter 33-10-03, or to the United States department of energy;
 - (2) By decay in storage;
 - (3) By release in effluents within the limits in subsection 1 of section 33-10-04.1-07; or
 - (4) As authorized pursuant to subsection 2, 3, 4, or 5.
- b. A person shall be specifically licensed or registered to receive waste containing licensed or registered material from other persons for:
- (1) Treatment prior to disposal;
 - (2) Treatment or disposal by incineration;
 - (3) Decay in storage;
 - (4) Disposal at a land disposal facility licensed pursuant to 10 CFR 61; or
 - (5) Storage until transferred to a storage or disposal facility authorized to receive the waste.

2. Method for obtaining approval of proposed disposal procedures.

A licensee or registrant or applicant for a license or registration may apply to the department for approval of proposed procedures, not otherwise authorized in this article, to dispose of licensed or registered material generated in the licensee's or registrant's operations. Each application shall 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;
- b. An analysis and evaluation of pertinent information on the nature of the environment;
- c. The nature and location of other potentially affected facilities; and
- d. Analyses and procedures to ensure that doses are maintained as low as is reasonably achievable and within the dose limits in this chapter.

3. Disposal by release into sanitary sewerage.

- a. A licensee or registrant may discharge licensed or registered material into sanitary sewerage if each of the following conditions is satisfied:
 - (1) The material is readily soluble, or is readily dispersible biological material, in water;
 - (2) The quantity of licensed or registered radioactive material that the licensee or registrant releases into the sewer in one month divided by the average monthly volume of water released into the sewer by the licensee or registrant does not exceed the concentration listed in table III of appendix B;
 - (3) If more than one radionuclide is released, the following conditions must also be satisfied:
 - (a) The licensee or registrant shall determine the fraction of the limit in table III of appendix B 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 B; and
 - (b) The sum of the fractions for each radionuclide required by subparagraph a does not exceed unity; and
 - (4) The total quantity of licensed or registered radioactive material that the licensee or registrant releases into the sanitary sewerage in a year does not exceed one hundred eighty-five gigabecquerels [5 Ci] of hydrogen-3, thirty-seven gigabecquerels [1 Ci] of carbon-14, and 37 gigabecquerels [1 Ci] of all other radioactive materials combined.
 - b. Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limitations contained in subdivision a.
4. **Treatment or disposal by incineration.** A licensee or registrant may treat or dispose of licensed or registered material by incineration only in the amounts-and-forms form and concentration specified in subsection 5 or as specifically approved by the department pursuant to subsection 2.
5. **Disposal of specific wastes.**
- a. A licensee or registrant may dispose of the following licensed or registered material as if it were not radioactive:

- (1) One and eighty-five one-hundredths kilobecquerels [0.05 μ Ci], or less, of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting; and
- (2) One and eighty-five one-hundredths kilobecquerels [0.05 μ Ci], or less, of hydrogen-3 or carbon-14 per gram of animal tissue, averaged over the weight of the entire animal.

- b. A licensee or registrant shall not dispose of tissue pursuant to paragraph 2 of subdivision a in a manner that would permit its use either as food for humans or as animal feed.
- c. The licensee or registrant shall maintain records in accordance with subsection 9 of section 33-10-04.1-15.

6. Transfer for disposal and manifests.

- a. The requirements of this subsection and appendix D are designed to control transfers of low-level radioactive waste intended for disposal at a licensed low-level radioactive waste disposal facility, establish a manifest tracking system, and supplement existing requirements concerning transfers and recordkeeping for those wastes.
- b. Each shipment of radioactive waste designated for disposal at a licensed low-level radioactive waste disposal facility shall be accompanied by a shipment manifest as specified in section I of appendix D.
- c. Each shipment manifest shall include a certification by the waste generator as specified in section II of appendix D.
- d. Each person involved in the transfer of waste for disposal or in the disposal of waste, including the waste generator, waste collector, waste processor, and disposal facility operator, shall comply with the requirements specified in section III of appendix D.

- 7. Compliance with environmental and health protection rules.** Nothing in subsection 1, 2, 3, 4, 5, or 6 relieves the licensee or registrant from complying with other applicable federal, state, and local rules governing any other toxic or hazardous properties of materials that may be disposed of in accordance with subsection 1, 2, 3, 4, 5, or 6.

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-04.1

33-10-04.1-16. Reports.

1. Reports of stolen, lost, or missing licensed or registered sources of radiation.

a. Telephone reports. Each licensee or registrant shall report to the department by telephone as follows:

- (1) Immediately after its occurrence becomes known to the licensee or registrant, stolen, lost, or missing licensed or registered radioactive material in an aggregate quantity equal to or greater than one thousand times the quantity specified in appendix C under such circumstances that it appears to the licensee or registrant that an exposure could result to individuals in unrestricted areas; or
- (2) Within thirty days after its occurrence becomes known to the licensee or registrant, lost, stolen, or missing licensed or registered radioactive material in an aggregate quantity greater than ten times the quantity specified in appendix C that is still missing.
- (3) Immediately after its occurrence becomes known to the registrant, a stolen, lost, or missing radiation machine.

b. Written reports. Each licensee or registrant required to make a report pursuant to subdivision a, within thirty days after making the telephone report, shall make a written report to the department setting forth the following information:

- (1) 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;
- (2) A description of the circumstances under which the loss or theft occurred;
- (3) A statement of disposition, or probable disposition, of the licensed or registered source of radiation involved;
- (4) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas;

- (5) Actions that have been taken, or will be taken, to recover the source of radiation; and
 - (6) 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.
- c. Subsequent to filing the written report, the licensee or registrant shall also report additional substantive information on the loss or theft within thirty days after the licensee or registrant learns of such information.
 - d. The licensee or registrant shall prepare any report filed with the department pursuant to this subsection so that names of individuals who may have received exposure to radiation are stated in a separate and detachable portion of the report.

2. Notification of incidents.

- a. Immediate notification. Notwithstanding other requirements for notification, each licensee or registrant shall immediately report each event involving a source of radiation possessed by the licensee or registrant that may have caused or threatens to cause any of the following conditions:
 - (1) An individual to receive:
 - (a) A total effective dose equivalent of twenty-five one-hundredths sievert [25 rem] or more;
 - (b) An eye dose equivalent of seventy-five one-hundredths sievert [75 rem] or more; or
 - (c) A shallow dose equivalent to the skin or extremities or a total organ dose equivalent of two and five-tenths gray [250 rad] or more; or
 - (2) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for twenty-four hours, the individual could have received an intake five times the annual limit on intake. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.
- b. Twenty-four-hour notification. Each licensee or registrant, within twenty-four hours of discovery of the event, shall 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, any of the following conditions:

- (1) An individual to receive, in a period of twenty-four hours:
 - (a) A total effective dose equivalent exceeding five-hundredths sievert [5 rem];
 - (b) An eye dose equivalent exceeding fifteen-hundredths sievert [15 rem]; or
 - (c) A shallow dose equivalent to the skin or extremities or a total organ dose equivalent exceeding five-tenths sievert [50 rem]; or
 - (2) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for twenty-four hours, the individual could have received an intake in excess of one annual limit on intake. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.
- c. The licensee or registrant shall prepare each report filed with the department pursuant to this subsection so that names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.
- d. Licensees or registrants shall make the reports required by subdivisions a and b to the department by telephone, telegram, mailgram, or facsimile to the department.
- e. The provisions of this subsection 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 pursuant to subsection 4.
3. **Reports of exposures, radiation levels, and concentrations of radioactive material exceeding the limits.**
- a. Reportable events. In addition to the notification required by subsection 2, each licensee or registrant shall submit a written report within thirty days after learning of any of the following occurrences:
 - (1) Incidents for which notification is required by subsection 2; or
 - (2) Doses in excess of any of the following:

- (a) The occupational dose limits for adults in subsection 1 of section 33-10-04.1-06;
 - (b) The occupational dose limits for a minor in subsection 7 of section 33-10-04.1-06;
 - (c) The limits for an embryo or fetus of a declared pregnant woman in subsection 8 of section 33-10-04.1-06;
 - (d) The limits for an individual member of the public in subsection 1 of section 33-10-04.1-07; or
 - (e) Any applicable limit in the license or registration; or
- (3) Levels of radiation or concentrations of radioactive material in:
- (a) A restricted area in excess of applicable limits in the license or registration; or
 - (b) An unrestricted area in excess of ten times the applicable limit set forth in this chapter or in the license or registration, whether or not involving exposure of any individual in excess of the limits in subsection 1 of section 33-10-04.1-07; or
- (4) For licensees subject to the provisions of United States environmental protection agency's generally applicable environmental radiation standards in 40 CFR 190, levels of radiation or releases of radioactive material in excess of those standards, or of license conditions related to those standards.

b. Contents of reports.

- (1) Each report required by subdivision a shall describe the extent of exposure of individuals to radiation and radioactive material, including, as appropriate:
- (a) Estimates of each individual's dose;
 - (b) The levels of radiation and concentrations of radioactive material involved;
 - (c) The cause of the elevated exposures, dose rates, or concentrations; and
 - (d) Corrective steps taken or planned to ensure against a recurrence, including the schedule for

achieving conformance with applicable limits, generally applicable environmental standards, and associated license or registration conditions.

- (2) Each report filed pursuant to subdivision a shall include for each individual exposed: the name, social security account number, and date of birth. With respect to the limit for the embryo or fetus in subsection 8 of section 33-10-04.1-06, the identifiers should be those of the declared pregnant woman. The report shall be prepared so that this information is stated in a separate and detachable portion of the report.
 - c. All licensees or registrants who make reports pursuant to subdivision a shall submit the report in writing to the department.
4. **Reports of planned special exposures.** The licensee or registrant shall submit a written report to the department within thirty days following any planned special exposure conducted in accordance with subsection 6 of section 33-10-04.1-06, informing the department that a planned special exposure was conducted and indicating the date the planned special exposure occurred and the information required by subsection 6 of section 33-10-04.1-15.
5. **Reporting requirements.**
- a. **Immediate report.** Each licensee shall notify the department as soon as possible but not later than four hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radiation or radioactive materials that could exceed regulatory limits or releases of licensed material that could exceed regulatory limits (events may include fires, explosions, toxic gas releases, etc.).
 - b. **Twenty-four-hour report.** Each licensee shall notify the department within twenty-four hours after the discovery of any of the following events involving licensed material:
 - (1) An unplanned contamination event that:
 - (a) Requires access to the contaminated area, by workers or the public, to be restricted for more than twenty-four hours by imposing additional radiological controls or by prohibiting entry into the area;
 - (b) Involves a quantity of material greater than five times the lowest annual limit on intake

specified in appendix B of this chapter for the material; and

- (c) Has access to the area restricted for a reason other than to allow isotopes with a half-life of less than twenty-four hours to decay prior to decontamination.
- (2) An event in which equipment is disabled or fails to function as designed when:
 - (a) The equipment is required by rule or license condition to prevent releases exceeding regulatory limits, to prevent exposures to radiation and radioactive materials exceeding regulatory limits, or to mitigate the consequences of an accident;
 - (b) The equipment is required to be available and operable when it is disabled or fails to function; and
 - (c) No redundant equipment is available and operable to perform the required safety function.
 - (3) An event that requires unplanned medical treatment at a medical facility of an individual with spreadable radioactive contamination on the individual's clothing or body.
 - (4) An unplanned fire or explosion damaging any licensed material or any device, container, or equipment containing licensed material when:
 - (a) The quantity of material involved is greater than five times the lowest annual limit on intake specified in appendix B of this chapter for the material; and
 - (b) The damage affects the integrity of the licensed material or its container.
- c. Preparation and submission of reports. Reports made by licensees in response to the requirements of this section must be made as follows:
- (1) Licensees shall make reports required by subdivisions a and b by telephone to the department. To the extent that the information is available at the time of notification, the information provided in these reports must include:
 - (a) The caller's name and callback telephone number;

- (b) A description of the event, including date and time;
 - (c) The exact location of the event;
 - (d) The isotopes, quantities, and chemical and physical form of the licensed material involved; and
 - (e) Any personnel radiation exposure data available.
- (2) Written report. Each licensee who makes a report required by subdivisions a and b shall submit a written followup report within thirty days of the initial report. Written reports prepared pursuant to other rules may be submitted to fulfill this requirement if the reports contain all of the necessary information and the appropriate distribution is made.
- (a) A description of the event, including the probable cause and the manufacturer and model number (if applicable) of any equipment that failed or malfunctioned;
 - (b) The exact location of the event;
 - (c) The isotopes, quantities, and chemical and physical form of the licensed material involved;
 - (d) Date and time of the event;
 - (e) Corrective actions taken or planned and the results of any evaluations or assessments; and
 - (f) The extent of exposure of individuals to radiation or to radioactive materials without identification of individuals by name.

6. Reports of individual monitoring.

- a. This section applies to each person licensed or registered by the department to:
 - (1) Possess or use sources of radiation for purposes of industrial radiography pursuant to chapters 33-10-03 and 33-10-05;
 - (2) Receive radioactive waste from other persons for disposal pursuant to chapter 33-10-03; or
 - (3) Possess or use at any time, for processing or manufacturing for distribution pursuant to chapter

33-10-03 or 33-10-07, radioactive material in quantities exceeding any one of the following quantities:

Radionuclide	Activity ^a	
	Ci	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

^a The department may require as a license condition, or by rule, or order pursuant to this section 33-10-01-09, reports from licensees or registrants who are licensed or registered to use radionuclides not on this list, in quantities sufficient to cause comparable radiation levels.

- b. Each licensee or registrant in a category listed in subdivision a shall submit an annual report of the results of individual monitoring carried out by the licensee or registrant for each individual for whom monitoring was required by subsection 2 of section 33-10-04.1-09 during that year. The licensee or registrant may include additional data for individuals for whom monitoring was provided but not required. The licensee or registrant shall use the department's current occupational radiation exposure form (SFN 8416) or equivalent or electronic media containing all the information required by the department's current occupational radiation exposure form (SFN 8416).
- c. The licensee or registrant shall file the report required by subdivision b, covering the preceding year, on or before April thirtieth of each year. The licensee or registrant shall submit the report to the department.

7. Notifications and reports to individuals.

- a. Requirements for notification and reports to individuals of exposure to radiation or radioactive material are specified in subsection 3 of section 33-10-10-02.
- b. When a licensee or registrant is required pursuant to subsection 3 to report to the department any exposure of an individual to radiation or radioactive material, the licensee or registrant shall also notify the individual. Such notice shall be transmitted at a time not later than

the transmittal to the department, and shall comply with the provisions of subdivision a of subsection 3 of section 33-10-10-02.

8. **Reports of leaking or contaminated sealed sources.** The licensee or registrant shall file a report within five days with the department if the test for leakage or contamination required pursuant to subsection 1 of section 33-10-04.1-08 indicates a sealed source is leaking or contaminated. The report shall include the equipment involved, the test results, and the corrective action taken.

History: Effective March 1, 1994; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04, 23-20.1-09.1

NOTES FOR CHAPTER 33-10-04.1

The following changes are made to the appendices in this chapter:

The amended copies of the rules generally have strike outs showing text to be deleted and underlines showing text to be added. This is true for all additions and deletions in Chapter 33-10-04.1 except those changes made to the tables in the appendices. The tables in the appendices in Chapter 33-10-04.1 are presented to the Legislative Council in a camera-ready format for printing in order to reduce the Council's typing burden. In order to accomplish this, the page format has to be specially modified by clerical staff of the State Health Department. To add underlines and leave in text being struck out would cause the appendices tables to "wrap" and they would no longer be printed in the proper format. Therefore, in order to show those changes being made to the appendices, a list of changes is attached outlining each change made in the appendices.

**List of Proposed Changes
to the Appendices of Chapter 33-10-04.1
of the North Dakota Radiological Health Rules
1994/1995**

APPENDIX B:

- Second page--Deleted the period in, "St. wall = stomach wall;" so it reads "St wall"...
- Fourth page, in the section titled Table II "Effluent Concentrations", the second paragraph, next to the last line--replaced, "they were" with "was the case"...
- Next paragraph after the last change above--added parentheses around the "ml" after " 2.4×10^9 " and changed "0.1 rem" to "1 mSv (0.1 rem)".
- Fifth page, in the section titled Table III "Releases to Sewers", at the end of the paragraph--changed "0.5 rem" to "5 mSv (0.5 rem)".
- entry for 42 Molybdenum-90 , Y--added a "2" subscript after "MoS".
- entry for 43 Technetium-97m, D--moved "St wall" from Table I, Col. 1 to Col. 2.
- entry for 62 Samarium-146, W--changed "4E2" to "4E-2" in Table I, Col. 2.
- entry for 62 Samarium-147, W-- changed "4E2" to "4E-2" in Table I, Col. 2.
- entry for 64 Gadolinium-148, D--changed "2E+2" to "2E-2" in Table I, Col. 2
- entry for 68 Erbium-172, W--changed "E+3" to "1E+3" in Table I, Col. 1.
- entry for 75 Rhenium-187, D--moved "St wall" from Table I, Col. 1 to Col.2.
- entry for 82 Lead-210, D--changed "6E1" to "6E-1" in Table 1, Col. 1 and changed "2E1" to "2E-1" in Table I, Col. 2.
- entry for 86 Radon-220--moved "(or 1.0 working level)" from Table II, Col. 1 to Table I, Col. 3.
- entry for 86 Radon-222--moved "(or 0.33 working level)" from Table II, Col. 1 to Table I, Col. 3.

APPENDIX C:

- entry for Indium-110m--deleted the "m" so it is "Indium-110".
- entry for Indium-110m--changed "(69.1m)" to "(69.1 min)".
- entry for Indium-110--changed "(4.9h)" to "(4.9 h)".
- entry for Antimony-120--changed "(16m)" to "(16 min)".
- entry for Antimony-120--changed "(5.76d)" to "(5.76 d)".
- entry for Antimony-128--changed "(10.4m)" to "(10.4 min)".
- entry for Antimony-128--changed "(9.01h)" to "(9.01 h)".
- entry for Europium-150--changed "(12.62h)" to "(12.62 h)".
- entry for Europium-150--changed "(34.2y)" to "(34.2 y)".
- entry for Terbium-156m--changed "(5.0h)" to "(5.0 h)".
- entry for Terbium-156m--changed "(24.4h)" to "(24.4 h)".
- entry for Rhenium-182--changed "(12.7h)" to "(12.7 h)".
- entry for Rhenium-182--changed "(64.0h)" to "(64.0 h)", note to use the zero not the capital letter o.
- entry for Iridium-192m--changed "(1.4m)" to "(1.4 min)".
- entry for Iridium-192--changed "(73.8d)" to "(73.8 d)".
- entry for Neptunium-236--changed "(1.15E+5)" to "(1.15E+5 y)".
- entry for Neptunium-236--changed "(22.5h)" to "(22.5 h)".

APPENDIX E:

- Fourth page, in the section titled "2. Radioactive Waste Characteristics", in paragraph 7, added "material" after "pyrophoric".

APPENDIX F:

- In the section titled "Concentrations in Soil and other materials except water", add "in soil" to paragraph 2, and added paragraph 3 to apply to non soil materials.

**APPENDIX A
PROTECTION FACTORS FOR RESPIRATORS¹**

Description	Modes ³	Protection Factors ⁴		Tested & Certified Equipment National Institute for Occupational Safety and Health & Mine Safety and Health Administration tests for permissibility
		Particulates only	Particulates, gases & vapors	
(1) AIR-PURIFYING RESPIRATORS ⁶				
Facepiece, half-mask ⁷	NP	10		30 CFR 11, Subpart K.
Facepiece, full	NP	50		
Facepiece, half-mask full, or hood	PP	1000		
(2) ATMOSPHERE-SUPPLYING RESPIRATORS				
1. Air-line respirator				
Facepiece, half-mask	CF		1000	30 CFR 11, Subpart J.
Facepiece, half-mask	D		5	
Facepiece, full	CF		2000	
Facepiece, full	D		5	
Facepiece, full	PD		2000	
Hood	CF		9.10	
Suit	CF			
2. Self-contained breathing apparatus (SCBA)				
Facepiece, full	D		50	30 CFR 11, Subpart H.
Facepiece, full	PD		10,000 ¹¹	
Facepiece, full	RD		50	
Facepiece, full	RP		5,000 ¹²	
(3) COMBINATION RESPIRATORS				
Any combination of air-purifying and atmosphere-supplying respirators			Protection factor for type and mode of operation as listed above.	30 CFR 11, Sec. 11.63(b).

FOOTNOTES

1. For use in the selection of respiratory protective equipment to be used only where the contaminants have been identified and the concentrations, or possible concentrations, are known.
2. Only for shaven faces and where nothing interferes with the seal of tight-fitting facepieces against the skin. Hoods and suits are excepted.
3. The mode symbols are defined as follows:
 - CF = continuous flow
 - D = demand
 - NP = negative pressure, that is, negative phase during inhalation
 - PD = pressure demand, that is, always positive pressure
 - PP = positive pressure
 - RD = demand, recirculating or closed circuit
 - RP = pressure demand, recirculating or closed circuit
4. a. The protection factor is a measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of airborne radioactive material outside the respiratory protective equipment to that inside the equipment, usually inside the facepiece, under conditions of use. It is applied to the ambient airborne concentration to estimate the concentrations inhaled by the wearer according to the following formula:
Concentration inhaled = Ambient airborne concentration
Protection factor
- b. The protection factors apply:
 - (1) Only for individuals trained in using respirators and wearing properly fitted respirators that are used and maintained under supervision in a well-planned respiratory protective program.
 - (2) For air-purifying respirators only when high efficiency particulate filters, above ninety-nine and ninety-seven hundredths percent removal efficiency by thermally generated three-tenths micron dioctyl phthalate (DOP) test or equivalent, are used in atmospheres not deficient in oxygen and not containing radioactive gas or vapor respiratory hazards.
 - (3) No adjustment is to be made for the use of sorbents against radioactive material in the form of gases or vapors.
 - (4) For atmosphere-supplying respirators only when supplied with adequate respirable air. Respirable air shall be provided of the quality and quantity required in accordance with the national institute for occupational safety and health and the mine safety and health administration

certification described in 30 CFR 11. Oxygen and air shall not be used in the same apparatus.

5. Excluding radioactive contaminants that present an absorption or submersion hazard. For tritium oxide, approximately one-third of the intake occurs by absorption through the skin so that an overall protection factor of less than two is appropriate when atmosphere--supplying respirators are used to protect against tritium oxide. If the protection factor for respiratory protective equipment is five, the effective protection factor for tritium is about one and four tenths; with protection factors of ten, the effective factor for tritium oxide is about one and seven tenths; and with protection factors of one hundred or more, the effective factor for tritium oxide is about one and nine tenths. Air-purifying respirators are not suitable for protection against tritium oxide. See also footnote 9 concerning supplied-air suits.
6. Canisters and cartridges shall not be used beyond service-life limitations.
7. Under-chin type only. This type of respirator is not satisfactory for use where it might be possible, such as, if an accident or emergency were to occur, for the ambient airborne concentrations to reach instantaneous values greater than 10 times the pertinent values in table I, column 3 of appendix B of chapter 33-10-04.1.1. This type of respirator is not suitable for protection against plutonium or other high-toxicity materials. The mask is to be tested for fit prior to use, each time it is donned.
8.
 - a. Equipment shall be operated in a manner that ensures that proper air flow-rates are maintained. A protection factor of no more than one thousand may be utilized for tested-and-certified supplied-air hoods when a minimum air flow of six cubic feet per minute ($0.17 \text{ m}^3/\text{min}$) is maintained and calibrated air line pressure gauges or flow measuring devices are used. A protection factor of up to two thousand may be used for tested and certified hoods only when the air flow is maintained at the manufacturer's recommended maximum rate for the equipment, this rate is greater than six cubic feet per minute ($0.17 \text{ m}^3/\text{min}$) and calibrated air line pressure gauges or flow measuring devices are used.
 - b. The design of the supplied-air hood or helmet, with a minimum flow of six cubic feet per minute ($0.17 \text{ m}^3/\text{min}$) of air, may determine its overall efficiency and the protection it provides. For example, some hoods aspirate contaminated air into the breathing zone when the wearer works with hands-over-head. This aspiration may be overcome if a short cape-like extension to the hood is worn under a coat or overalls. Other limitations specified by the approval agency shall be considered before using a hood in certain types of atmospheres. See footnote 9.

9. Appropriate protection factors shall be determined, taking into account the design of the suit and its permeability to the contaminant under conditions of use. There shall be a standby rescue person equipped with a respirator or other apparatus appropriate for the potential hazards and communications equipment whenever supplied-air suits are used.
10. No approval schedules are currently available for this equipment. Equipment is to be evaluated by testing or on the basis of reliable test information.
11. This type of respirator may provide greater protection and be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure, such as skin absorption, must be taken into account in such circumstances.
12. Quantitative fit testing shall be performed on each individual, and no more than two hundredths percent leakage is allowed with this type of apparatus. Perceptible outward leakage of gas from this or any positive pressure self-contained breathing apparatus is unacceptable because service life will be reduced substantially. Special training in the use of this type of apparatus shall be provided to the wearer.

Note 1: Protection factors for respirators approved by the U.S. bureau of mines and the national institute for occupational safety and health, according to applicable approvals for respirators for type and mode of use to protect against airborne radionuclides, may be used to the extent that they do not exceed the protection factors listed in this table. The protection factors listed in this table may not be appropriate to circumstances where chemical or other respiratory hazards exist in addition to radioactive hazards. The selection and use of respirators for such circumstances should take into account applicable approvals of the U.S. bureau of mines and the national institute for occupational safety and health.

Note 2: Radioactive contaminants, for which the concentration values in table I, column 3 of appendix B of chapter 33-10-04.1.1 are based on internal dose due to inhalation, may present external exposure hazards at higher concentrations. Under these circumstances, limitations on occupancy may have to be governed by external dose limits.

APPENDIX B

ANNUAL LIMITS ON INTAKE (ALI) AND DERIVED AIR CONCENTRATIONS (DAC) OF RADIONUCLIDES FOR OCCUPATIONAL EXPOSURE; EFFLUENT CONCENTRATIONS; CONCENTRATIONS FOR RELEASE TO SANITARY SEWERAGE

Introduction

For each radionuclide, table I indicates the chemical form which is to be used for selecting the appropriate annual limit on intake or derived air concentration value. The annual limit on intakes and derived air concentrations for inhalation are given for an aerosol with an activity median aerodynamic diameter (AMAD) of one μm , micron, and for three classes (D,W,Y) of radioactive material, which refer to their retention (approximately days, weeks or years) in the pulmonary region of the lung. This classification applies to a range of clearance half-times of less than ten days for D, from ten to one hundred days for W, and of greater than one hundred days for Y. The class (D, W, Y) given in the column headed "class" applies only to the inhalation annual limit on intakes and derived air concentrations given in table I columns 2 and 3. Table II provides concentration limits for airborne and liquid effluents released to the general environment. Table III provides concentration limits for discharges to sanitary sewerage.

Note:

The values in tables I, II, and III are presented in the computer "E" notation. In this notation a value of 6E-02 represents a value of 6×10^{-2} or six hundredths, 6E+2 represents 6×10^2 or six hundred, and 6E+0 represents 6×10^0 or six.

Table I "Occupational Values"

Note that the columns in table I of this appendix captioned "oral ingestion annual limit on intake," "inhalation annual limit on intake," and "derived air concentration," are applicable to occupational exposure to radioactive material.

The annual limit on intakes in this appendix are the annual intakes of given radionuclide by "reference man" which would result in either (1) a committed effective dose equivalent of five hundredths sieverts (five rem), stochastic annual limit on intake, or (2) a committed dose equivalent of five tenths sieverts (fifty rem) to an organ or tissue, non-stochastic annual limit on intake. The stochastic annual limit on intakes were derived to result in a risk, due to irradiation of organs and tissues, comparable to the risk associated with deep dose equivalent to the whole body of five hundredths sieverts (five rem). The derivation includes multiplying the committed dose equivalent to an organ or tissue by a weighting factor, w_T . This weighting factor is the proportion of the risk of stochastic effects resulting from irradiation of the organ or tissue, T, to the total risk of stochastic effects when the whole body is

irradiated uniformly. The values of w_T are listed under the definition of weighting factor in section 33-10-04.1.1-03. The non-stochastic annual limit on intakes were derived to avoid non-stochastic effects, such as prompt damage to tissue or reduction in organ function.

A value of $w_T = 0.06$ is applicable to each of the five organs or tissues in the "remainder" category receiving the highest dose equivalents, and the dose equivalents of all other remaining tissues may be disregarded. The following portions of the gastro-intestinal tract -- stomach, small intestine, upper large intestine, and lower large intestine -- are to be treated as four separate organs.

Note that the dose equivalents for an extremity (hands and forearms, feet, and lower legs), skin, and lens of the eye are not considered in computing the committed effective dose equivalent, but are subject to limits that must be met separately.

When an annual limit on intake is defined by the stochastic dose limit, this value alone is given. When an annual limit on intake is determined by the non-stochastic dose limit to an organ, the organ or tissue to which the limit applies is shown, and the annual limit on intake for the stochastic limit is shown in parentheses. Abbreviated organ or tissue designations are used:

LLI wall = lower large intestine wall;
St wall = stomach wall;
Blad wall = bladder wall; and
Bone surf = bone surface.

The use of the annual limit on intakes listed first, the more limiting of the stochastic and non-stochastic annual limit on intakes, will ensure that non-stochastic effects are avoided and that the risk of stochastic effects is limited to an acceptably low value. If, in a particular situation involving a radionuclide for which the non-stochastic annual limit on intake is limiting, use of that non-stochastic annual limit on intake is considered unduly conservative, the licensee may use the stochastic annual limit on intake to determine the committed effective dose equivalent. However, the licensee shall also ensure that the five tenths sievert (fifty rem) dose equivalent limit for any organ or tissue is not exceeded by the sum of the external deep dose equivalent plus the internal committed dose equivalent to that organ, not the effective dose. For the case where there is no external dose contribution, this would be demonstrated if the sum of the fractions of the nonstochastic annual limit on intakes (ALI_{ns}) that contribute to the committed dose equivalent to the organ receiving the highest dose does not exceed unity, that is, $\sum (\text{intake (in } \mu\text{Ci) of each radionuclide} / ALI_{ns}) \leq \text{one}$. If there is an external deep dose equivalent contribution of H_d , then this sum must be less than $1 - (H_d/50)$, instead of $\leq \text{one}$.

The derived air concentration (DAC) values are derived limits intended to control chronic occupational exposures. The relationship between the derived air concentration and the annual limit on intake is given by:

$$\text{DAC} = \text{ALI}(\text{in } \mu\text{Ci}) / (2000 \text{ hours per working year} \times 60 \text{ minutes/hour} \times 2 \times 10^4 \text{ ml per minute}) = [\text{ALI} / 2.4 \times 10^9] \mu\text{Ci/ml}.$$

where 2×10^4 ml is the volume of air breathed per minute at work by reference man under working conditions of light work.

The derived air concentration values relate to one of two modes of exposure: either external submersion or the internal committed dose equivalents resulting from inhalation of radioactive materials. Derived air concentrations based upon submersion are for immersion in a semi-infinite cloud of uniform concentration and apply to each radionuclide separately.

The annual limit on intake and derived air concentration values include contributions to exposure by the single radionuclide named and any in-growth of daughter radionuclides produced in the body by decay of the parent. However, intakes that include both the parent and daughter radionuclides should be treated by the general method appropriate for mixtures.

The values of annual limit on intake and derived air concentration do not apply directly when the individual both ingests and inhales a radionuclide, when the individual is exposed to a mixture of radionuclides by either inhalation or ingestion or both, or when the individual is exposed to both internal and external irradiation. See subsection 2 of section 33-10-04.1.1-06. When an individual is exposed to radioactive materials which fall under several of the translocation classifications of the same radionuclide, such as, class D, class W, or class Y, the exposure may be evaluated as if it were a mixture of different radionuclides.

It should be noted that the classification of a compound as class D, W, or Y is based on the chemical form of the compound and does not take into account the radiological half-life of different radionuclides. For this reason, values are given for class D, W, and Y compounds, even for very short-lived radionuclides.

Table II "Effluent Concentrations"

The columns in table II of this appendix captioned "effluent concentrations," "air" and "water" are applicable to the assessment and control of dose to the public, particularly in the implementation of the provisions of subsection 2 of section 33-10-04.1.1-07. The concentration values given in columns 1 and 2 of table II are equivalent to the radionuclide concentrations which, if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of five tenths millisievert (0.05 rem).

Consideration of non-stochastic limits has not been included in deriving the air and water effluent concentration limits because non-stochastic effects are presumed not to occur at or below the dose levels established for individual members of the public. For radionuclides, where the non-stochastic limit was governing in deriving the occupational derived

air concentration, the stochastic annual limit on intake was used in deriving the corresponding airborne effluent limit in table II. For this reason, the derived air concentration and airborne effluent limits are not always proportional as was the case in appendix A of the 1992 revision of chapter 33-10-04.1.1.

The air concentration values listed in table II, column 1 were derived by one of two methods. For those radionuclides for which the stochastic limit is governing, the occupational stochastic inhalation annual limit on intake was divided by 2.4×10^9 (ml), relating the inhalation annual limit on intake to the derived air concentration, as explained above, and then divided by a factor of three hundred. The factor of three hundred includes the following components: a factor of fifty to relate the five hundredths sievert (5 rem) annual occupational dose limit to the one millisievert (0.1 rem) limit for members of the public, a factor of three to adjust for the difference in exposure time and the inhalation rate for a worker and that for members of the public; and a factor of two to adjust the occupational values, derived for adults, so that they are applicable to other age groups.

For those radionuclides for which submersion, that is external dose, is limiting, the occupational derived air concentration in table I, column 3 was divided by two hundred nineteen. The factor of two hundred nineteen is composed of a factor of fifty, as described above, and a factor of four and thirty-eight hundredths relating occupational exposure for two thousand hours per year to full-time exposure (8,760 hours per year). Note that an additional factor of two for age considerations is not warranted in the submersion case.

The water concentrations were derived by taking the most restrictive occupational stochastic oral ingestion annual limit on intake and dividing by 7.3×10^7 . The factor of 7.3×10^7 (ml) includes the following components: the factors of fifty and two described above and a factor of 7.3×10^5 (ml) which is the annual water intake of reference man.

Note 2 of this appendix provides groupings of radionuclides which are applicable to unknown mixtures of radionuclides. These groupings, including occupational inhalation annual limit on intakes and derived air concentrations, air and water effluent concentrations and releases to sewer, require demonstrating that the most limiting radionuclides in successive classes are absent. The limit for the unknown mixture is defined when the presence of one of the listed radionuclides cannot be definitely excluded either from knowledge of the radionuclide composition of the source or from actual measurements.

Table III "Releases to Sewers"

The monthly average concentrations for release to sanitary sewerage are applicable to the provisions in subsection 3 of section 33-10-04.1.1-14. The concentration values were derived by taking the most restrictive occupational stochastic oral ingestion annual limit on intake and dividing by 7.3×10^6 (ml). The factor of 7.3×10^6 (ml) is composed of a factor of

7.3×10^5 (ml), the annual water intake by reference man, and a factor of 10, such that the concentrations, if the sewage released by the licensee were the only source of water ingested by a reference man during a year, would result in a committed effective dose equivalent of five millisieverts (0.5 rem).

LIST OF ELEMENTS

Name	Symbol	Atomic Number	Name	Symbol	Atomic Number
Actinium	Ac	89	Mercury	Hg	80
Aluminum	Al	13	Molybdenum	Mo	42
Americium	Am	95	Neodymium	Nd	60
Antimony	Sb	51	Neptunium	Np	93
Argon	Ar	18	Nickel	Ni	28
Arsenic	As	33	Niobium	Nb	41
Astatine	At	85	Osmium	Os	76
Barium	Ba	56	Palladium	Pd	46
Berkelium	Bk	97	Phosphorus	P	15
Beryllium	Be	4	Platinum	Pt	78
Bismuth	Bi	83	Plutonium	Pu	94
Bromine	Br	35	Polonium	Po	84
Cadmium	Cd	48	Potassium	K	19
Calcium	Ca	20	Praseodymium	Pr	59
Californium	Cf	98	Promethium	Pm	61
Carbon	C	6	Protactinium	Pa	91
Cerium	Ce	58	Radium	Ra	88
Cesium	Cs	55	Radon	Rn	86
Chlorine	Cl	17	Rhenium	Re	75
Chromium	Cr	24	Rhodium	Rh	45
Cobalt	Co	27	Rubidium	Rb	37
Copper	Cu	29	Ruthenium	Ru	44
Curium	Cm	96	Samarium	Sm	62
Dysprosium	Dy	66	Scandium	Sc	21
Einsteinium	Es	99	Selenium	Se	34
Erbium	Er	68	Silicon	Si	14
Europium	Eu	63	Silver	Ag	47
Fermium	Fm	100	Sodium	Na	11
Fluorine	F	9	Strontium	Sr	38
Francium	Fr	87	Sulfur	S	16
Gadolinium	Gd	64	Tantalum	Ta	73
Gallium	Ga	31	Technetium	Tc	43
Germanium	Ge	32	Tellurium	Te	52
Gold	Au	79	Terbium	Tb	65
Hafnium	Hf	72	Thallium	Tl	81
Holmium	Ho	67	Thorium	Th	90
Hydrogen	H	1	Thulium	Tm	69
Indium	In	49	Tin	Sn	50
Iodine	I	53	Titanium	Ti	22
Iridium	Ir	77	Tungsten	W	74
Iron	Fe	26	Uranium	U	92
Krypton	Kr	36	Vanadium	V	23
Lanthanum	La	57	Xenon	Xe	54
Lead	Pb	82	Ytterbium	Yb	70
Lutetium	Lu	71	Yttrium	Y	39
Magnesium	Mg	12	Zinc	Zn	30
Manganese	Mn	25	Zirconium	Zr	40
Mendelevium	Md	101			

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
1	Hydrogen-3	Water, DAC includes skin absorption	8E+4	8E+4	2E-5	1E-7	1E-3	1E-2
		Gas (HT or T ₂) Submersion ¹ : Use above values as HT and T ₂ oxidize in air and in the body to HTO.						
4	Beryllium-7	W, all compounds except those given for Y Y, oxides, halides, and nitrates	4E+4	2E+4	9E-6	3E-8	6E-4	6E-3
4	Beryllium-10	W, see ⁷ Be	1E+3	2E+2	6E-8	2E-10	-	-
		Y, see ⁷ Be	LLI wall (1E+3)	-	-	-	2E-5	2E-4
6	Carbon-11 ²	Monoxide	-	1E+6	5E-4	2E-6	-	-
		Dioxide	-	6E+5	3E-4	9E-7	-	-
		Compounds	4E+5	4E+5	2E-4	6E-7	6E-3	6E-2
6	Carbon-14	Monoxide	-	2E+6	7E-4	2E-6	-	-
		Dioxide	-	2E+5	9E-5	3E-7	-	-
		Compounds	2E+3	2E+3	1E-6	3E-9	3E-5	3E-4
9	Fluorine-18 ²	D, fluorides of H, Li, Na, K, Rb, Cs, and Fr	5E+4	7E+4	3E-5	1E-7	-	-
		W, fluorides of Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, As, Sb, Bi, Fe, Ru, Os, Co, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, V, Nb, Ta, Mn, Tc, and Re	St wall (5E+4)	-	-	-	7E-4	7E-3
		Y, lanthanum fluoride	-	9E+4	4E-5	1E-7	-	-
			-	8E+4	3E-5	1E-7	-	-
11	Sodium-22	D, all compounds	4E+2	6E+2	3E-7	9E-10	6E-6	6E-5
11	Sodium-24	D, all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
12	Magnesium-28	D. all compounds except those given for W W. oxides, hydroxides, carbides, halides, and nitrates	7E+2 -	2E+3 1E+3	7E-7 5E-7	2E-9 2E-9	9E-6 -	9E-5 -
13	Aluminum-26	D. all compounds except those given for W W. oxides, hydroxides, carbides, halides, and nitrates	4E+2 -	6E+1 9E+1	3E-8 4E-8	9E-11 1E-10	6E-6 -	6E-5 -
14	Silicon-31	D. all compounds except those given for W and Y W. oxides, hydroxides, carbides, and nitrates Y. aluminosilicate glass	9E+3 - -	3E+4 3E+4 3E+4	1E-5 1E-5 1E-5	4E-8 5E-8 4E-8	1E-4 - -	1E-3 - -
14	Silicon-32	D. see ^{31}Si W. see ^{31}Si Y. see ^{31}Si	2E+3 LLI wall (3E+3) - -	2E+2 - 1E+2 5E+0	1E-7 - 5E-8 2E-9	3E-10 - 2E-10 7E-12	- 4E-5 - -	- 4E-4 - -
15	Phosphorus-32	D. all compounds except phosphates given for W W. phosphates of Zn^{2+} , S^{4+} , Mg^{2+} , Fe^{3+} , Bi^{3+} , and lanthanides	6E+2 -	9E+2 4E+2	4E-7 2E-7	1E-9 5E-10	9E-6 -	9E-5 -
15	Phosphorus-33	D. see ^{32}P W. see ^{32}P	6E+3 -	8E+3 3E+3	4E-6 1E-6	1E-8 4E-9	8E-5 -	8E-4 -
16	Sulfur-35	Vapor D. sulfides and sulfates except those given for W	1E+4 1E+4 LLI wall (8E+3)	6E-6 2E+4 -	2E-8 7E-6 -	- 2E-8 -	- - 1E-4	- - 1E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)		Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
		W. elemental sulfur, sulfides of Sr, Ba, Ge, Sn, Pb, As, Sb, Bi, Cu, Ag, Au, Zn, Cd, Hg, W, and Mo. Sulfates of Ca, Sr, Ba, Ra, As, Sb, and Bi	6E+3					
17	Chlorine-36	D. chlorides of H, Li, Na, K, Rb, Cs, and Fr	2E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W. chlorides of lanthanides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Tl, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Tc, and Re	-	2E+2	1E-7	3E-10	-	-
17	Chlorine-38 ²	D. see ³⁶ Cl	2E+4	4E+4	2E-5	6E-8	-	-
		W. see ³⁶ Cl	St wall (3E+4)	5E+4	2E-5	6E-8	3E-4	3E-3
17	Chlorine-39 ²	D. see ³⁶ Cl	2E+4	5E+4	2E-5	7E-8	-	-
		W. see ³⁶ Cl	St wall (4E+4)	6E+4	2E-5	8E-8	5E-4	5E-3
18	Argon-37	Submersion ¹	-	-	1E+0	6E-3	-	-
18	Argon-39	Submersion ¹	-	-	2E-4	8E-7	-	-
18	Argon-41	Submersion ¹	-	-	3E-6	1E-8	-	-
19	Potassium-40	D. all compounds	3E+2	4E+2	2E-7	6E-10	4E-6	4E-5
19	Potassium-42	D. all compounds	5E+3	5E+3	2E-6	7E-9	6E-5	6E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
19	Potassium-43	D, all compounds	6E+3	9E+3	4E-6	1E-8	9E-5	9E-4
19	Potassium-44 ²	D, all compounds	2E+4 St wall (4E+4)	7E+4 -	3E-5 -	9E-8 -	- 5E-4	- 5E-3
19	Potassium-45 ²	D, all compounds	3E+4 St wall (5E+4)	1E+5 -	5E-5 -	2E-7 -	- 7E-4	- 7E-3
20	Calcium-41	W, all compounds	3E+3 Bone surf (4E+3)	4E+3 Bone surf (4E+3)	2E-6 -	- 5E-9	- 6E-5	- 6E-4
20	Calcium-45	W, all compounds	2E+3	8E+2	4E-7	1E-9	2E-5	2E-4
20	Calcium-47	W, all compounds	8E+2	9E+2	4E-7	1E-9	1E-5	1E-4
21	Scandium-43	Y, all compounds	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
21	Scandium-44m	Y, all compounds	5E+2	7E+2	3E-7	1E-9	7E-6	7E-5
21	Scandium-44	Y, all compounds	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
21	Scandium-46	Y, all compounds	9E+2	2E+2	1E-7	3E-10	1E-5	1E-4
21	Scandium-47	Y, all compounds	2E+3 LLI wall (3E+3)	3E+3 -	1E-6 -	4E-9 -	- 4E-5	- 4E-4
21	Scandium-48	Y, all compounds	8E+2	1E+3	6E-7	2E-9	1E-5	1E-4
21	Scandium-49 ²	Y, all compounds	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
22	Titanium-44	D. all compounds except those given for W and Y W. oxides, hydroxides, carbides, halides, and nitrates Y. SrTiO_3	3E+2 - -	1E+1 3E+1 6E+0	5E-9 1E-8 2E-9	2E-11 4E-11 8E-12	4E-6 - -	4E-5 - -
22	Titanium-45	D. see ^{44}Ti W. see ^{44}Ti Y. see ^{44}Ti	9E+3 - -	3E+4 4E+4 3E+4	1E-5 1E-5 1E-5	3E-8 5E-8 4E-8	1E-4 - -	1E-3 - -
23	Vanadium-47 ²	D. all compounds except those given for W W. oxides, hydroxides, carbides, and halides	3E+4 St wall (3E+4) -	8E+4 - 1E+5	3E-5 - 4E-5	1E-7 - 1E-7	- 4E-4 -	- 4E-3 -
23	Vanadium-48	D. see ^{47}V W. see ^{47}V	6E+2 -	1E+3 6E+2	5E-7 3E-7	2E-9 9E-10	9E-6 -	9E-5 -
23	Vanadium-49	D. see ^{47}V W. see ^{47}V	7E+4 LLI wall (9E+4) -	3E+4 Bone surf (3E+4) 2E+4	1E-5 - 8E-6	- 5E-8 2E-8	- 1E-3 -	- 1E-2 -
24	Chromium-48	D. all compounds except those given for W and Y W. halides and nitrates Y. oxides and hydroxides	6E+3 - -	1E+4 7E+3 7E+3	5E-6 3E-6 3E-6	2E-8 1E-8 1E-8	8E-5 - -	8E-4 - -
24	Chromium-49 ²	D. see ^{48}Cr W. see ^{48}Cr Y. see ^{48}Cr	3E+4 - -	8E+4 1E+5 9E+4	4E-5 4E-5 4E-5	1E-7 1E-7 1E-7	4E-4 - -	4E-3 - -
24	Chromium-51	D. see ^{48}Cr W. see ^{48}Cr Y. see ^{48}Cr	4E+4 - -	5E+4 2E+4 2E+4	2E-5 1E-5 8E-6	6E-8 3E-8 3E-8	5E-4 - -	5E-3 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
25	Manganese-51 ²	D. all compounds except those given for W W. oxides, hydroxides, halides, and nitrates	2E+4 -	5E+4 6E+4	2E-5 3E-5	7E-8 8E-8	3E-4 -	3E-3 -
25	Manganese-52m ²	D. see ⁵¹ Mn W. see ⁵¹ Mn	3E+4 St wall (4E+4) -	9E+4 1E+5	4E-5 4E-5	1E-7 1E-7	- 5E-4	- 5E-3
25	Manganese-52	D. see ⁵¹ Mn W. see ⁵¹ Mn	7E+2 -	1E+3 9E+2	5E-7 4E-7	2E-9 1E-9	1E-5 -	1E-4 -
25	Manganese-53	D. see ⁵¹ Mn W. see ⁵¹ Mn	5E+4 -	1E+4 Bone surf (2E+4) 1E+4	5E-6 5E-6	- 3E-8 2E-8	7E-4 -	7E-3 -
25	Manganese-54	D. see ⁵¹ Mn W. see ⁵¹ Mn	2E+3 -	9E+2 8E+2	4E-7 3E-7	1E-9 1E-9	3E-5 -	3E-4 -
25	Manganese-56	D. see ⁵¹ Mn W. see ⁵¹ Mn	5E+3 -	2E+4 2E+4	6E-6 9E-6	2E-8 3E-8	7E-5 -	7E-4 -
26	Iron-52	D. all compounds except those given for W W. oxides, hydroxides, and halides	9E+2 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	1E-5 -	1E-4 -
26	Iron-55	D. see ⁵² Fe W. see ⁵² Fe	9E+3 -	2E+3 4E+3	8E-7 2E-6	3E-9 6E-9	1E-4 -	1E-3 -
26	Iron-59	D. see ⁵² Fe W. see ⁵² Fe	8E+2 -	3E+2 5E+2	1E-7 2E-7	5E-10 7E-10	1E-5 -	1E-4 -
26	Iron-60	D. see ⁵² Fe W. see ⁵² Fe	3E+1 -	6E+0 2E+1	3E-9 8E-9	9E-12 3E-11	4E-7 -	4E-6 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
27	Cobalt-55	W. all compounds except those given for Y Y. oxides, hydroxides, halides, and nitrates	1E+3 -	3E+3 3E+3	1E-6 1E-6	4E-9 4E-9	2E-5 -	2E-4 -
27	Cobalt-56	W. see ^{56}Co Y. see ^{56}Co	5E+2 4E+2	3E+2 2E+2	1E-7 8E-8	4E-10 3E-10	6E-6 -	6E-5 -
27	Cobalt-57	W. see ^{56}Co Y. see ^{56}Co	8E+3 4E+3	3E+3 7E+2	1E-6 3E-7	4E-9 9E-10	6E-5 -	6E-4 -
27	Cobalt-58m	W. see ^{56}Co Y. see ^{56}Co	6E+4 -	9E+4 6E+4	4E-5 3E-5	1E-7 9E-8	8E-4 -	8E-3 -
27	Cobalt-58	W. see ^{56}Co Y. see ^{56}Co	2E+3 1E+3	1E+3 7E+2	5E-7 3E-7	2E-9 1E-9	2E-5 -	2E-4 -
27	Cobalt-60m ²	W. see ^{56}Co Y. see ^{56}Co	1E+6 St wall (1E+6) -	4E+6 3E+6	2E-3 1E-3	6E-6 4E-6	- 2E-2 -	- 2E-1 -
27	Cobalt-60	W. see ^{56}Co Y. see ^{56}Co	5E+2 2E+2	2E+2 3E+1	7E-8 1E-8	2E-10 5E-11	3E-6 -	3E-5 -
27	Cobalt-61 ²	W. see ^{56}Co Y. see ^{56}Co	2E+4 2E+4	6E+4 6E+4	3E-5 2E-5	9E-8 8E-8	3E-4 -	3E-3 -
27	Cobalt-62m ²	W. see ^{56}Co Y. see ^{56}Co	4E+4 St wall (5E+4) -	2E+5 2E+5	7E-5 6E-5	2E-7 2E-7	- 7E-4 -	- 7E-3 -
28	Nickel-56	D. all compounds except those given for W W. oxides, hydroxides, and carbides Vapor	1E+3 - -	2E+3 1E+3 1E+3	8E-7 5E-7 5E-7	3E-9 2E-9 2E-9	2E-5 - -	2E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
28	Nickel-57	D. see ^{56}Ni W. see ^{56}Ni Vapor	2E+3 - -	5E+3 3E+3 6E+3	2E-6 1E-6 3E-6	7E-9 4E-9 9E-9	2E-5 -	2E-4 - -
28	Nickel-59	D. see ^{56}Ni W. see ^{56}Ni Vapor	2E+4 - -	4E+3 7E+3 2E+3	2E-6 3E-6 8E-7	5E-9 1E-8 3E-9	3E-4 -	3E-3 - -
28	Nickel-63	D. see ^{56}Ni W. see ^{56}Ni Vapor	9E+3 - -	2E+3 3E+3 8E+2	7E-7 1E-6 3E-7	2E-9 4E-9 1E-9	1E-4 -	1E-3 - -
28	Nickel-65	D. see ^{56}Ni W. see ^{56}Ni Vapor	8E+3 - -	2E+4 3E+4 2E+4	1E-5 1E-5 7E-6	3E-8 4E-8 2E-8	1E-4 -	1E-3 - -
28	Nickel-66	D. see ^{56}Ni W. see ^{56}Ni Vapor	4E+2 LLI wall (5E+2) - -	2E+3 - 6E+2 3E+3	7E-7 - 3E-7 1E-6	2E-9 - 9E-10 4E-9	- 6E-6 -	- 6E-5 -
29	Copper-60 ²	D. all compounds except those given for W and Y W. sulfides, halides, and nitrates Y. oxides and hydroxides	3E+4 St. wall (3E+4) - -	9E+4 - 1E+5 1E+5	4E-5 - 5E-5 4E-5	1E-7 - 2E-7 1E-7	- 4E-4 -	- 4E-3 -
29	Copper-61	D. see ^{60}Cu W. see ^{60}Cu Y. see ^{60}Cu	1E+4 - -	3E+4 4E+4 4E+4	1E-5 2E-5 1E-5	4E-8 6E-8 5E-8	2E-4 -	2E-3 - -
29	Copper-64	D. see ^{60}Cu W. see ^{60}Cu Y. see ^{60}Cu	1E+4 - -	3E+4 2E+4 2E+4	1E-5 1E-5 9E-6	4E-8 3E-8 3E-8	2E-4 -	2E-3 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
29	Copper-67	D. see ^{60}Cu W. see ^{60}Cu Y. see ^{60}Cu	5E+3 - -	8E+3 5E+3 5E+3	3E-6 2E-6 2E-6	1E-8 7E-9 6E-9	6E-5 - -	6E-4 - -
30	Zinc-62	Y. all compounds	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
30	Zinc-63 ²	Y. all compounds	2E+4 St wall (3E+4)	7E+4 -	3E-5 -	9E-8 -	- 3E-4	- 3E-3
30	Zinc-65	Y. all compounds	4E+2	3E+2	1E-7	4E-10	5E-6	5E-5
30	Zinc-69m	Y. all compounds	4E+3	7E+3	3E-6	1E-8	6E-5	6E-4
30	Zinc-69 ²	Y. all compounds	6E+4	1E+5	6E-5	2E-7	8E-4	8E-3
30	Zinc-71m	Y. all compounds	6E+3	2E+4	7E-6	2E-8	8E-5	8E-4
30	Zinc-72	Y. all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
31	Gallium-65 ²	D. all compounds except those given for W	5E+4 St wall (6E+4)	2E+5 -	7E-5 -	2E-7 -	- 9E-4	- 9E-3
		W. oxides, hydroxides, carbides, halides, and nitrates	-	2E+5	8E-5	3E-7	-	-
31	Gallium-66	D. see ^{66}Ga W. see ^{66}Ga	1E+3 -	4E+3 3E+3	1E-6 1E-6	5E-9 4E-9	1E-5 -	1E-4 -
31	Gallium-67	D. see ^{65}Ga W. see ^{65}Ga	7E+3 -	1E+4 1E+4	6E-6 4E-6	2E-8 1E-8	1E-4 -	1E-3 -
31	Gallium-68 ²	D. see ^{66}Ga W. see ^{66}Ga	2E+4 -	4E+4 5E+4	2E-5 2E-5	6E-8 7E-8	2E-4 -	2E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
31	Gallium-70 ²	D. see ⁶⁶ Ga	5E+4 St wall (7E+4)	2E+5	7E-5	2E-7	-	-
		W. see ⁶⁶ Ga	-	2E+5	8E-5	3E-7	1E-3	1E-2
31	Gallium-72	D. see ⁶⁶ Ga	1E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W. see ⁶⁶ Ga	-	3E+3	1E-6	4E-9	-	-
31	Gallium-73	D. see ⁶⁶ Ga	5E+3	2E+4	6E-6	2E-8	7E-5	7E-4
		W. see ⁶⁶ Ga	-	2E+4	6E-6	2E-8	-	-
32	Germanium-66	D. all compounds except those given for W	2E+4	3E+4	1E-5	4E-8	3E-4	3E-3
		W. oxides, sulfides, and halides	-	2E+4	8E-6	3E-8	-	-
32	Germanium-67 ²	D. see ⁶⁶ Ge	3E+4 St wall (4E+4)	9E+4	4E-5	1E-7	-	-
		W. see ⁶⁶ Ge	-	1E+5	4E-5	1E-7	6E-4	6E-3
32	Germanium-68	D. see ⁶⁶ Ge	5E+3	4E+3	2E-6	5E-9	6E-5	6E-4
		W. see ⁶⁶ Ge	-	1E+2	4E-8	1E-10	-	-
32	Germanium-69	D. see ⁶⁶ Ge	1E+4	2E+4	6E-6	2E-8	2E-4	2E-3
		W. see ⁶⁶ Ge	-	8E+3	3E-6	1E-8	-	-
32	Germanium-71	D. see ⁶⁶ Ge	5E+5	4E+5	2E-4	6E-7	7E-3	7E-2
		W. see ⁶⁶ Ge	-	4E+4	2E-5	6E-8	-	-
32	Germanium-75 ²	D. see ⁶⁶ Ge	4E+4 St wall (7E+4)	8E+4	3E-5	1E-7	-	-
		W. see ⁶⁶ Ge	-	8E+4	4E-5	1E-7	9E-4	9E-3
32	Germanium-77	D. see ⁶⁶ Ge	9E+3	1E+4	4E-6	1E-8	1E-4	1E-3
		W. see ⁶⁶ Ge	-	6E+3	2E-6	8E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
32	Germanium-78 ²	D. see ⁶⁶ Ge	2E+4 St. wall (2E+4)	2E+4	9E-6	3E-8	-	-
		W. see ⁶⁶ Ge	-	2E+4	9E-6	3E-8	3E-4	3E-3
33	Arsenic-69 ²	W. all compounds	3E+4 St. wall (4E+4)	1E+5	5E-5	2E-7	-	-
			-	-	-	-	6E-4	6E-3
33	Arsenic-70 ²	W. all compounds	1E+4	5E+4	2E-5	7E-8	2E-4	2E-3
33	Arsenic-71	W. all compounds	4E+3	5E+3	2E-6	6E-9	5E-5	5E-4
33	Arsenic-72	W. all compounds	9E+2	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-73	W. all compounds	8E+3	2E+3	7E-7	2E-9	1E-4	1E-3
33	Arsenic-74	W. all compounds	1E+3	8E+2	3E-7	1E-9	2E-5	2E-4
33	Arsenic-76	W. all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4
33	Arsenic-77	W. all compounds	4E+3 LLI wall (5E+3)	5E+3	2E-6	7E-9	-	-
			-	-	-	-	6E-5	6E-4
33	Arsenic-78 ²	W. all compounds	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
34	Selenium-70 ²	D. all compounds except those given for W.	2E+4	4E+4	2E-5	5E-8	1E-4	1E-3
		W. oxides, hydroxides, carbides, and elemental Se	1E+4	4E+4	2E-5	6E-8	-	-
34	Selenium-73m ²	D. see ⁷⁶ Se	6E+4	2E+5	6E-5	2E-7	4E-4	4E-3
		W. see ⁷⁶ Se	3E+4	1E+5	6E-5	2E-7	-	-
34	Selenium-73	D. see ⁷⁶ Se	3E+3	1E+4	5E-6	2E-8	4E-5	4E-4
		W. see ⁷⁶ Se	-	2E+4	7E-6	2E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci/ml}$)	Col. 1 Air ($\mu\text{Ci/ml}$)	Col. 2 Water ($\mu\text{Ci/ml}$)	Monthly Average Concentration ($\mu\text{Ci/ml}$)
34	Selenium-75	D. see ^{70}Se W. see ^{70}Se	5E+2 -	7E+2 6E+2	3E-7 3E-7	1E-9 8E-10	7E-6 -	7E-5 -
34	Selenium-79	D. see ^{70}Se W. see ^{70}Se	6E+2 -	8E+2 6E+2	3E-7 2E-7	1E-9 8E-10	8E-6 -	8E-5 -
34	Selenium-81m ²	D. see ^{70}Se W. see ^{70}Se	4E+4 2E+4	7E+4 7E+4	3E-5 3E-5	9E-8 1E-7	3E-4 -	3E-3 -
34	Selenium-81 ²	D. see ^{70}Se W. see ^{70}Se	6E+4 St wall (8E+4) -	2E+5 -	9E-5 -	3E-7 -	- 1E-3 -	- 1E-2 -
34	Selenium-83 ²	D. see ^{70}Se W. see ^{70}Se	4E+4 3E+4	1E+5 1E+5	5E-5 5E-5	2E-7 2E-7	4E-4 -	4E-3 -
35	Bromine-74m ²	D. bromides of H, Li, Na, K, Rb, Cs, and Fr W. bromides of lantha- nides, Be, Mg, Ca, Sr, Ba, Ra, Al, Ga, In, Tl, Ge, Sn, Pb, As, Sb, Bi, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au, Zn, Cd, Hg, Sc, Y, Ti, Zr, Hf, V, Nb, Ta, Mn, Tc, and Re	1E+4 St wall (2E+4) -	4E+4 -	2E-5 -	5E-8 -	- 3E-4 -	- 3E-3 -
35	Bromine-74 ²	D. see ^{74m}Br W. see ^{74m}Br	2E+4 St wall (4E+4) -	7E+4 -	3E-5 -	1E-7 -	- 5E-4 -	- 5E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
35	Bromine-75 ²	D. see ^{74m} Br	3E+4	5E+4	2E-5	7E-8	-	-
		W. see ^{74m} Br	St wall (4E+4)	5E+4	2E-5	-	5E-4	5E-3
35	Bromine-76	D. see ^{74m} Br	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
		W. see ^{74m} Br	-	4E+3	2E-6	6E-9	-	-
35	Bromine-77	D. see ^{74m} Br	2E+4	2E+4	1E-5	3E-8	2E-4	2E-3
		W. see ^{74m} Br	-	2E+4	8E-6	3E-8	-	-
35	Bromine-80m	D. see ^{74m} Br	2E+4	2E+4	7E-6	2E-8	3E-4	3E-3
		W. see ^{74m} Br	-	1E+4	6E-6	2E-8	-	-
35	Bromine-80 ²	D. see ^{74m} Br	5E+4	2E+5	8E-5	3E-7	-	-
		W. see ^{74m} Br	St wall (9E+4)	-	-	-	1E-3	1E-2
			-	2E+5	9E-5	3E-7	-	-
35	Bromine-82	D. see ^{74m} Br	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W. see ^{74m} Br	-	4E+3	2E-6	5E-9	-	-
35	Bromine-83	D. see ^{74m} Br	5E+4	6E+4	3E-5	9E-8	-	-
		W. see ^{74m} Br	St wall (7E+4)	-	-	-	9E-4	9E-3
			-	6E+4	3E-5	9E-8	-	-
35	Bromine-84 ²	D. see ^{74m} Br	2E+4	6E+4	2E-5	8E-8	-	-
		W. see ^{74m} Br	St wall (3E+4)	-	-	-	4E-4	4E-3
			-	6E+4	3E-5	9E-8	-	-
36	Krypton-74 ²	Submersion ¹	-	-	3E-6	1E-8	-	-
36	Krypton-76	Submersion ¹	-	-	9E-6	4E-8	-	-
36	Krypton-77 ²	Submersion ¹	-	-	4E-6	2E-8	-	-
36	Krypton-79	Submersion ¹	-	-	2E-5	7E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
36	Krypton-81	Submersion ¹	-	-	7E-4	3E-6	-	-
36	Krypton-83m ²	Submersion ¹	-	-	1E-2	5E-5	-	-
36	Krypton-85m	Submersion ¹	-	-	2E-5	1E-7	-	-
36	Krypton-85	Submersion ¹	-	-	1E-4	7E-7	-	-
36	Krypton-87 ²	Submersion ¹	-	-	5E-6	2E-8	-	-
36	Krypton-88	Submersion ¹	-	-	2E-6	9E-9	-	-
37	Rubidium-79 ²	D. all compounds	4E+4 St wall (6E+4)	1E+5	5E-5	2E-7	-	-
				-	-	-	8E-4	8E-3
37	Rubidium-81m ²	D. all compounds	2E+5 St wall (3E+5)	3E+5	1E-4	5E-7	-	-
				-	-	-	4E-3	4E-2
37	Rubidium-81	D. all compounds	4E+4	5E+4	2E-5	7E-8	5E-4	5E-3
37	Rubidium-82m	D. all compounds	1E+4	2E+4	7E-6	2E-8	2E-4	2E-3
37	Rubidium-83	D. all compounds	6E+2	1E+3	4E-7	1E-9	9E-6	9E-5
37	Rubidium-84	D. all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-86	D. all compounds	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
37	Rubidium-87	D. all compounds	1E+3	2E+3	6E-7	2E-9	1E-5	1E-4
37	Rubidium-88 ²	D. all compounds	2E+4 St wall (3E+4)	6E+4	3E-5	9E-8	-	-
				-	-	-	4E-4	4E-3
37	Rubidium-89 ²	D. all compounds	4E+4 St wall (6E+4)	1E+5	6E-5	2E-7	-	-
				-	-	-	9E-4	9E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
38	Strontium-80 ²	D. all soluble compounds except SrTiO_3 Y. all insoluble compounds and SrTiO_3	4E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	6E-5 -	6E-4 -
38	Strontium-81 ²	D. see ^{80}Sr Y. see ^{80}Sr	3E+4 2E+4	8E+4 8E+4	3E-5 3E-5	1E-7 1E-7	3E-4 -	3E-3 -
38	Strontium-82	D. see ^{80}Sr Y. see ^{80}Sr	3E+2 LLI wall (2E+2) 2E+2	4E+2 - 9E+1	2E-7 - 4E-8	6E-10 - 1E-10	- 3E-6 -	- 3E-5 -
38	Strontium-83	D. see ^{80}Sr Y. see ^{80}Sr	3E+3 2E+3	7E+3 4E+3	3E-6 1E-6	1E-8 5E-9	3E-5 -	3E-4 -
38	Strontium-85m ²	D. see ^{80}Sr Y. see ^{80}Sr	2E+5 -	6E+5 8E+5	3E-4 4E-4	9E-7 1E-6	3E-3 -	3E-2 -
38	Strontium-85	D. see ^{80}Sr Y. see ^{80}Sr	3E+3 -	3E+3 2E+3	1E-6 6E-7	4E-9 2E-9	4E-5 -	4E-4 -
38	Strontium-87m	D. see ^{80}Sr Y. see ^{80}Sr	5E+4 4E+4	1E+5 2E+5	5E-5 6E-5	2E-7 2E-7	6E-4 -	6E-3 -
38	Strontium-89	D. see ^{80}Sr Y. see ^{80}Sr	6E+2 LLI wall (6E+2) 5E+2	8E+2 - 1E+2	4E-7 - 6E-8	1E-9 - 2E-10	- 8E-6 -	- 8E-5 -
38	Strontium-90	D. see ^{80}Sr Y. see ^{80}Sr	3E+1 Bone surf (4E+1) -	2E+1 Bone surf (2E+1) 4E+0	8E-9 - 2E-9	- 3E-11 6E-12	- 5E-7 -	- 5E-6 -
38	Strontium-91	D. see ^{80}Sr Y. see ^{80}Sr	2E+3 -	6E+3 4E+3	2E-6 1E-6	8E-9 5E-9	2E-5 -	2E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
38	Strontium-92	D. see ^{90}Sr Y. see ^{90}Sr	3E+3 -	9E+3 7E+3	4E-6 3E-6	1E-8 9E-9	4E-5 -	4E-4 -
39	Yttrium-86m ²	W. all compounds except those given for Y Y. oxides and hydroxides	2E+4 -	6E+4 5E+4	2E-5 2E-5	8E-8 8E-8	3E-4 -	3E-3 -
39	Yttrium-86	W. see ^{86}Y Y. see ^{86}Y	1E+3 -	3E+3 3E+3	1E-6 1E-6	5E-9 5E-9	2E-5 -	2E-4 -
39	Yttrium-87	W. see ^{87}Y Y. see ^{87}Y	2E+3 -	3E+3 3E+3	1E-6 1E-6	5E-9 5E-9	3E-5 -	3E-4 -
39	Yttrium-88	W. see ^{88}Y Y. see ^{88}Y	1E+3 -	3E+2 2E+2	1E-7 1E-7	3E-10 3E-10	1E-5 -	1E-4 -
39	Yttrium-90m	W. see ^{90}Y Y. see ^{90}Y	8E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	1E-4 -	1E-3 -
39	Yttrium-90	W. see ^{90}Y Y. see ^{90}Y	4E+2 LLI wall (5E+2) -	7E+2 - 6E+2	3E-7 - 3E-7	9E-10 - 9E-10	- - 7E-6	- - 7E-5
39	Yttrium-91m ²	W. see ^{91}Y Y. see ^{91}Y	1E+5 -	2E+5 2E+5	1E-4 7E-5	3E-7 2E-7	2E-3 -	2E-2 -
39	Yttrium-91	W. see ^{91}Y Y. see ^{91}Y	5E+2 LLI wall (6E+2) -	2E+2 - 1E+2	7E-8 - 5E-8	2E-10 - 2E-10	- - 8E-6	- - 8E-5
39	Yttrium-92	W. see ^{92}Y Y. see ^{92}Y	3E+3 -	9E+3 8E+3	4E-6 3E-6	1E-8 1E-8	4E-5 -	4E-4 -
39	Yttrium-93	W. see ^{93}Y Y. see ^{93}Y	1E+3 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	2E-5 -	2E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
39	Yttrium-94 ²	W. see ⁸⁹ Y Y. see ⁸⁹ Y	2E+4 St wall (3E+4) -	8E+4 - 8E+4	3E-5 - 3E-5	1E-7 - 1E-7	- 4E-4 -	- 4E-3 -
39	Yttrium-95 ²	W. see ⁸⁹ Y Y. see ⁸⁹ Y	4E+4 St wall (5E+4) -	2E+5 - 1E+5	6E-5 - 6E-5	2E-7 - 2E-7	- 7E-4 -	- 7E-3 -
40	Zirconium-86	D. all compounds except those given for W and Y W. oxides, hydroxides, halides, and nitrates Y. carbide	1E+3 - -	4E+3 3E+3 2E+3	2E-6 1E-6 1E-6	6E-9 4E-9 3E-9	2E-5 - -	2E-4 - -
40	Zirconium-88	D. see ⁸⁶ Zr W. see ⁸⁶ Zr Y. see ⁸⁶ Zr	4E+3 - -	2E+2 5E+2 3E+2	9E-8 2E-7 1E-7	3E-10 7E-10 4E-10	5E-5 - -	5E-4 - -
40	Zirconium-89	D. see ⁸⁶ Zr W. see ⁸⁶ Zr Y. see ⁸⁶ Zr	2E+3 - -	4E+3 2E+3 2E+3	1E-6 1E-6 1E-6	5E-9 3E-9 3E-9	2E-5 - -	2E-4 - -
40	Zirconium-93	D. see ⁸⁶ Zr W. see ⁸⁶ Zr Y. see ⁸⁶ Zr	1E+3 Bone surf (3E+3) - -	6E+0 Bone surf (2E+1) 2E+1 Bone surf (6E+1) 6E+1 Bone surf (7E+1)	3E-9 - 1E-8 - 2E-8 -	- 2E-11 - 9E-11 - 9E-11	- 4E-5 - - -	- 4E-4 - - -
40	Zirconium-95	D. see ⁸⁶ Zr W. see ⁸⁶ Zr Y. see ⁸⁶ Zr	1E+3 - -	1E+2 Bone surf (3E+2) 4E+2 3E+2	5E-8 - 2E-7 1E-7	- 4E-10 5E-10 4E-10	2E-5 - -	2E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci}/\text{ml}$)	Col. 1 Air ($\mu\text{Ci}/\text{ml}$)	Col. 2 Water ($\mu\text{Ci}/\text{ml}$)	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
40	Zirconium-97	D, see ^{96}Zr W, see ^{96}Zr Y, see ^{96}Zr	6E+2 - -	2E+3 1E+3 1E+3	8E-7 6E-7 5E-7	3E-9 2E-9 2E-9	9E-6 - -	9E-5 - -
41	Niobium-88 ²	W, all compounds except those given for Y Y, oxides and hydroxides	5E+4 St wall (7E+4) -	2E+5 - 2E+5	9E-5 - 9E-5	3E-7 - 3E-7	- 1E-3 -	- 1E-2 -
41	Niobium-89 ² (66 min)	W, see ^{90}Nb Y, see ^{90}Nb	1E+4 -	4E+4 4E+4	2E-5 2E-5	6E-8 5E-8	1E-4 -	1E-3 -
41	Niobium-89 (122 min)	W, see ^{90}Nb Y, see ^{90}Nb	5E+3 -	2E+4 2E+4	8E-6 6E-6	3E-8 2E-8	7E-5 -	7E-4 -
41	Niobium-90	W, see ^{90}Nb Y, see ^{90}Nb	1E+3 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	1E-5 -	1E-4 -
41	Niobium-93m	W, see ^{90}Nb Y, see ^{90}Nb	9E+3 LLI wall (1E+4) -	2E+3 - 2E+2	8E-7 - 7E-8	3E-9 - 2E-10	- 2E-4 -	- 2E-3 -
41	Niobium-94	W, see ^{90}Nb Y, see ^{90}Nb	9E+2 -	2E+2 2E+1	8E-8 6E-9	3E-10 2E-11	1E-5 -	1E-4 -
41	Niobium-95m	W, see ^{90}Nb Y, see ^{90}Nb	2E+3 LLI wall (2E+3) -	3E+3 - 2E+3	1E-6 - 9E-7	4E-9 - 3E-9	- 3E-5 -	- 3E-4 -
41	Niobium-95	W, see ^{90}Nb Y, see ^{90}Nb	2E+3 -	1E+3 1E+3	5E-7 5E-7	2E-9 2E-9	3E-5 -	3E-4 -
41	Niobium-96	W, see ^{90}Nb Y, see ^{90}Nb	1E+3 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	2E-5 -	2E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
41	Niobium-97 ²	W. see ⁹⁴ Nb Y. see ⁹⁴ Nb	2E+4 -	8E+4 7E+4	3E-5 3E-5	1E-7 1E-7	3E-4 -	3E-3 -
41	Niobium-98 ²	W. see ⁹⁴ Nb Y. see ⁹⁴ Nb	1E+4 -	5E+4 5E+4	2E-5 2E-5	8E-8 7E-8	2E-4 -	2E-3 -
42	Molybdenum-90	D. all compounds except those given for Y Y. oxides, hydroxides, and MoS ₂	4E+3 2E+3	7E+3 5E+3	3E-6 2E-6	1E-8 6E-9	3E-5 -	3E-4 -
42	Molybdenum-93m	D. see ⁹⁴ Mo Y. see ⁹⁴ Mo	9E+3 4E+3	2E+4 1E+4	7E-6 6E-6	2E-8 2E-8	6E-5 -	6E-4 -
42	Molybdenum-93	D. see ⁹⁴ Mo Y. see ⁹⁴ Mo	4E+3 2E+4	5E+3 2E+2	2E-6 8E-8	8E-9 2E-10	5E-5 -	5E-4 -
42	Molybdenum-99	D. see ⁹⁴ Mo Y. see ⁹⁴ Mo	2E+3 LLI wall (1E+3) 1E+3	3E+3 1E+3	1E-6 -	4E-9 2E-9	- 2E-5	- 2E-4
42	Molybdenum-101 ²	D. see ⁹⁴ Mo Y. see ⁹⁴ Mo	4E+4 St wall (5E+4) -	1E+5 1E+5	6E-5 6E-5	2E-7 2E-7	- 7E-4	- 7E-3
43	Technetium-93m ²	D. all compounds except those given for W W. oxides, hydroxides, halides, and nitrates	7E+4 -	2E+5 3E+5	6E-5 1E-4	2E-7 4E-7	1E-3 -	1E-2 -
43	Technetium-93	D. see ^{93m} Tc W. see ^{93m} Tc	3E+4 -	7E+4 1E+5	3E-5 4E-5	1E-7 1E-7	4E-4 -	4E-3 -
43	Technetium-94m ²	D. see ^{93m} Tc W. see ^{93m} Tc	2E+4 -	4E+4 6E+4	2E-5 2E-5	6E-8 8E-8	3E-4 -	3E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
43	Technetium-94	D. see ^{94}Tc W. see ^{94}Tc	9E+3 -	2E+4 2E+4	8E-6 1E-5	3E-8 3E-8	1E-4 -	1E-3 -
43	Technetium-95m	D. see ^{95m}Tc W. see ^{95m}Tc	4E+3 -	5E+3 2E+3	2E-6 8E-7	8E-9 3E-9	5E-5 -	5E-4 -
43	Technetium-95	D. see ^{95}Tc W. see ^{95}Tc	1E+4 -	2E+4 2E+4	9E-6 8E-6	3E-8 3E-8	1E-4 -	1E-3 -
43	Technetium-96m ²	D. see ^{96m}Tc W. see ^{96m}Tc	2E+5 -	3E+5 2E+5	1E-4 1E-4	4E-7 3E-7	2E-3 -	2E-2 -
43	Technetium-96	D. see ^{96}Tc W. see ^{96}Tc	2E+3 -	3E+3 2E+3	1E-6 9E-7	5E-9 3E-9	3E-5 -	3E-4 -
43	Technetium-97m	D. see ^{97m}Tc W. see ^{97m}Tc	5E+3 -	7E+3 St wall (7E+3) 1E+3	3E-6 -	- 1E-8 2E-9	6E-5 -	6E-4 -
43	Technetium-97	D. see ^{97}Tc W. see ^{97}Tc	4E+4 -	5E+4 6E+3	2E-5 2E-6	7E-8 8E-9	5E-4 -	5E-3 -
43	Technetium-98	D. see ^{98}Tc W. see ^{98}Tc	1E+3 -	2E+3 3E+2	7E-7 1E-7	2E-9 4E-10	1E-5 -	1E-4 -
43	Technetium-99m	D. see ^{99m}Tc W. see ^{99m}Tc	8E+4 -	2E+5 2E+5	6E-5 1E-4	2E-7 3E-7	1E-3 -	1E-2 -
43	Technetium-99	D. see ^{99}Tc W. see ^{99}Tc	4E+3 -	5E+3 St wall (6E+3) 7E+2	2E-6 -	- 8E-9 9E-10	6E-5 -	6E-4 -
43	Technetium-101 ²	D. see ^{101}Tc W. see ^{101}Tc	9E+4 St wall (1E+5) -	3E+5 -	1E-4 -	5E-7 -	- 2E-3 -	- 2E-2 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)		Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
		DAC ($\mu\text{Ci/ml}$)						
43	Technetium-104 ²	D. see ^{99m} Tc	2E+4 St wall (3E+4)	7E+4	3E-5	1E-7	-	-
		W. see ^{99m} Tc	-	9E+4	4E-5	1E-7	4E-4	4E-3
44	Ruthenium-94 ²	D. all compounds except those given for W and Y	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W. halides	-	6E+4	3E-5	9E-8	-	-
		Y. oxides and hydroxides	-	6E+4	2E-5	8E-8	-	-
44	Ruthenium-97	D. see ⁹⁹ Ru	8E+3	2E+4	8E-6	3E-8	1E-4	1E-3
		W. see ⁹⁹ Ru	-	1E+4	5E-6	2E-8	-	-
		Y. see ⁹⁹ Ru	-	1E+4	5E-6	2E-8	-	-
44	Ruthenium-103	D. see ⁹⁹ Ru	2E+3	2E+3	7E-7	2E-9	3E-5	3E-4
		W. see ⁹⁹ Ru	-	1E+3	4E-7	1E-9	-	-
		Y. see ⁹⁹ Ru	-	6E+2	3E-7	9E-10	-	-
44	Ruthenium-105	D. see ⁹⁹ Ru	5E+3	1E+4	6E-6	2E-8	7E-5	7E-4
		W. see ⁹⁹ Ru	-	1E+4	6E-6	2E-8	-	-
		Y. see ⁹⁹ Ru	-	1E+4	5E-6	2E-8	-	-
44	Ruthenium-106	D. see ⁹⁹ Ru	2E+2 LLL wall (2E+2)	9E+1	4E-8	1E-10	-	-
		W. see ⁹⁹ Ru	-	5E+1	2E-8	8E-11	3E-6	3E-5
		Y. see ⁹⁹ Ru	-	1E+1	5E-9	2E-11	-	-
45	Rhodium-99m	D. all compounds except those given for W and Y	2E+4	6E+4	2E-5	8E-8	2E-4	2E-3
		W. halides	-	8E+4	3E-5	1E-7	-	-
		Y. oxides and hydroxides	-	7E+4	3E-5	9E-8	-	-
45	Rhodium-99	D. see ^{99m} Rh	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W. see ^{99m} Rh	-	2E+3	9E-7	3E-9	-	-
		Y. see ^{99m} Rh	-	2E+3	8E-7	3E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
45	Rhodium-100	D. see ^{100}Rh W. see ^{100}Rh Y. see ^{100}Rh	2E+3 - -	5E+3 4E+3 4E+3	2E-6 2E-6 2E-6	7E-9 6E-9 5E-9	2E-5 - -	2E-4 - -
45	Rhodium-101m	D. see ^{101m}Rh W. see ^{101m}Rh Y. see ^{101m}Rh	6E+3 - -	1E+4 8E+3 8E+3	5E-6 4E-6 3E-6	2E-8 1E-8 1E-8	8E-5 - -	8E-4 - -
45	Rhodium-101	D. see ^{101}Rh W. see ^{101}Rh Y. see ^{101}Rh	2E+3 - -	5E+2 8E+2 2E+2	2E-7 3E-7 6E-8	7E-10 1E-9 2E-10	3E-5 - -	3E-4 - -
45	Rhodium-102m	D. see ^{102m}Rh W. see ^{102m}Rh Y. see ^{102m}Rh	1E+3 LLI wall (1E+3) - -	5E+2 - 4E+2 1E+2	2E-7 - 2E-7 5E-8	7E-10 - 5E-10 2E-10	- - 2E-5 -	- - 2E-4 -
45	Rhodium-102	D. see ^{102}Rh W. see ^{102}Rh Y. see ^{102}Rh	6E+2 - -	9E+1 2E+2 6E+1	4E-8 7E-8 2E-8	1E-10 2E-10 8E-11	8E-6 - -	8E-5 - -
45	Rhodium-103m ²	D. see ^{103m}Rh W. see ^{103m}Rh Y. see ^{103m}Rh	4E+5 - -	1E+6 1E+6 1E+6	5E-4 5E-4 5E-4	2E-6 2E-6 2E-6	6E-3 - -	6E-2 - -
45	Rhodium-105	D. see ^{105}Rh W. see ^{105}Rh Y. see ^{105}Rh	4E+3 LLI wall (4E+3) - -	1E+4 - 6E+3 6E+3	5E-6 - 3E-6 2E-6	2E-8 - 9E-9 8E-9	- - 5E-5 -	- - 5E-4 -
45	Rhodium-106m	D. see ^{106m}Rh W. see ^{106m}Rh Y. see ^{106m}Rh	8E+3 - -	3E+4 4E+4 4E+4	1E-5 2E-5 1E-5	4E-8 5E-8 5E-8	1E-4 - -	1E-3 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi) DAC ($\mu\text{Ci}/\text{ml}$)		Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
45	Rhodium-107 ²	D. see ¹⁰⁷ Rh W. see ¹⁰⁷ Rh Y. see ¹⁰⁷ Rh	7E+4 St wall (9E+4) - -	2E+5 - 3E+5 3E+5	1E-4 - 1E-4 1E-4	3E-7 - 4E-7 3E-7	- 1E-3 - -	- 1E-2 - -
46	Palladium-100	D. all compounds except those given for W and Y W. nitrates Y. oxides and hydroxides	1E+3 - -	1E+3 1E+3 1E+3	6E-7 5E-7 6E-7	2E-9 2E-9 2E-9	2E-5 - -	2E-4 - -
46	Palladium-101	D. see ¹⁰⁰ Pd W. see ¹⁰⁰ Pd Y. see ¹⁰⁰ Pd	1E+4 - -	3E+4 3E+4 3E+4	1E-5 1E-5 1E-5	5E-8 5E-8 4E-8	2E-4 - -	2E-3 - -
46	Palladium-103	D. see ¹⁰⁰ Pd W. see ¹⁰⁰ Pd Y. see ¹⁰⁰ Pd	6E+3 LLI wall (7E+3) - -	6E+3 - 4E+3 4E+3	3E-6 - 2E-6 1E-6	9E-9 - 6E-9 5E-9	- 1E-4 - -	- 1E-3 - -
46	Palladium-107	D. see ¹⁰⁰ Pd W. see ¹⁰⁰ Pd Y. see ¹⁰⁰ Pd	3E+4 LLI wall (4E+4) - -	2E+4 Kidneys (2E+4) 7E+3 4E+2	9E-6 - 3E-6 2E-7	- 3E-8 1E-8 6E-10	- 5E-4 - -	- 5E-3 - -
46	Palladium-109	D. see ¹⁰⁰ Pd W. see ¹⁰⁰ Pd Y. see ¹⁰⁰ Pd	2E+3 - -	6E+3 5E+3 5E+3	3E-6 2E-6 2E-6	9E-9 8E-9 6E-9	3E-5 - -	3E-4 - -
47	Silver-102 ²	D. all compounds except those given for W and Y W. nitrates and sulfides Y. oxides and hydroxides	5E+4 St wall (6E+4) - -	2E+5 - 2E+5 2E+5	8E-5 - 9E-5 8E-5	2E-7 - 3E-7 3E-7	- 9E-4 - -	- 9E-3 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
47	Silver-103 ²	D. see ¹⁰³ Ag W. see ¹⁰³ Ag Y. see ¹⁰³ Ag	4E+4 - -	1E+5 1E+5 1E+5	4E-5 5E-5 5E-5	1E-7 2E-7 2E-7	5E-4 - -	5E-3 - -
47	Silver-104m ²	D. see ¹⁰⁴ Ag W. see ¹⁰⁴ Ag Y. see ¹⁰⁴ Ag	3E+4 - -	9E+4 1E+5 1E+5	4E-5 5E-5 5E-5	1E-7 2E-7 2E-7	4E-4 - -	4E-3 - -
47	Silver-104 ²	D. see ¹⁰⁴ Ag W. see ¹⁰⁴ Ag Y. see ¹⁰⁴ Ag	2E+4 - -	7E+4 1E+5 1E+5	3E-5 6E-5 6E-5	1E-7 2E-7 2E-7	3E-4 - -	3E-3 - -
47	Silver-105	D. see ¹⁰⁵ Ag W. see ¹⁰⁵ Ag Y. see ¹⁰⁵ Ag	3E+3 - -	1E+3 2E+3 2E+3	4E-7 7E-7 7E-7	1E-9 2E-9 2E-9	4E-5 - -	4E-4 - -
47	Silver-106m	D. see ¹⁰⁶ Ag W. see ¹⁰⁶ Ag Y. see ¹⁰⁶ Ag	8E+2 - -	7E+2 9E+2 9E+2	3E-7 4E-7 4E-7	1E-9 1E-9 1E-9	1E-5 - -	1E-4 - -
47	Silver-106 ²	D. see ¹⁰⁶ Ag W. see ¹⁰⁶ Ag Y. see ¹⁰⁶ Ag	6E+4 St. wall (6E+4) - -	2E+5 - 2E+5	8E-5 - 9E-5 8E-5	3E-7 - 3E-7 3E-7	- 9E-4 - -	- 9E-3 - -
47	Silver-108m	D. see ¹⁰⁸ Ag W. see ¹⁰⁸ Ag Y. see ¹⁰⁸ Ag	6E+2 - -	2E+2 3E+2 2E+1	8E-8 1E-7 1E-8	3E-10 4E-10 3E-11	9E-6 - -	9E-5 - -
47	Silver-110m	D. see ¹¹⁰ Ag W. see ¹¹⁰ Ag Y. see ¹¹⁰ Ag	5E+2 - -	1E+2 2E+2 9E+1	5E-8 8E-8 4E-8	2E-10 3E-10 1E-10	6E-6 - -	6E-5 - -
47	Silver-111	D. see ¹¹¹ Ag W. see ¹¹¹ Ag Y. see ¹¹¹ Ag	9E+2 LLI wall (1E+3) - -	2E+3 Liver (2E+3) 9E+2 9E+2	6E-7 - 4E-7 4E-7	- 2E-9 1E-9 1E-9	- 2E-5 - -	- 2E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
47	Silver-112	D. see ^{112}Ag W. see ^{112}Ag Y. see ^{112}Ag	3E+3 - -	8E+3 1E+4 9E+3	3E-6 4E-6 4E-6	1E-8 1E-8 1E-8	4E-5 - -	4E-4 - -
47	Silver-115 ²	D. see ^{115}Ag W. see ^{115}Ag Y. see ^{115}Ag	3E+4 St wall (3E+4) - -	9E+4 - 9E+4 8E+4	4E-5 - 4E-5 3E-5	1E-7 - 1E-7 1E-7	- 4E-4 - -	- 4E-3 - -
48	Cadmium-104 ²	D. all compounds except those given for W and Y W. sulfides, halides, and nitrates Y. oxides and hydroxides	2E+4 - -	7E+4 1E+5 1E+5	3E-5 5E-5 5E-5	9E-8 2E-7 2E-7	3E-4 - -	3E-3 - -
48	Cadmium-107	D. see ^{107}Cd W. see ^{107}Cd Y. see ^{107}Cd	2E+4 - -	5E+4 6E+4 5E+4	2E-5 2E-5 2E-5	8E-8 8E-8 7E-8	3E-4 - -	3E-3 - -
48	Cadmium-109	D. see ^{109}Cd W. see ^{109}Cd Y. see ^{109}Cd	3E+2 Kidneys (4E+2) - -	4E+1 Kidneys (5E+1) 1E+2 Kidneys (1E+2) 1E+2	1E-8 - 5E-8 - 5E-8	- 7E-11 - 2E-10 2E-10	- 6E-6 - - -	- 6E-5 - - -
48	Cadmium-113m	D. see ^{113m}Cd W. see ^{113m}Cd Y. see ^{113m}Cd	2E+1 Kidneys (4E+1) - -	2E+0 Kidneys (4E+0) 8E+0 Kidneys (1E+1) 1E+1	1E-9 - 4E-9 - 5E-9	- 5E-12 - 2E-11 2E-11	- 5E-7 - - -	- 5E-6 - - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
48	Cadmium-113	D. see ^{106}Cd W. see ^{106}Cd Y. see ^{106}Cd	2E+1 Kidneys (3E+1) - -	2E+0 Kidneys (3E+0) 8E+0 Kidneys (1E+1) 1E+1	9E-10 - 3E-9 - 6E-9	- 5E-12 - 2E-11 2E-11	- 4E-7 - - -	- 4E-6 - - -
48	Cadmium-115m	D. see ^{106}Cd W. see ^{106}Cd Y. see ^{106}Cd	3E+2 - -	5E+1 Kidneys (8E+1) 1E+2 1E+2	2E-8 - 5E-8 6E-8	- 1E-10 2E-10 2E-10	4E-6 - - -	4E-5 - - -
48	Cadmium-115	D. see ^{106}Cd W. see ^{106}Cd Y. see ^{106}Cd	9E+2 LLI wall (1E+3) - -	1E+3 - 1E+3 1E+3	6E-7 - 5E-7 6E-7	2E-9 - 2E-9 2E-9	- 1E-5 - -	- 1E-4 - -
48	Cadmium-117m	D. see ^{106}Cd W. see ^{106}Cd Y. see ^{106}Cd	5E+3 - -	1E+4 2E+4 1E+4	5E-6 7E-6 6E-6	2E-8 2E-8 2E-8	6E-5 - -	6E-4 - -
48	Cadmium-117	D. see ^{106}Cd W. see ^{106}Cd Y. see ^{106}Cd	5E+3 - -	1E+4 2E+4 1E+4	5E-6 7E-6 6E-6	2E-8 2E-8 2E-8	6E-5 - -	6E-4 - -
49	Indium-109	D. all compounds except those given for W W. oxides, hydroxides, halides, and nitrates	2E+4 -	4E+4 6E+4	2E-5 3E-5	6E-8 9E-8	3E-4 -	3E-3 -
49	Indium-110 ² (69.1 min)	D. see ^{109}In W. see ^{109}In	2E+4 -	4E+4 6E+4	2E-5 2E-5	6E-8 8E-8	2E-4 -	2E-3 -
49	Indium-110 (4.9 h)	D. see ^{109}In W. see ^{109}In	5E+3 -	2E+4 2E+4	7E-6 8E-6	2E-8 3E-8	7E-5 -	7E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
49	Indium-111	D. see ^{109}In W. see ^{109}In	4E+3 -	6E+3 6E+3	3E-6 3E-6	9E-9 9E-9	6E-5 -	6E-4 -
49	Indium-112 ²	D. see ^{109}In W. see ^{109}In	2E+5 -	6E+5 7E+5	3E-4 3E-4	9E-7 1E-6	2E-3 -	2E-2 -
49	Indium-113m ²	D. see ^{109}In W. see ^{109}In	5E+4 -	1E+5 2E+5	6E-5 8E-5	2E-7 3E-7	7E-4 -	7E-3 -
49	Indium-114m	D. see ^{109}In W. see ^{109}In	3E+2 LLI wall (4E+2) -	6E+1 - 1E+2	3E-8 - 4E-8	9E-11 - 1E-10	- 5E-6 -	- 5E-5 -
49	Indium-115m	D. see ^{109}In W. see ^{109}In	1E+4 -	4E+4 5E+4	2E-5 2E-5	6E-8 7E-8	2E-4 -	2E-3 -
49	Indium-115	D. see ^{109}In W. see ^{109}In	4E+1 -	1E+0 5E+0	6E-10 2E-9	2E-12 8E-12	5E-7 -	5E-6 -
49	Indium-116m ²	D. see ^{109}In W. see ^{109}In	2E+4 -	8E+4 1E+5	3E-5 5E-5	1E-7 2E-7	3E-4 -	3E-3 -
49	Indium-117m ²	D. see ^{109}In W. see ^{109}In	1E+4 -	3E+4 4E+4	1E-5 2E-5	5E-8 6E-8	2E-4 -	2E-3 -
49	Indium-117 ²	D. see ^{109}In W. see ^{109}In	6E+4 -	2E+5 2E+5	7E-5 9E-5	2E-7 3E-7	8E-4 -	8E-3 -
49	Indium-119m ²	D. see ^{109}In W. see ^{109}In	4E+4 St wall (5E+4) -	1E+5 - 1E+5	5E-5 - 6E-5	2E-7 - 2E-7	- 7E-4 -	- 7E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
50	Tin-110	D. all compounds except those given for W. sulfides, oxides, hydroxides, halides, nitrates, and stannic phosphate	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
			-	1E+4	5E-6	2E-8	-	-
50	Tin-111 ²	D. see ¹¹⁰ Sn W. see ¹¹⁰ Sn	7E+4 -	2E+5 3E+5	9E-5 1E-4	3E-7 4E-7	1E-3 -	1E-2 -
50	Tin-113	D. see ¹¹⁰ Sn	2E+3	1E+3	5E-7	2E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4
		W. see ¹¹⁰ Sn	-	5E+2	2E-7	8E-10	-	-
50	Tin-117m	D. see ¹¹⁰ Sn	2E+3	1E+3	5E-7	-	-	-
			LLI wall (2E+3)	Bone surf (2E+3)	-	3E-9	3E-5	3E-4
		W. see ¹¹⁰ Sn	-	1E+3	6E-7	2E-9	-	-
50	Tin-119m	D. see ¹¹⁰ Sn	3E+3	2E+3	1E-6	3E-9	-	-
			LLI wall (4E+3)	-	-	-	6E-5	6E-4
		W. see ¹¹⁰ Sn	-	1E+3	4E-7	1E-9	-	-
50	Tin-121m	D. see ¹¹⁰ Sn	3E+3	9E+2	4E-7	1E-9	-	-
			LLI wall (4E+3)	-	-	-	5E-5	5E-4
		W. see ¹¹⁰ Sn	-	5E+2	2E-7	8E-10	-	-
50	Tin-121	D. see ¹¹⁰ Sn	6E+3	2E+4	6E-6	2E-8	-	-
			LLI wall (6E+3)	-	-	-	8E-5	8E-4
		W. see ¹¹⁰ Sn	-	1E+4	5E-6	2E-8	-	-
50	Tin-123m ²	D. see ¹¹⁰ Sn W. see ¹¹⁰ Sn	5E+4 -	1E+5 1E+5	5E-5 6E-5	2E-7 2E-7	7E-4 -	7E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)		Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
50	Tin-123	D. see ^{116}Sn	5E+2 LLI wall (6E+2)	6E+2	3E-7	9E-10	-	-
		W. see ^{116}Sn	-	2E+2	7E-8	2E-10	9E-6	9E-5
50	Tin-125	D. see ^{116}Sn	4E+2 LLI wall (5E+2)	9E+2	4E-7	1E-9	-	-
		W. see ^{116}Sn	-	4E+2	1E-7	5E-10	6E-6	6E-5
50	Tin-126	D. see ^{116}Sn	3E+2	6E+1	2E-8	8E-11	4E-6	4E-5
		W. see ^{116}Sn	-	7E+1	3E-8	9E-11	-	-
50	Tin-127	D. see ^{116}Sn	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		W. see ^{116}Sn	-	2E+4	8E-6	3E-8	-	-
50	Tin-128 ²	D. see ^{116}Sn	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W. see ^{116}Sn	-	4E+4	1E-5	5E-8	-	-
51	Antimony-115 ²	D. all compounds except those given for W	8E+4	2E+5	1E-4	3E-7	1E-3	1E-2
		W. oxides, hydroxides, halides, sulfides, sulfates, and nitrates	-	3E+5	1E-4	4E-7	-	-
51	Antimony-116m ²	D. see ^{115}Sb	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
		W. see ^{115}Sb	-	1E+5	6E-5	2E-7	-	-
51	Antimony-116 ²	D. see ^{115}Sb	7E+4 St wall (9E+4)	3E+5	1E-4	4E-7	-	-
		W. see ^{115}Sb	-	3E+5	1E-4	5E-7	1E-3	1E-2
51	Antimony-117	D. see ^{115}Sb	7E+4	2E+5	9E-5	3E-7	9E-4	9E-3
		W. see ^{115}Sb	-	3E+5	1E-4	4E-7	-	-
51	Antimony-118m	D. see ^{115}Sb	6E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		W. see ^{115}Sb	5E+3	2E+4	9E-6	3E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
51	Antimony-119	D. see ^{115}Sb W. see ^{115}Sb	2E+4 2E+4	5E+4 3E+4	2E-5 1E-5	6E-8 4E-8	2E-4 -	2E-3 -
51	Antimony-120 ² (16 min)	D. see ^{115}Sb W. see ^{115}Sb	1E+5 St wall (2E+5) -	4E+5 5E+5	2E-4 2E-4	6E-7 7E-7	- 2E-3 -	- 2E-2 -
51	Antimony-120 (5.76 d)	D. see ^{115}Sb W. see ^{115}Sb	1E+3 9E+2	2E+3 1E+3	9E-7 5E-7	3E-9 2E-9	1E-5 -	1E-4 -
51	Antimony-122	D. see ^{115}Sb W. see ^{115}Sb	8E+2 LLI wall (8E+2) 7E+2	2E+3 1E+3	1E-6 -	3E-9 2E-9	- 1E-5 -	- 1E-4 -
51	Antimony-124m ²	D. see ^{115}Sb W. see ^{115}Sb	3E+5 2E+5	8E+5 6E+5	4E-4 2E-4	1E-6 8E-7	3E-3 -	3E-2 -
51	Antimony-124	D. see ^{115}Sb W. see ^{115}Sb	6E+2 5E+2	9E+2 2E+2	4E-7 1E-7	1E-9 3E-10	7E-6 -	7E-5 -
51	Antimony-125	D. see ^{115}Sb W. see ^{115}Sb	2E+3 -	2E+3 5E+2	1E-6 2E-7	3E-9 7E-10	3E-5 -	3E-4 -
51	Antimony-126m ²	D. see ^{115}Sb W. see ^{115}Sb	5E+4 St wall (7E+4) -	2E+5 2E+5	8E-5 8E-5	3E-7 3E-7	- 9E-4 -	- 9E-3 -
51	Antimony-126	D. see ^{115}Sb W. see ^{115}Sb	6E+2 5E+2	1E+3 5E+2	5E-7 2E-7	2E-9 7E-10	7E-6 -	7E-5 -
51	Antimony-127	D. see ^{115}Sb W. see ^{115}Sb	8E+2 LLI wall (8E+2) 7E+2	2E+3 9E+2	9E-7 4E-7	3E-9 1E-9	- 1E-5 -	- 1E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
51	Antimony-128 ² (10.4 min)	D. see ¹¹⁵ Sb W. see ¹¹⁵ Sb	8E+4 St wall (1E+5) -	4E+5 - 4E+5	2E-4 - 2E-4	5E-7 - 6E-7	- 1E-3 -	- 1E-2 -
51	Antimony-128 (9.01 h)	D. see ¹¹⁵ Sb W. see ¹¹⁵ Sb	1E+3 -	4E+3 3E+3	2E-6 1E-6	6E-9 5E-9	2E-5 -	2E-4 -
51	Antimony-129	D. see ¹¹⁵ Sb W. see ¹¹⁵ Sb	3E+3 -	9E+3 9E+3	4E-6 4E-6	1E-8 1E-8	4E-5 -	4E-4 -
51	Antimony-130 ²	D. see ¹¹⁵ Sb W. see ¹¹⁵ Sb	2E+4 -	6E+4 8E+4	3E-5 3E-5	9E-8 1E-7	3E-4 -	3E-3 -
51	Antimony-131 ²	D. see ¹¹⁵ Sb W. see ¹¹⁵ Sb	1E+4 Thyroid (2E+4) -	2E+4 Thyroid (4E+4) 2E+4 Thyroid (4E+4) -	1E-5 - 1E-5 -	- 6E-8 - 6E-8	- 2E-4 -	- 2E-3 -
52	Tellurium-116	D. all compounds except those given for W W. oxides, hydroxides, and nitrates	8E+3 -	2E+4 3E+4	9E-6 1E-5	3E-8 4E-8	1E-4 -	1E-3 -
52	Tellurium-121m	D. see ¹¹⁶ Te W. see ¹¹⁶ Te	5E+2 Bone surf (7E+2) -	2E+2 Bone surf (4E+2) 4E+2	8E-8 - 2E-7	- 5E-10 6E-10	- 1E-5 -	- 1E-4 -
52	Tellurium-121	D. see ¹¹⁶ Te W. see ¹¹⁶ Te	3E+3 -	4E+3 3E+3	2E-6 1E-6	6E-9 4E-9	4E-5 -	4E-4 -
52	Tellurium-123m	D. see ¹¹⁶ Te W. see ¹¹⁶ Te	6E+2 Bone surf (1E+3) -	2E+2 Bone surf (5E+2) 5E+2	9E-8 - 2E-7	- 8E-10 8E-10	- 1E-5 -	- 1E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci}/\text{ml}$)	Col. 1 Air ($\mu\text{Ci}/\text{ml}$)	Col. 2 Water ($\mu\text{Ci}/\text{ml}$)	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
52	Tellurium-123	D. see ^{116}Te	5E+2 Bone surf (1E+3)	2E+2 Bone surf (5E+2)	8E-8	-	-	-
		W. see ^{116}Te	-	4E+2 Bone surf (1E+3)	2E-7	7E-10	2E-5	2E-4
52	Tellurium-125m	D. see ^{116}Te	1E+3 Bone surf (1E+3)	4E+2 Bone surf (1E+3)	2E-7	-	-	-
		W. see ^{116}Te	-	7E+2	3E-7	1E-9 1E-9	2E-5	2E-4
52	Tellurium-127m	D. see ^{116}Te	6E+2	3E+2 Bone surf (4E+2)	1E-7	-	9E-6	9E-5
		W. see ^{116}Te	-	3E+2	1E-7	6E-10 4E-10	-	-
52	Tellurium-127	D. see ^{116}Te	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W. see ^{116}Te	-	2E+4	7E-6	2E-8	-	-
52	Tellurium-129m	D. see ^{116}Te	5E+2	6E+2	3E-7	9E-10	7E-6	7E-5
		W. see ^{116}Te	-	2E+2	1E-7	3E-10	-	-
52	Tellurium-129 ²	D. see ^{116}Te	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
		W. see ^{116}Te	-	7E+4	3E-5	1E-7	-	-
52	Tellurium-131m	D. see ^{116}Te	3E+2 Thyroid (6E+2)	4E+2 Thyroid (1E+3)	2E-7	-	-	-
		W. see ^{116}Te	-	4E+2 Thyroid (9E+2)	2E-7	2E-9	8E-6	8E-5
			-	-	-	1E-9	-	-
52	Tellurium-131 ²	D. see ^{116}Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6	-	-	-
		W. see ^{116}Te	-	5E+3 Thyroid (1E+4)	2E-6	2E-8	8E-5	8E-4
			-	-	-	2E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
52	Tellurium-132	D. see ^{116}Te	2E+2 Thyroid (7E+2)	2E+2 Thyroid (8E+2)	9E-8	-	-	-
		W. see ^{116}Te	-	2E+2 Thyroid (6E+2)	9E-8	1E-9	9E-6	9E-5
52	Tellurium-133m ²	D. see ^{116}Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6	-	-	-
		W. see ^{116}Te	-	5E+3 Thyroid (1E+4)	2E-6	2E-8	9E-5	9E-4
52	Tellurium-133 ²	D. see ^{116}Te	1E+4 Thyroid (3E+4)	2E+4 Thyroid (6E+4)	9E-6	-	-	-
		W. see ^{116}Te	-	2E+4 Thyroid (6E+4)	9E-6	8E-8	4E-4	4E-3
52	Tellurium-134 ²	D. see ^{116}Te	2E+4 Thyroid (2E+4)	2E+4 Thyroid (5E+4)	1E-5	-	-	-
		W. see ^{116}Te	-	2E+4 Thyroid (5E+4)	1E-5	7E-8	3E-4	3E-3
53	Iodine-120m ²	D. all compounds	1E+4 Thyroid (1E+4)	2E+4	9E-6	3E-8	-	-
53	Iodine-120 ²	D. all compounds	4E+3 Thyroid (8E+3)	9E+3 Thyroid (1E+4)	4E-6	-	2E-4	2E-3
53	Iodine-121	D. all compounds	1E+4 Thyroid (3E+4)	2E+4 Thyroid (5E+4)	8E-6	-	1E-4	1E-3
						7E-8	4E-4	4E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
53	Iodine-123	D, all compounds	3E+3 Thyroid (1E+4)	6E+3 Thyroid (2E+4)	3E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-124	D, all compounds	5E+1 Thyroid (2E+2)	8E+1 Thyroid (3E+2)	3E-8 -	- 4E-10	- 2E-6	- 2E-5
53	Iodine-125	D, all compounds	4E+1 Thyroid (1E+2)	6E+1 Thyroid (2E+2)	3E-8 -	- 3E-10	- 2E-6	- 2E-5
53	Iodine-126	D, all compounds	2E+1 Thyroid (7E+1)	4E+1 Thyroid (1E+2)	1E-8 -	- 2E-10	- 1E-6	- 1E-5
53	Iodine-128 ²	D, all compounds	4E+4 St wall (6E+4)	1E+5 -	5E-5 -	2E-7 -	- 8E-4	- 8E-3
53	Iodine-129	D, all compounds	5E+0 Thyroid (2E+1)	9E+0 Thyroid (3E+1)	4E-9 -	- 4E-11	- 2E-7	- 2E-6
53	Iodine-130	D, all compounds	4E+2 Thyroid (1E+3)	7E+2 Thyroid (2E+3)	3E-7 -	- 3E-9	- 2E-5	- 2E-4
53	Iodine-131	D, all compounds	3E+1 Thyroid (9E+1)	5E+1 Thyroid (2E+2)	2E-8 -	- 2E-10	- 1E-6	- 1E-5
53	Iodine-132m ²	D, all compounds	4E+3 Thyroid (1E+4)	8E+3 Thyroid (2E+4)	4E-6 -	- 3E-8	- 1E-4	- 1E-3
53	Iodine-132	D, all compounds	4E+3 Thyroid (9E+3)	8E+3 Thyroid (1E+4)	3E-6 -	- 2E-8	- 1E-4	- 1E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
53	Iodine-133	D. all compounds	1E+2 Thyroid (5E+2)	3E+2 Thyroid (9E+2)	1E-7	-	7E-6	7E-5
53	Iodine-134 ²	D. all compounds	2E+4 Thyroid (3E+4)	5E+4	2E-5	6E-8	4E-4	4E-3
53	Iodine-135	D. all compounds	8E+2 Thyroid (3E+3)	2E+3 Thyroid (4E+3)	7E-7	6E-9	3E-5	3E-4
54	Xenon-120 ²	Submersion ¹	-	-	1E-5	4E-8	-	-
54	Xenon-121 ²	Submersion ¹	-	-	2E-6	1E-8	-	-
54	Xenon-122	Submersion ¹	-	-	7E-5	3E-7	-	-
54	Xenon-123	Submersion ¹	-	-	6E-6	3E-8	-	-
54	Xenon-125	Submersion ¹	-	-	2E-5	7E-8	-	-
54	Xenon-127	Submersion ¹	-	-	1E-5	6E-8	-	-
54	Xenon-129m	Submersion ¹	-	-	2E-4	9E-7	-	-
54	Xenon-131m	Submersion ¹	-	-	4E-4	2E-6	-	-
54	Xenon-133m	Submersion ¹	-	-	1E-4	6E-7	-	-
54	Xenon-133	Submersion ¹	-	-	1E-4	5E-7	-	-
54	Xenon-135m ²	Submersion ¹	-	-	9E-6	4E-8	-	-
54	Xenon-135	Submersion ¹	-	-	1E-5	7E-8	-	-
54	Xenon-138 ²	Submersion ¹	-	-	4E-6	2E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
55	Cesium-125 ²	D, all compounds	5E+4 St wall (9E+4)	1E+5	6E-5	2E-7	-	-
55	Cesium-127	D, all compounds	6E+4	9E+4	4E-5	1E-7	9E-4	9E-3
55	Cesium-129	D, all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
55	Cesium-130 ²	D, all compounds	6E+4 St wall (1E+5)	2E+5	8E-5	3E-7	-	-
55	Cesium-131	D, all compounds	2E+4	3E+4	1E-5	4E-8	3E-4	3E-3
55	Cesium-132	D, all compounds	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
55	Cesium-134m	D, all compounds	1E+5 St wall (1E+5)	1E+5	6E-5	2E-7	-	-
55	Cesium-134	D, all compounds	7E+1	1E+2	4E-8	2E-10	9E-7	9E-6
55	Cesium-135m ²	D, all compounds	1E+5	2E+5	8E-5	3E-7	1E-3	1E-2
55	Cesium-135	D, all compounds	7E+2	1E+3	5E-7	2E-9	1E-5	1E-4
55	Cesium-136	D, all compounds	4E+2	7E+2	3E-7	9E-10	6E-6	6E-5
55	Cesium-137	D, all compounds	1E+2	2E+2	6E-8	2E-10	1E-6	1E-5
55	Cesium-138 ²	D, all compounds	2E+4 St wall (3E+4)	6E+4	2E-5	8E-8	-	-
56	Barium-126 ²	D, all compounds	6E+3	2E+4	6E-6	2E-8	8E-5	8E-4
56	Barium-128	D, all compounds	5E+2	2E+3	7E-7	2E-9	7E-6	7E-5

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
56	Barium-131m ²	D. all compounds	4E+5 St wall (5E+5)	1E+6	6E-4	2E-6	-	-
56	Barium-131	D. all compounds	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
56	Barium-133m	D. all compounds	2E+3 LLI wall (3E+3)	9E+3	4E-6	1E-8	-	-
56	Barium-133	D. all compounds	2E+3	7E+2	3E-7	9E-10	2E-5	2E-4
56	Barium-135m	D. all compounds	3E+3	1E+4	5E-6	2E-8	4E-5	4E-4
56	Barium-139 ²	D. all compounds	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
56	Barium-140	D. all compounds	5E+2 LLI wall (6E+2)	1E+3	6E-7	2E-9	-	-
56	Barium-141 ²	D. all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
56	Barium-142 ²	D. all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
57	Lanthanum-131 ²	D. all compounds except those given for W W. oxides and hydroxides	5E+4	1E+5	5E-5	2E-7	6E-4	6E-3
			-	2E+5	7E-5	2E-7	-	-
57	Lanthanum-132	D. see ¹³¹ La W. see ¹³¹ La	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4
			-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-135	D. see ¹³¹ La W. see ¹³¹ La	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
			-	9E+4	4E-5	1E-7	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
57	Lanthanum-137	D. see ^{137}La	1E+4	6E+1 Liver (7E+1)	3E-8	-	2E-4	2E-3
		W. see ^{137}La	-	3E+2 Liver (3E+2)	1E-7	1E-10	-	-
			-	-	-	4E-10	-	-
57	Lanthanum-138	D. see ^{138}La	9E+2	4E+0	1E-9	5E-12	1E-5	1E-4
		W. see ^{138}La	-	1E+1	6E-9	2E-11	-	-
57	Lanthanum-140	D. see ^{140}La	6E+2	1E+3	6E-7	2E-9	9E-6	9E-5
		W. see ^{140}La	-	1E+3	5E-7	2E-9	-	-
57	Lanthanum-141	D. see ^{141}La	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
		W. see ^{141}La	-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-142 ²	D. see ^{142}La	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W. see ^{142}La	-	3E+4	1E-5	5E-8	-	-
57	Lanthanum-143 ²	D. see ^{143}La	4E+4	1E+5	4E-5	1E-7	-	-
		W. see ^{143}La	St wall (4E+4)	-	-	-	5E-4	5E-3
			-	9E+4	4E-5	1E-7	-	-
58	Cerium-134	W. all compounds except those given for Y	5E+2 LLI wall (6E+2)	7E+2	3E-7	1E-9	-	-
		Y. oxides, hydroxides, and fluorides	-	7E+2	3E-7	-	8E-6	8E-5
			-	7E+2	3E-7	9E-10	-	-
58	Cerium-135	W. see ^{135}Ce	2E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		Y. see ^{135}Ce	-	4E+3	1E-6	5E-9	-	-
58	Cerium-137m	W. see ^{137m}Ce	2E+3 LLI wall (2E+3)	4E+3	2E-6	6E-9	-	-
		Y. see ^{137m}Ce	-	4E+3	2E-6	-	3E-5	3E-4
			-	-	-	5E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
58	Cerium-137	W. see ^{134}Ce Y. see ^{134}Ce	5E+4 -	1E+5 1E+5	6E-5 5E-5	2E-7 2E-7	7E-4 -	7E-3 -
58	Cerium-139	W. see ^{134}Ce Y. see ^{134}Ce	5E+3 -	8E+2 7E+2	3E-7 3E-7	1E-9 9E-10	7E-5 -	7E-4 -
58	Cerium-141	W. see ^{134}Ce Y. see ^{134}Ce	2E+3 LLI wall (2E+3) -	7E+2 - 6E+2	3E-7 - 2E-7	1E-9 - 8E-10	- - 3E-5	- - 3E-4
58	Cerium-143	W. see ^{134}Ce Y. see ^{134}Ce	1E+3 LLI wall (1E+3) -	2E+3 - 2E+3	8E-7 - 7E-7	3E-9 - 2E-9	- - 2E-5	- - 2E-4
58	Cerium-144	W. see ^{134}Ce Y. see ^{134}Ce	2E+2 LLI wall (3E+2) -	3E+1 - 1E+1	1E-8 - 6E-9	4E-11 - 2E-11	- - 3E-6	- - 3E-5
59	Praseodymium-136 ²	W. all compounds except those given for Y Y. oxides, hydroxides, carbides, and fluorides	5E+4 St wall (7E+4) -	2E+5 - 2E+5	1E-4 - 9E-5	3E-7 - 3E-7	- - 1E-3	- - 1E-2
59	Praseodymium-137 ²	W. see ^{136}Pr Y. see ^{136}Pr	4E+4 -	2E+5 1E+5	6E-5 6E-5	2E-7 2E-7	5E-4 -	5E-3 -
59	Praseodymium-138m	W. see ^{136}Pr Y. see ^{136}Pr	1E+4 -	5E+4 4E+4	2E-5 2E-5	8E-8 6E-8	1E-4 -	1E-3 -
59	Praseodymium-139	W. see ^{136}Pr Y. see ^{136}Pr	4E+4 -	1E+5 1E+5	5E-5 5E-5	2E-7 2E-7	6E-4 -	6E-3 -
59	Praseodymium-142m ²	W. see ^{136}Pr Y. see ^{136}Pr	8E+4 -	2E+5 1E+5	7E-5 6E-5	2E-7 2E-7	1E-3 -	1E-2 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
59	Praseodymium-142	W. see ^{136}Pr Y. see ^{136}Pr	1E+3 -	2E+3 2E+3	9E-7 8E-7	3E-9 3E-9	1E-5 -	1E-4 -
59	Praseodymium-143	W. see ^{136}Pr Y. see ^{136}Pr	9E+2 LLI wall (1E+3) -	8E+2 - 7E+2	3E-7 - 3E-7	1E-9 - 9E-10	- 2E-5 -	- 2E-4 -
59	Praseodymium-144 ²	W. see ^{136}Pr Y. see ^{136}Pr	3E+4 St wall (4E+4) -	1E+5 - 1E+5	5E-5 - 5E-5	2E-7 - 2E-7	- 6E-4 -	- 6E-3 -
59	Praseodymium-145	W. see ^{136}Pr Y. see ^{136}Pr	3E+3 -	9E+3 8E+3	4E-6 3E-6	1E-8 1E-8	4E-5 -	4E-4 -
59	Praseodymium-147 ²	W. see ^{136}Pr Y. see ^{136}Pr	5E+4 St wall (8E+4) -	2E+5 - 2E+5	8E-5 - 8E-5	3E-7 - 3E-7	- 1E-3 -	- 1E-2 -
60	Neodymium-136 ²	W. all compounds except those given for Y Y. oxides, hydroxides, carbides, and fluorides	1E+4 -	6E+4 5E+4	2E-5 2E-5	8E-8 8E-8	2E-4 -	2E-3 -
60	Neodymium-138	W. see ^{136}Nd Y. see ^{136}Nd	2E+3 -	6E+3 5E+3	3E-6 2E-6	9E-9 7E-9	3E-5 -	3E-4 -
60	Neodymium-139m	W. see ^{136}Nd Y. see ^{136}Nd	5E+3 -	2E+4 1E+4	7E-6 6E-6	2E-8 2E-8	7E-5 -	7E-4 -
60	Neodymium-139 ²	W. see ^{136}Nd Y. see ^{136}Nd	9E+4 -	3E+5 3E+5	1E-4 1E-4	5E-7 4E-7	1E-3 -	1E-2 -
60	Neodymium-141	W. see ^{136}Nd Y. see ^{136}Nd	2E+5 -	7E+5 6E+5	3E-4 3E-4	1E-6 9E-7	2E-3 -	2E-2 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
60	Neodymium-147	W. see ^{136}Nd Y. see ^{136}Nd	1E+3 LLI wall (1E+3)	9E+2 - 8E+2	4E-7 - 4E-7	1E-9 - 1E-9	- 2E-5 -	- 2E-4 -
60	Neodymium-149 ²	W. see ^{136}Nd Y. see ^{136}Nd	1E+4 -	3E+4 2E+4	1E-5 1E-5	4E-8 3E-8	1E-4 -	1E-3 -
60	Neodymium-151 ²	W. see ^{136}Nd Y. see ^{136}Nd	7E+4 -	2E+5 2E+5	8E-5 8E-5	3E-7 3E-7	9E-4 -	9E-3 -
61	Promethium-141 ²	W. all compounds except those given for Y Y. oxides, hydroxides, carbides, and fluorides	5E+4 St wall (6E+4)	2E+5 - 2E+5	8E-5 - 7E-5	3E-7 - 2E-7	- 8E-4 -	- 8E-3 -
61	Promethium-143	W. see ^{141}Pm Y. see ^{141}Pm	5E+3 -	6E+2 7E+2	2E-7 3E-7	8E-10 1E-9	7E-5 -	7E-4 -
61	Promethium-144	W. see ^{141}Pm Y. see ^{141}Pm	1E+3 -	1E+2 1E+2	5E-8 5E-8	2E-10 2E-10	2E-5 -	2E-4 -
61	Promethium-145	W. see ^{141}Pm Y. see ^{141}Pm	1E+4 -	2E+2 Bone surf (2E+2) 2E+2	7E-8 - 8E-8	- 3E-10 3E-10	1E-4 -	1E-3 -
61	Promethium-146	W. see ^{141}Pm Y. see ^{141}Pm	2E+3 -	5E+1 4E+1	2E-8 2E-8	7E-11 6E-11	2E-5 -	2E-4 -
61	Promethium-147	W. see ^{141}Pm Y. see ^{141}Pm	4E+3 LLI wall (5E+3)	1E+2 Bone surf (2E+2) 1E+2	5E-8 - 6E-8	- 3E-10 2E-10	- 7E-5 -	- 7E-4 -
61	Promethium-148m	W. see ^{141}Pm Y. see ^{141}Pm	7E+2 -	3E+2 3E+2	1E-7 1E-7	4E-10 5E-10	1E-5 -	1E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
61	Promethium-148	W. see ^{141}Pm	4E+2 LLI wall (5E+2)	5E+2	2E-7	8E-10	-	-
		Y. see ^{141}Pm	-	5E+2	2E-7	7E-10	7E-6	7E-5
61	Promethium-149	W. see ^{141}Pm	1E+3 LLI wall (1E+3)	2E+3	8E-7	3E-9	-	-
		Y. see ^{141}Pm	-	2E+3	8E-7	2E-9	2E-5	2E-4
61	Promethium-150	W. see ^{141}Pm	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y. see ^{141}Pm	-	2E+4	7E-6	2E-8	-	-
61	Promethium-151	W. see ^{141}Pm	2E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		Y. see ^{141}Pm	-	3E+3	1E-6	4E-9	-	-
62	Samarium-141m ²	W. all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
62	Samarium-141 ²	W. all compounds	5E+4 St wall (6E+4)	2E+5	8E-5	2E-7	-	-
			-	-	-	-	8E-4	8E-3
62	Samarium-142 ²	W. all compounds	8E+3	3E+4	1E-5	4E-8	1E-4	1E-3
62	Samarium-145	W. all compounds	6E+3	5E+2	2E-7	7E-10	8E-5	8E-4
62	Samarium-146	W. all compounds	1E+1 Bone surf (3E+1)	4E-2 Bone surf (6E-2)	1E-11	-	-	-
			-	-	-	9E-14	3E-7	3E-6
62	Samarium-147	W. all compounds	2E+1 Bone surf (3E+1)	4E-2 Bone surf (7E-2)	2E-11	-	-	-
			-	-	-	1E-13	4E-7	4E-6
62	Samarium-151	W. all compounds	1E+4 LLI wall (1E+4)	1E+2 Bone surf (2E+2)	4E-8	-	-	-
			-	-	-	2E-10	2E-4	2E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
62	Samarium-153	W. all compounds	2E+3 LLI wall (2E+3)	3E+3	1E-6	4E-9	-	3E-4
62	Samarium-155 ²	W. all compounds	6E+4 St wall (8E+4)	2E+5	9E-5	3E-7	-	1E-2
62	Samarium-156	W. all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
63	Europium-145	W. all compounds	2E+3	2E+3	8E-7	3E-9	2E-5	2E-4
63	Europium-146	W. all compounds	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
63	Europium-147	W. all compounds	3E+3	2E+3	7E-7	2E-9	4E-5	4E-4
63	Europium-148	W. all compounds	1E+3	4E+2	1E-7	5E-10	1E-5	1E-4
63	Europium-149	W. all compounds	1E+4	3E+3	1E-6	4E-9	2E-4	2E-3
63	Europium-150 (12.62 h)	W. all compounds	3E+3	8E+3	4E-6	1E-8	4E-5	4E-4
63	Europium-150 (34.2 y)	W. all compounds	8E+2	2E+1	8E-9	3E-11	1E-5	1E-4
63	Europium-152m	W. all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
63	Europium-152	W. all compounds	8E+2	2E+1	1E-8	3E-11	1E-5	1E-4
63	Europium-154	W. all compounds	5E+2	2E+1	8E-9	3E-11	7E-6	7E-5
63	Europium-155	W. all compounds	4E+3	9E+1 Bone surf (1E+2)	4E-8	-	5E-5	5E-4
63	Europium-156	W. all compounds	6E+2	5E+2	2E-7	6E-10	8E-6	8E-5
63	Europium-157	W. all compounds	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
63	Europium-158 ²	W. all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
64	Gadolinium-145 ²	D. all compounds except those given for W	5E+4	2E+5	6E-5	2E-7	-	-
		W. oxides, hydroxides, and fluorides	St wall (5E+4)	-	-	-	6E-4	6E-3
64	Gadolinium-146	D. see ¹⁴⁵ Gd W. see ¹⁴⁵ Gd	1E+3 -	1E+2 3E+2	5E-8 1E-7	2E-10 4E-10	2E-5 -	2E-4 -
64	Gadolinium-147	D. see ¹⁴⁵ Gd W. see ¹⁴⁵ Gd	2E+3 -	4E+3 4E+3	2E-6 1E-6	6E-9 5E-9	3E-5 -	3E-4 -
64	Gadolinium-148	D. see ¹⁴⁵ Gd W. see ¹⁴⁵ Gd	1E+1 Bone surf (2E+1) -	8E+3 Bone surf (2E-2) 3E-2 Bone surf (6E-2)	3E-12 - 1E-11 -	- 2E-14 - 8E-14	- 3E-7 - -	- 3E-6 - -
64	Gadolinium-149	D. see ¹⁴⁵ Gd W. see ¹⁴⁵ Gd	3E+3 -	2E+3 2E+3	9E-7 1E-6	3E-9 3E-9	4E-5 -	4E-4 -
64	Gadolinium-151	D. see ¹⁴⁵ Gd W. see ¹⁴⁵ Gd	6E+3 -	4E+2 Bone surf (6E+2) 1E+3	2E-7 - 5E-7	- 9E-10 2E-9	9E-5 - -	9E-4 - -
64	Gadolinium-152	D. see ¹⁴⁵ Gd W. see ¹⁴⁵ Gd	2E+1 Bone surf (3E+1) -	1E-2 Bone surf (2E-2) 4E-2 Bone surf (8E-2)	4E-12 - 2E-11 -	- 3E-14 - 1E-13	- 4E-7 - -	- 4E-6 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
64	Gadolinium-153	D. see ^{146}Gd W. see ^{146}Gd	5E+3 -	1E+2 Bone surf (2E+2) 6E+2	6E-8 - 2E-7	- 3E-10 8E-10	6E-5 -	6E-4 -
64	Gadolinium-159	D. see ^{146}Gd W. see ^{146}Gd	3E+3 -	8E+3 6E+3	3E-6 2E-6	1E-8 8E-9	4E-5 -	4E-4 -
65	Terbium-147 ²	W. all compounds	9E+3	3E+4	1E-5	5E-8	1E-4	1E-3
65	Terbium-149	W. all compounds	5E+3	7E+2	3E-7	1E-9	7E-5	7E-4
65	Terbium-150	W. all compounds	5E+3	2E+4	9E-6	3E-8	7E-5	7E-4
65	Terbium-151	W. all compounds	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
65	Terbium-153	W. all compounds	5E+3	7E+3	3E-6	1E-8	7E-5	7E-4
65	Terbium-154	W. all compounds	2E+3	4E+3	2E-6	6E-9	2E-5	2E-4
65	Terbium-155	W. all compounds	6E+3	8E+3	3E-6	1E-8	8E-5	8E-4
65	Terbium-156m (5.0 h)	W. all compounds	2E+4	3E+4	1E-5	4E-8	2E-4	2E-3
65	Terbium-156m (24.4 h)	W. all compounds	7E+3	8E+3	3E-6	1E-8	1E-4	1E-3
65	Terbium-156	W. all compounds	1E+3	1E+3	6E-7	2E-9	1E-5	1E-4
65	Terbium-157	W. all compounds	5E+4 LLL wall (5E+4)	3E+2 Bone surf (6E+2)	1E-7 -	- 8E-10	- 7E-4	- 7E-3
65	Terbium-158	W. all compounds	1E+3	2E+1	8E-9	3E-11	2E-5	2E-4
65	Terbium-160	W. all compounds	8E+2	2E+2	9E-8	3E-10	1E-5	1E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
65	Terbium-161	W. all compounds	2E+3 LLI wall (2E+3)	2E+3	7E-7	2E-9	-	3E-4
66	Dysprosium-155	W. all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
66	Dysprosium-157	W. all compounds	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
66	Dysprosium-159	W. all compounds	1E+4	2E+3	1E-6	3E-9	2E-4	2E-3
66	Dysprosium-165	W. all compounds	1E+4	5E+4	2E-5	6E-8	2E-4	2E-3
66	Dysprosium-166	W. all compounds	6E+2 LLI wall (8E+2)	7E+2	3E-7	1E-9	-	1E-4
67	Holmium-155 ²	W. all compounds	4E+4	2E+5	6E-5	2E-7	6E-4	6E-3
67	Holmium-157 ²	W. all compounds	3E+5	1E+6	6E-4	2E-6	4E-3	4E-2
67	Holmium-159 ²	W. all compounds	2E+5	1E+6	4E-4	1E-6	3E-3	3E-2
67	Holmium-161	W. all compounds	1E+5	4E+5	2E-4	6E-7	1E-3	1E-2
67	Holmium-162m ²	W. all compounds	5E+4	3E+5	1E-4	4E-7	7E-4	7E-3
67	Holmium-162 ²	W. all compounds	5E+5 St wall (8E+5)	2E+6	1E-3	3E-6	-	1E-1
67	Holmium-164m ²	W. all compounds	1E+5	3E+5	1E-4	4E-7	1E-3	1E-2
67	Holmium-164 ²	W. all compounds	2E+5 St wall (2E+5)	6E+5	3E-4	9E-7	-	3E-2
67	Holmium-166m	W. all compounds	6E+2	7E+0	3E-9	9E-12	9E-6	9E-5

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers		
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)		
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)			
67	Holmium-166	W. all compounds	9E+2 LLI wall (9E+2)	2E+3	7E-7	2E-9	-	1E-5	1E-4	
67	Holmium-167	W. all compounds	2E+4	6E+4	2E-5	8E-8	2E-4	2E-4	2E-3	
68	Erbium-161	W. all compounds	2E+4	6E+4	3E-5	9E-8	2E-4	2E-4	2E-3	
68	Erbium-165	W. all compounds	6E+4	2E+5	8E-5	3E-7	9E-4	9E-4	9E-3	
68	Erbium-169	W. all compounds	3E+3 LLI wall (4E+3)	3E+3	1E-6	4E-9	-	5E-5	5E-4	
68	Erbium-171	W. all compounds	4E+3	1E+4	4E-6	1E-8	5E-5	5E-5	5E-4	
68	Erbium-172	W. all compounds	1E+3 LLI wall (1E+3)	1E+3	6E-7	2E-9	-	2E-5	2E-4	
69	Thulium-162 ²	W. all compounds	7E+4 St wall (7E+4)	3E+5	1E-4	4E-7	-	1E-3	1E-2	
69	Thulium-166	W. all compounds	4E+3	1E+4	6E-6	2E-8	6E-5	6E-5	6E-4	
69	Thulium-167	W. all compounds	2E+3 LLI wall (2E+3)	2E+3	8E-7	3E-9	-	3E-5	3E-4	
69	Thulium-170	W. all compounds	8E+2 LLI wall (1E+3)	2E+2	9E-8	3E-10	-	1E-5	1E-4	
69	Thulium-171	W. all compounds	1E+4 LLI wall (1E+4)	3E+2 Bone surf (6E+2)	1E-7	-	-	8E-10	2E-4	2E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
69	Thulium-172	W. all compounds	7E+2 LLI wall (8E+2)	1E+3	5E-7	2E-9	-	-
69	Thulium-173	W. all compounds	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
69	Thulium-175 ²	W. all compounds	7E+4 St wall (9E+4)	3E+5	1E-4	4E-7	-	-
			-	-	-	-	1E-3	1E-2
70	Ytterbium-162 ²	W. all compounds except those given for Y oxides, hydroxides, and fluorides	7E+4	3E+5	1E-4	4E-7	1E-3	1E-2
			-	3E+5	1E-4	4E-7	-	-
70	Ytterbium-166	W. see ¹⁶² Yb Y. see ¹⁶² Yb	1E+3	2E+3	8E-7	3E-9	2E-5	2E-4
			-	2E+3	8E-7	3E-9	-	-
70	Ytterbium-167 ²	W. see ¹⁶² Yb Y. see ¹⁶² Yb	3E+5	8E+5	3E-4	1E-6	4E-3	4E-2
			-	7E+5	3E-4	1E-6	-	-
70	Ytterbium-169	W. see ¹⁶² Yb Y. see ¹⁶² Yb	2E+3	8E+2	4E-7	1E-9	2E-5	2E-4
			-	7E+2	3E-7	1E-9	-	-
70	Ytterbium-175	W. see ¹⁶² Yb	3E+3 LLI wall (3E+3)	4E+3	1E-6	5E-9	-	-
			-	-	-	-	4E-5	4E-4
		Y. see ¹⁶² Yb	-	3E+3	1E-6	5E-9	-	-
70	Ytterbium-177 ²	W. see ¹⁶² Yb Y. see ¹⁶² Yb	2E+4	5E+4	2E-5	7E-8	2E-4	2E-3
			-	5E+4	2E-5	6E-8	-	-
70	Ytterbium-178 ²	W. see ¹⁶² Yb Y. see ¹⁶² Yb	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
			-	4E+4	2E-5	5E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
71	Lutetium-169	W. all compounds except those given for Y Y. oxides, hydroxides, and fluorides	3E+3 -	4E+3 4E+3	2E-6 2E-6	6E-9 6E-9	3E-5 -	3E-4 -
71	Lutetium-170	W. see ^{169}Lu Y. see ^{169}Lu	1E+3 -	2E+3 2E+3	9E-7 8E-7	3E-9 3E-9	2E-5 -	2E-4 -
71	Lutetium-171	W. see ^{169}Lu Y. see ^{169}Lu	2E+3 -	2E+3 2E+3	8E-7 8E-7	3E-9 3E-9	3E-5 -	3E-4 -
71	Lutetium-172	W. see ^{169}Lu Y. see ^{169}Lu	1E+3 -	1E+3 1E+3	5E-7 5E-7	2E-9 2E-9	1E-5 -	1E-4 -
71	Lutetium-173	W. see ^{169}Lu Y. see ^{169}Lu	5E+3 -	3E+2 Bone surf (5E+2) 3E+2	1E-7 -	- 6E-10 4E-10	7E-5 -	7E-4 -
71	Lutetium-174m	W. see ^{169}Lu Y. see ^{169}Lu	2E+3 LLI wall (3E+3) -	2E+2 Bone surf (3E+2) 2E+2	1E-7 -	- 5E-10 3E-10	- 4E-5 -	- 4E-4 -
71	Lutetium-174	W. see ^{169}Lu Y. see ^{169}Lu	5E+3 -	1E+2 Bone surf (2E+2) 2E+2	5E-8 -	- 3E-10 2E-10	7E-5 -	7E-4 -
71	Lutetium-176m	W. see ^{169}Lu Y. see ^{169}Lu	8E+3 -	3E+4 2E+4	1E-5 9E-6	3E-8 3E-8	1E-4 -	1E-3 -
71	Lutetium-176	W. see ^{169}Lu Y. see ^{169}Lu	7E+2 -	5E+0 Bone surf (1E+1) 8E+0	2E-9 -	- 2E-11 1E-11	1E-5 -	1E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
71	Lutetium-177m	W. see ^{169}Lu	7E+2	1E+2 Bone surf (1E+2)	5E-8	-	1E-5	1E-4
		Y. see ^{169}Lu	-	8E+1	3E-8	2E-10 1E-10	-	-
71	Lutetium-177	W. see ^{169}Lu	2E+3 LLI wall (3E+3)	2E+3	9E-7	3E-9	-	-
		Y. see ^{169}Lu	-	2E+3	9E-7	3E-9	4E-5	4E-4
71	Lutetium-178m ²	W. see ^{169}Lu	5E+4 St. wall (6E+4)	2E+5	8E-5	3E-7	-	-
		Y. see ^{169}Lu	-	2E+5	7E-5	2E-7	8E-4	8E-3
71	Lutetium-178 ²	W. see ^{169}Lu	4E+4 St wall (4E+4)	1E+5	5E-5	2E-7	-	-
		Y. see ^{169}Lu	-	1E+5	5E-5	2E-7	6E-4	6E-3
71	Lutetium-179	W. see ^{169}Lu	6E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		Y. see ^{169}Lu	-	2E+4	6E-6	3E-8	-	-
72	Hafnium-170	D. all compounds except those given for W W. oxides, hydroxides, carbides, and nitrates	3E+3	6E+3	2E-6	8E-9	4E-5	4E-4
			-	5E+3	2E-6	6E-9	-	-
72	Hafnium-172	D. see ^{176}Hf	1E+3	9E+0 Bone surf (2E+1)	4E-9	-	2E-5	2E-4
		W. see ^{176}Hf	-	4E+1 Bone surf (6E+1)	2E-8	3E-11	-	-
			-	-	-	8E-11	-	-
72	Hafnium-173	D. see ^{176}Hf	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W. see ^{176}Hf	-	1E+4	5E-6	2E-8	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
72	Hafnium-175	D. see ^{174}Hf	3E+3	9E+2	4E-7	-	4E-5	4E-4
		W. see ^{174}Hf	-	Bone surf (1E+3) 1E+3	- 5E-7	1E-9 2E-9	-	-
72	Hafnium-177m ²	D. see ^{174}Hf	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
		W. see ^{174}Hf	-	9E+4	4E-5	1E-7	-	-
72	Hafnium-178m	D. see ^{174}Hf	3E+2	1E+0	5E-10	-	3E-6	3E-5
		W. see ^{174}Hf	-	Bone surf (2E+0) 5E+0	- 2E-9	3E-12 -	-	-
			-	Bone surf (9E+0)	-	1E-11	-	-
72	Hafnium-179m	D. see ^{174}Hf	1E+3	3E+2	1E-7	-	1E-5	1E-4
		W. see ^{174}Hf	-	Bone surf (6E+2) 6E+2	- 3E-7	8E-10 8E-10	-	-
72	Hafnium-180m	D. see ^{174}Hf	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W. see ^{174}Hf	-	3E+4	1E-5	4E-8	-	-
72	Hafnium-181	D. see ^{174}Hf	1E+3	2E+2	7E-8	-	2E-5	2E-4
		W. see ^{174}Hf	-	Bone surf (4E+2) 4E+2	- 2E-7	6E-10 6E-10	-	-
72	Hafnium-182m ²	D. see ^{174}Hf	4E+4	9E+4	4E-5	1E-7	5E-4	5E-3
		W. see ^{174}Hf	-	1E+5	6E-5	2E-7	-	-
72	Hafnium-182	D. see ^{174}Hf	2E+2	8E-1	3E-10	-	-	-
		W. see ^{174}Hf	Bone surf (4E+2) -	Bone surf (2E+0) 3E+0	- 1E-9	2E-12 -	5E-6 -	5E-5 -
			-	Bone surf (7E+0)	-	1E-11	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
72	Hafnium-183 ²	D. see ¹⁷⁶ Hf W. see ¹⁷⁶ Hf	2E+4 -	5E+4 6E+4	2E-5 2E-5	6E-8 8E-8	3E-4 -	3E-3 -
72	Hafnium-184	D. see ¹⁷⁶ Hf W. see ¹⁷⁶ Hf	2E+3 -	8E+3 6E+3	3E-6 3E-6	1E-8 9E-9	3E-5 -	3E-4 -
73	Tantalum-172 ²	W. all compounds except those given for Y Y. elemental Ta, oxides, hydroxides, halides, carbides, nitrates, and nitrides	4E+4 -	1E+5 1E+5	5E-5 4E-5	2E-7 1E-7	5E-4 -	5E-3 -
73	Tantalum-173	W. see ¹⁷² Ta Y. see ¹⁷² Ta	7E+3 -	2E+4 2E+4	8E-6 7E-6	3E-8 2E-8	9E-5 -	9E-4 -
73	Tantalum-174 ²	W. see ¹⁷² Ta Y. see ¹⁷² Ta	3E+4 -	1E+5 9E+4	4E-5 4E-5	1E-7 1E-7	4E-4 -	4E-3 -
73	Tantalum-175	W. see ¹⁷² Ta Y. see ¹⁷² Ta	6E+3 -	2E+4 1E+4	7E-6 6E-6	2E-8 2E-8	8E-5 -	8E-4 -
73	Tantalum-176	W. see ¹⁷² Ta Y. see ¹⁷² Ta	4E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	5E-5 -	5E-4 -
73	Tantalum-177	W. see ¹⁷² Ta Y. see ¹⁷² Ta	1E+4 -	2E+4 2E+4	8E-6 7E-6	3E-8 2E-8	2E-4 -	2E-3 -
73	Tantalum-178	W. see ¹⁷² Ta Y. see ¹⁷² Ta	2E+4 -	9E+4 7E+4	4E-5 3E-5	1E-7 1E-7	2E-4 -	2E-3 -
73	Tantalum-179	W. see ¹⁷² Ta Y. see ¹⁷² Ta	2E+4 -	5E+3 9E+2	2E-6 4E-7	8E-9 1E-9	3E-4 -	3E-3 -
73	Tantalum-180m	W. see ¹⁷² Ta Y. see ¹⁷² Ta	2E+4 -	7E+4 6E+4	3E-5 2E-5	9E-8 8E-8	3E-4 -	3E-3 -
73	Tantalum-180	W. see ¹⁷² Ta Y. see ¹⁷² Ta	1E+3 -	4E+2 2E+1	2E-7 1E-8	6E-10 3E-11	2E-5 -	2E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
73	Tantalum-182 ^{m2}	W. see ¹⁷² Ta	2E+5 St wall (2E+5)	5E+5	2E-4	8E-7	-	-
		Y. see ¹⁷² Ta	-	4E+5	2E-4	6E-7	3E-3	3E-2
73	Tantalum-182	W. see ¹⁷² Ta	8E+2	3E+2	1E-7	5E-10	1E-5	1E-4
		Y. see ¹⁷² Ta	-	1E+2	6E-8	2E-10	-	-
73	Tantalum-183	W. see ¹⁷² Ta	9E+2 LLI wall (1E+3)	1E+3	5E-7	2E-9	-	-
		Y. see ¹⁷² Ta	-	1E+3	4E-7	1E-9	2E-5	2E-4
73	Tantalum-184	W. see ¹⁷² Ta	2E+3	5E+3	2E-6	8E-9	3E-5	3E-4
		Y. see ¹⁷² Ta	-	5E+3	2E-6	7E-9	-	-
73	Tantalum-185 ²	W. see ¹⁷² Ta	3E+4	7E+4	3E-5	1E-7	4E-4	4E-3
		Y. see ¹⁷² Ta	-	6E+4	3E-5	9E-8	-	-
73	Tantalum-186 ²	W. see ¹⁷² Ta	5E+4 St wall (7E+4)	2E+5	1E-4	3E-7	-	-
		Y. see ¹⁷² Ta	-	2E+5	9E-5	3E-7	1E-3	1E-2
74	Tungsten-176	D. all compounds	1E+4	5E+4	2E-5	7E-8	1E-4	1E-3
74	Tungsten-177	D. all compounds	2E+4	9E+4	4E-5	1E-7	3E-4	3E-3
74	Tungsten-178	D. all compounds	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
74	Tungsten-179 ²	D. all compounds	5E+5	2E+6	7E-4	2E-6	7E-3	7E-2
74	Tungsten-181	D. all compounds	2E+4	3E+4	1E-5	5E-8	2E-4	2E-3
74	Tungsten-185	D. all compounds	2E+3 LLI wall (3E+3)	7E+3	3E-6	9E-9	-	-
			-	-	-	-	4E-5	4E-4
74	Tungsten-187	D. all compounds	2E+3	9E+3	4E-6	1E-8	3E-5	3E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
74	Tungsten-188	D. all compounds	4E+2 LLI wall (5E+2)	1E+3	5E-7	2E-9	-	-
75	Rhenium-177 ²	D. all compounds except those given for W	9E+4 St wall (1E+5)	3E+5	1E-4	4E-7	-	-
		W. oxides, hydroxides, and nitrates	-	4E+5	1E-4	5E-7	2E-3	2E-2
75	Rhenium-178 ²	D. see ¹⁷⁷ Re	7E+4 St wall (1E+5)	3E+5	1E-4	4E-7	-	-
		W. see ¹⁷⁷ Re	-	3E+5	1E-4	4E-7	1E-3	1E-2
75	Rhenium-181	D. see ¹⁷⁷ Re	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
		W. see ¹⁷⁷ Re	-	9E+3	4E-6	1E-8	-	-
75	Rhenium-182 (12.7 h)	D. see ¹⁷⁷ Re	7E+3	1E+4	5E-6	2E-8	9E-5	9E-4
		W. see ¹⁷⁷ Re	-	2E+4	6E-6	2E-8	-	-
75	Rhenium-182 (64.0 h)	D. see ¹⁷⁷ Re	1E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W. see ¹⁷⁷ Re	-	2E+3	9E-7	3E-9	-	-
75	Rhenium-184m	D. see ¹⁷⁷ Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W. see ¹⁷⁷ Re	-	4E+2	2E-7	6E-10	-	-
75	Rhenium-184	D. see ¹⁷⁷ Re	2E+3	4E+3	1E-6	5E-9	3E-5	3E-4
		W. see ¹⁷⁷ Re	-	1E+3	6E-7	2E-9	-	-
75	Rhenium-186m	D. see ¹⁷⁷ Re	1E+3	2E+3	7E-7	-	-	-
		W. see ¹⁷⁷ Re	St wall (2E+3)	St wall (2E+3)	-	3E-9	2E-5	2E-4
			-	2E+2	6E-8	2E-10	-	-
75	Rhenium-186	D. see ¹⁷⁷ Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W. see ¹⁷⁷ Re	-	2E+3	7E-7	2E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
75	Rhenium-187	D. see ^{187}Re W. see ^{187}Re	6E+5 -	8E+5 St wall (9E+5) 1E+5	4E-4 - 4E-5	- 1E-6 1E-7	8E-3 -	8E-2 -
75	Rhenium-188m ²	D. see ^{188}Re W. see ^{188}Re	8E+4 -	1E+5 1E+5	6E-5 6E-5	2E-7 2E-7	1E-3 -	1E-2 -
75	Rhenium-188	D. see ^{188}Re W. see ^{188}Re	2E+3 -	3E+3 3E+3	1E-6 1E-6	4E-9 4E-9	2E-5 -	2E-4 -
75	Rhenium-189	D. see ^{189}Re W. see ^{189}Re	3E+3 -	5E+3 4E+3	2E-6 2E-6	7E-9 6E-9	4E-5 -	4E-4 -
76	Osmium-180 ²	D. all compounds except those given for W and Y W. halides and nitrates Y. oxides and hydroxides	1E+5 - -	4E+5 5E+5 5E+5	2E-4 2E-4 2E-4	5E-7 7E-7 6E-7	1E-3 -	1E-2 -
76	Osmium-181 ²	D. see ^{180}Os W. see ^{180}Os Y. see ^{180}Os	1E+4 - -	4E+4 5E+4 4E+4	2E-5 2E-5 2E-5	6E-8 6E-8 6E-8	2E-4 -	2E-3 -
76	Osmium-182	D. see ^{180}Os W. see ^{180}Os Y. see ^{180}Os	2E+3 - -	6E+3 4E+3 4E+3	2E-6 2E-6 2E-6	8E-9 6E-9 6E-9	3E-5 -	3E-4 -
76	Osmium-185	D. see ^{180}Os W. see ^{180}Os Y. see ^{180}Os	2E+3 - -	5E+2 8E+2 8E+2	2E-7 3E-7 3E-7	7E-10 1E-9 1E-9	3E-5 -	3E-4 -
76	Osmium-189m	D. see ^{180}Os W. see ^{180}Os Y. see ^{180}Os	8E+4 - -	2E+5 2E+5 2E+5	1E-4 9E-5 7E-5	3E-7 3E-7 2E-7	1E-3 -	1E-2 -
76	Osmium-191m	D. see ^{180}Os W. see ^{180}Os Y. see ^{180}Os	1E+4 - -	3E+4 2E+4 2E+4	1E-5 8E-6 7E-6	4E-8 3E-8 2E-8	2E-4 -	2E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
76	Osmium-191	D. see ^{186}Os W. see ^{186}Os Y. see ^{186}Os	2E+3 LLI wall (3E+3) - -	2E+3 - 1E+3	9E-7 - 7E-7 6E-7	3E-9 - 2E-9 2E-9	- 3E-5 -	- 3E-4 -
76	Osmium-193	D. see ^{186}Os W. see ^{186}Os Y. see ^{186}Os	2E+3 LLI wall (2E+3) - -	5E+3 - 3E+3 3E+3	2E-6 - 1E-6 1E-6	6E-9 - 4E-9 4E-9	- 2E-5 -	- 2E-4 -
76	Osmium-194	D. see ^{186}Os W. see ^{186}Os Y. see ^{186}Os	4E+2 LLI wall (6E+2) - -	4E+1 - 6E+1 8E+0	2E-8 - 2E-8 3E-9	6E-11 - 8E-11 1E-11	- 8E-6 -	- 8E-5 -
77	Iridium-182 ²	D. all compounds except those given for W and Y W. halides, nitrates, and metallic iridium Y. oxides and hydroxides	4E+4 St wall (4E+4) - -	1E+5 - 2E+5 1E+5	6E-5 - 6E-5 5E-5	2E-7 - 2E-7 2E-7	- 6E-4 -	- 6E-3 -
77	Iridium-184	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	8E+3 - -	2E+4 3E+4 3E+4	1E-5 1E-5 1E-5	3E-8 5E-8 4E-8	1E-4 - -	1E-3 - -
77	Iridium-185	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	5E+3 - -	1E+4 1E+4 1E+4	5E-6 5E-6 4E-6	2E-8 2E-8 1E-8	7E-5 - -	7E-4 - -
77	Iridium-186	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	2E+3 - -	8E+3 6E+3 6E+3	3E-6 3E-6 2E-6	1E-8 9E-9 8E-9	3E-5 - -	3E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
77	Iridium-187	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	1E+4 - -	3E+4 3E+4 3E+4	1E-5 1E-5 1E-5	5E-8 4E-8 4E-8	1E-4 - -	1E-3 - -
77	Iridium-188	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	2E+3 - -	5E+3 4E+3 3E+3	2E-6 1E-6 1E-6	6E-9 5E-9 5E-9	3E-5 - -	3E-4 - -
77	Iridium-189	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	5E+3 LLI wall (5E+3) - -	5E+3 - 4E+3 4E+3	2E-6 - 2E-6 1E-6	7E-9 - 5E-9 5E-9	- 7E-5 - -	- 7E-4 - -
77	Iridium-190m ²	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	2E+5 - -	2E+5 2E+5 2E+5	8E-5 9E-5 8E-5	3E-7 3E-7 3E-7	2E-3 - -	2E-2 - -
77	Iridium-190	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	1E+3 - -	9E+2 1E+3 9E+2	4E-7 4E-7 4E-7	1E-9 1E-9 1E-9	1E-5 - -	1E-4 - -
77	Iridium-192m	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	3E+3 - -	9E+1 2E+2 2E+1	4E-8 9E-8 6E-9	1E-10 3E-10 2E-11	4E-5 - -	4E-4 - -
77	Iridium-192	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	9E+2 - -	3E+2 4E+2 2E+2	1E-7 2E-7 9E-8	4E-10 6E-10 3E-10	1E-5 - -	1E-4 - -
77	Iridium-194m	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	6E+2 - -	9E+1 2E+2 1E+2	4E-8 7E-8 4E-8	1E-10 2E-10 1E-10	9E-6 - -	9E-5 - -
77	Iridium-194	D. see ^{182}Ir W. see ^{182}Ir Y. see ^{182}Ir	1E+3 - -	3E+3 2E+3 2E+3	1E-6 9E-7 8E-7	4E-9 3E-9 3E-9	1E-5 - -	1E-4 - -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
77	Iridium-195m	D. see ^{192}Ir W. see ^{192}Ir Y. see ^{192}Ir	8E+3 - -	2E+4 3E+4 2E+4	1E-5 1E-5 9E-6	3E-8 4E-8 3E-8	1E-4 - -	1E-3 - -
77	Iridium-195	D. see ^{192}Ir W. see ^{192}Ir Y. see ^{192}Ir	1E+4 - -	4E+4 5E+4 4E+4	2E-5 2E-5 2E-5	6E-8 7E-8 6E-8	2E-4 - -	2E-3 - -
78	Platinum-186	D. all compounds	1E+4	4E+4	2E-5	5E-8	2E-4	2E-3
78	Platinum-188	D. all compounds	2E+3	2E+3	7E-7	2E-9	2E-5	2E-4
78	Platinum-189	D. all compounds	1E+4	3E+4	1E-5	4E-8	1E-4	1E-3
78	Platinum-191	D. all compounds	4E+3	8E+3	4E-6	1E-8	5E-5	5E-4
78	Platinum-193m	D. all compounds	3E+3 LLI wall (3E+4)	6E+3 - -	3E-6 - -	8E-9 - -	- 4E-5	- 4E-4
78	Platinum-193	D. all compounds	4E+4 LLI wall (5E+4)	2E+4 - -	1E-5 - -	3E-8 - -	- 6E-4	- 6E-3
78	Platinum-195m	D. all compounds	2E+3 LLI wall (2E+3)	4E+3 - -	2E-6 - -	6E-9 - -	- 3E-5	- 3E-4
78	Platinum-197m ²	D. all compounds	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
78	Platinum-197	D. all compounds	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4
78	Platinum-199 ²	D. all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
78	Platinum-200	D. all compounds	1E+3	3E+3	1E-6	5E-9	2E-5	2E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
79	Gold-193	D, all compounds except those given for W and Y W, halides and nitrates Y, oxides and hydroxides	9E+3 -	3E+4 2E+4 2E+4	1E-5 9E-6 8E-6	4E-8 3E-8 3E-8	1E-4 -	1E-3 -
79	Gold-194	D, see ^{193}Au W, see ^{193}Au Y, see ^{193}Au	3E+3 -	8E+3 5E+3 5E+3	3E-6 2E-6 2E-6	1E-8 8E-9 7E-9	4E-5 -	4E-4 -
79	Gold-195	D, see ^{193}Au W, see ^{193}Au Y, see ^{193}Au	5E+3 -	1E+4 1E+3 4E+2	5E-6 6E-7 2E-7	2E-8 2E-9 6E-10	7E-5 -	7E-4 -
79	Gold-198m	D, see ^{193}Au W, see ^{193}Au Y, see ^{193}Au	1E+3 -	3E+3 1E+3 1E+3	1E-6 5E-7 5E-7	4E-9 2E-9 2E-9	1E-5 -	1E-4 -
79	Gold-198	D, see ^{193}Au W, see ^{193}Au Y, see ^{193}Au	1E+3 -	4E+3 2E+3 2E+3	2E-6 8E-7 7E-7	5E-9 3E-9 2E-9	2E-5 -	2E-4 -
79	Gold-199	D, see ^{193}Au W, see ^{193}Au Y, see ^{193}Au	3E+3 LLL wall (3E+3) -	9E+3 4E+3 4E+3	4E-6 2E-6 2E-6	1E-8 6E-9 5E-9	4E-5 -	4E-4 -
79	Gold-200m	D, see ^{193}Au W, see ^{193}Au Y, see ^{193}Au	1E+3 -	4E+3 3E+3 2E+4	1E-6 1E-6 1E-6	5E-9 4E-9 3E-9	2E-5 -	2E-4 -
79	Gold-200 ²	D, see ^{193}Au W, see ^{193}Au Y, see ^{193}Au	3E+4 -	6E+4 8E+4 7E+4	3E-5 3E-5 3E-5	9E-8 1E-7 1E-7	4E-4 -	4E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
79	Gold-201 ²	D, see ¹⁹³ Au	7E+4 St wall (9E+4)	2E+5	9E-5	3E-7	-	-
		W, see ¹⁹³ Au	-	2E+5	1E-4	3E-7	1E-3	1E-2
		Y, see ¹⁹³ Au	-	2E+5	9E-5	3E-7	-	-
80	Mercury-193m	Vapor	-	8E+3	4E-6	1E-8	-	-
		Organic D	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		D, sulfates	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		W, oxides, hydroxides, halides, nitrates, and sulfides	-	8E+3	3E-6	1E-8	-	-
80	Mercury-193	Vapor	-	3E+4	1E-5	4E-8	-	-
		Organic D	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		D, see ^{193m} Hg	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see ^{193m} Hg	-	4E+4	2E-5	6E-8	-	-
80	Mercury-194	Vapor	-	3E+1	1E-8	4E-11	-	-
		Organic D	2E+1	3E+1	1E-8	4E-11	2E-7	2E-6
		D, see ^{194m} Hg	8E+2	4E+1	2E-8	6E-11	1E-5	1E-4
		W, see ^{194m} Hg	-	1E+2	5E-8	2E-10	-	-
80	Mercury-195m	Vapor	-	4E+3	2E-6	6E-9	-	-
		Organic D	3E+3	6E+3	3E-6	8E-9	4E-5	4E-4
		D, see ^{195m} Hg	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4
		W, see ^{195m} Hg	-	4E+3	2E-6	5E-9	-	-
80	Mercury-195	Vapor	-	3E+4	1E-5	4E-8	-	-
		Organic D	2E+4	5E+4	2E-5	6E-8	2E-4	2E-3
		D, see ^{195m} Hg	1E+4	4E+4	1E-5	5E-8	2E-4	2E-3
		W, see ^{195m} Hg	-	3E+4	1E-5	5E-8	-	-
80	Mercury-197m	Vapor	-	5E+3	2E-6	7E-9	-	-
		Organic D	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
		D, see ^{197m} Hg	3E+3	7E+3	3E-6	1E-8	4E-5	4E-4
		W, see ^{197m} Hg	-	5E+3	2E-6	7E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
80	Mercury-197	Vapor Organic D D. see ^{197}Hg W. see ^{197}Hg	- 7E+3 6E+3 -	8E+3 1E+4 1E+4 9E+3	4E-6 6E-6 5E-6 4E-6	1E-8 2E-8 2E-8 1E-8	- 9E-5 8E-5 -	- 9E-4 8E-4 -
80	Mercury-199m ²	Vapor Organic D D. see ^{199}Hg W. see ^{199}Hg	- 6E+4 St. wall (1E+5) 6E+4 -	8E+4 2E+5 - 1E+5 2E+5	3E-5 7E-5 - 6E-5 7E-5	1E-7 2E-7 - 2E-7 2E-7	- - 1E-3 8E-4 -	- - 1E-2 8E-3 -
80	Mercury-203	Vapor Organic D D. see ^{203}Hg W. see ^{203}Hg	- 5E+2 2E+3 -	8E+2 8E+2 1E+3 1E+3	4E-7 3E-7 5E-7 5E-7	1E-9 1E-9 2E-9 2E-9	- 7E-6 3E-5 -	- 7E-5 3E-4 -
81	Thallium-194m ²	D. all compounds	5E+4 St. wall (7E+4)	2E+5 -	6E-5 -	2E-7 -	- 1E-3	- 1E-2
81	Thallium-194 ²	D. all compounds	3E+5 St. wall (3E+5)	6E+5 -	2E-4 -	8E-7 -	- 4E-3	- 4E-2
81	Thallium-195 ²	D. all compounds	6E+4	1E+5	5E-5	2E-7	9E-4	9E-3
81	Thallium-197	D. all compounds	7E+4	1E+5	5E-5	2E-7	1E-3	1E-2
81	Thallium-198m ²	D. all compounds	3E+4	5E+4	2E-5	8E-8	4E-4	4E-3
81	Thallium-198	D. all compounds	2E+4	3E+4	1E-5	5E-8	3E-4	3E-3
81	Thallium-199	D. all compounds	6E+4	8E+4	4E-5	1E-7	9E-4	9E-3
81	Thallium-200	D. all compounds	8E+3	1E+4	5E-6	2E-8	1E-4	1E-3
81	Thallium-201	D. all compounds	2E+4	2E+4	9E-6	3E-8	2E-4	2E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
81	Thallium-202	D. all compounds	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
81	Thallium-204	D. all compounds	2E+3	2E+3	9E-7	3E-9	2E-5	2E-4
82	Lead-195m ²	D. all compounds	6E+4	2E+5	8E-5	3E-7	8E-4	8E-3
82	Lead-198	D. all compounds	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
82	Lead-199 ²	D. all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
82	Lead-200	D. all compounds	3E+3	6E+3	3E-6	9E-9	4E-5	4E-4
82	Lead-201	D. all compounds	7E+3	2E+4	8E-6	3E-8	1E-4	1E-3
82	Lead-202m	D. all compounds	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
82	Lead-202	D. all compounds	1E+2	5E+1	2E-8	7E-11	2E-6	2E-5
82	Lead-203	D. all compounds	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
82	Lead-205	D. all compounds	4E+3	1E+3	6E-7	2E-9	5E-5	5E-4
82	Lead-209	D. all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
82	Lead-210	D. all compounds	6E-1 Bone surf (1E+0)	2E-1 Bone surf (4E-1)	1E-10 -	- 6E-13	- 1E-8	- 1E-7
82	Lead-211 ²	D. all compounds	1E+4	6E+2	3E-7	9E-10	2E-4	2E-3
82	Lead-212	D. all compounds	8E+1 Bone surf (1E+2)	3E+1 -	1E-8 -	5E-11 -	- 2E-6	- 2E-5
82	Lead-214 ²	D. all compounds	9E+3	8E+2	3E-7	1E-9	1E-4	1E-3
83	Bismuth-200 ²	D. nitrates W. all other compounds	3E+4 -	8E+4 1E+5	4E-5 4E-5	1E-7 1E-7	4E-4 -	4E-3 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
83	Bismuth-201 ²	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	1E+4 -	3E+4 4E+4	1E-5 2E-5	4E-8 5E-8	2E-4 -	2E-3 -
83	Bismuth-202 ²	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	1E+4 -	4E+4 8E+4	2E-5 3E-5	6E-8 1E-7	2E-4 -	2E-3 -
83	Bismuth-203	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	2E+3 -	7E+3 6E+3	3E-6 3E-6	9E-9 9E-9	3E-5 -	3E-4 -
83	Bismuth-205	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	1E+3 -	3E+3 1E+3	1E-6 5E-7	3E-9 2E-9	2E-5 -	2E-4 -
83	Bismuth-206	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	6E+2 -	1E+3 9E+2	6E-7 4E-7	2E-9 1E-9	9E-6 -	9E-5 -
83	Bismuth-207	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	1E+3 -	2E+3 4E+2	7E-7 1E-7	2E-9 5E-10	1E-5 -	1E-4 -
83	Bismuth-210m	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	4E+1 Kidneys (6E+1)	5E+0 Kidneys (6E+0) 7E-1	2E-9 - 3E-10	- 9E-12 9E-13	- 8E-7 -	- 8E-6 -
83	Bismuth-210	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	8E+2 -	2E+2 Kidneys (4E+2) 3E+1	1E-7 - 1E-8	- 5E-10 4E-11	1E-5 -	1E-4 -
83	Bismuth-212 ²	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	5E+3 -	2E+2 3E+2	1E-7 1E-7	3E-10 4E-10	7E-5 -	7E-4 -
83	Bismuth-213 ²	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	7E+3 -	3E+2 4E+2	1E-7 1E-7	4E-10 5E-10	1E-4 -	1E-3 -
83	Bismuth-214 ²	D. see ²⁰⁰ Bi W. see ²⁰⁰ Bi	2E+4 St wall (2E+4)	8E+2 -	3E-7 -	1E-9 -	- 3E-4	- 3E-3
				9E-2	4E-7	1E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
84	Polonium-203 ²	D, all compounds except those given for W W, oxides, hydroxides, and nitrates	3E+4 -	6E+4 9E+4	3E-5 4E-5	9E-8 1E-7	3E-4 -	3E-3 -
84	Polonium-205 ²	D, see ²⁰³ Po W, see ²⁰³ Po	2E+4 -	4E+4 7E+4	2E-5 3E-5	5E-8 1E-7	3E-4 -	3E-3 -
84	Polonium-207	D, see ²⁰³ Po W, see ²⁰³ Po	8E+3 -	3E+4 3E+4	1E-5 1E-5	3E-8 4E-8	1E-4 -	1E-3 -
84	Polonium-210	D, see ²⁰³ Po W, see ²⁰³ Po	3E+0 -	6E-1 6E-1	3E-10 3E-10	9E-13 9E-13	4E-8 -	4E-7 -
85	Astatine-207 ²	D, halides W	6E+3 -	3E+3 2E+3	1E-6 9E-7	4E-9 3E-9	8E-5 -	8E-4 -
85	Astatine-211	D, halides W	1E+2 -	8E+1 5E+1	3E-8 2E-8	1E-10 8E-11	2E-6 -	2E-5 -
86	Radon-220	With daughters removed With daughters present	- -	2E+4 2E+1 (or 12 working level months)	7E-6 9E-9 (or 1.0 working level)	2E-8 3E-11	- -	- -
86	Radon-222	With daughters removed With daughters present	- -	1E+4 1E+2 (or 4 working level months)	4E-6 3E-8 (or 0.33 working level)	1E-8 1E-10	- -	- -
87	Francium-222 ²	D, all compounds	2E+3	5E+2	2E-7	6E-10	3E-5	3E-4
87	Francium-223 ²	D, all compounds	6E+2	8E+2	3E-7	1E-9	8E-6	8E-5

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
88	Radium-223	W. all compounds	5E+0 Bone surf (9E+0)	7E-1	3E-10	9E-13	-	1E-6
88	Radium-224	W. all compounds	8E+0 Bone surf (2E+1)	2E+0	7E-10	2E-12	-	2E-6
88	Radium-225	W. all compounds	8E+0 Bone surf (2E+1)	7E-1	3E-10	9E-13	-	2E-6
88	Radium-226	W. all compounds	2E+0 Bone surf (5E+0)	6E-1	3E-10	9E-13	-	6E-7
88	Radium-227 ²	W. all compounds	2E+4 Bone surf (2E+4)	1E+4 Bone surf (2E+4)	6E-6	-	3E-4	3E-3
88	Radium-228	W. all compounds	2E+0 Bone surf (4E+0)	1E+0	5E-10	2E-12	-	6E-7
89	Actinium-224	D. all compounds except those given for W and Y	2E+3 LLI wall (2E+3)	3E+1 Bone surf (4E+1)	1E-8	-	-	-
		W. halides and nitrates	-	5E+1	2E-8	5E-11	3E-5	3E-4
		Y. oxides and hydroxides	-	5E+1	2E-8	7E-11	-	-
89	Actinium-225	D. see ²²⁴ Ac	5E+1 LLI wall (5E+1)	3E-1 Bone surf (5E-1)	1E-10	-	-	-
		W. see ²²⁴ Ac	-	6E-1	3E-10	7E-13	7E-7	7E-6
		Y. see ²²⁴ Ac	-	6E-1	3E-10	9E-13	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
89	Actinium-226	D. see ^{224}Ac W. see ^{224}Ac Y. see ^{224}Ac	1E+2 LLI wall (1E+2) -	3E+0 Bone surf (4E+0) 5E+0 5E+0	1E-9 - 2E-9 2E-9	- 5E-12 7E-12 6E-12	- 2E-6 -	- 2E-5 -
89	Actinium-227	D. see ^{224}Ac W. see ^{224}Ac Y. see ^{224}Ac	2E-1 Bone surf (4E-1) -	4E-4 Bone surf (8E-4) 2E-3 Bone surf (3E-3) 4E-3	2E-13 - 7E-13 - 2E-12	- 1E-15 - 4E-15 6E-15	- 5E-9 -	- 5E-8 -
89	Actinium-228	D. see ^{224}Ac W. see ^{224}Ac Y. see ^{224}Ac	2E+3 -	9E+0 Bone surf (2E+1) 4E+1 Bone surf (6E+1) 4E+1	4E-9 - 2E-8 - 2E-8	- 2E-11 - 8E-11 6E-11	- - - -	3E-4 - -
90	Thorium-226 ²	W. all compounds except those given for Y Y. oxides and hydroxides	5E+3 St wall (5E+3) -	2E+2 -	6E-8 - 6E-8	2E-10 - 2E-10	- 7E-5 -	- 7E-4 -
90	Thorium-227	W. see ^{226}Th Y. see ^{226}Th	1E+2 -	3E-1 3E-1	1E-10 1E-10	5E-13 5E-13	2E-6 -	2E-5 -
90	Thorium-228	W. see ^{226}Th Y. see ^{226}Th	6E+0 Bone surf (1E+1) -	1E-2 Bone surf (2E-2) 2E-2	4E-12 - 7E-12	- 3E-14 2E-14	- 2E-7 -	- 2E-6 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion AI I (μCi)	Inhalation AI I (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
90	Thorium-229	W. see ^{226}Th Y. see ^{226}Th	6E-1 Bone surf (1E+0)	9E-4 Bone surf (2E-3) 2E-3 Bone surf (3E-3)	4E-13 - 1E-12	- 3E-15 4E-15	- 2E-8 -	- 2E-7 -
90	Thorium-230	W. see ^{226}Th Y. see ^{226}Th	4E+0 Bone surf (9E+0)	6E-3 Bone surf (2E-2) 2E-2 Bone surf (2E-2)	3E-12 - 6E-12 -	- 2E-14 3E-14	- 1E-7 -	- 1E-6 -
90	Thorium-231	W. see ^{226}Th Y. see ^{226}Th	4E+3 -	6E+3 6E+3	3E-6 3E-6	9E-9 9E-9	5E-5 -	5E-4 -
90	Thorium-232	W. see ^{226}Th Y. see ^{226}Th	7E-1 Bone surf (2E+0)	1E-3 Bone surf (3E-3) 3E-3 Bone surf (4E-3)	5E-13 - 1E-12 -	- 4E-15 6E-15	- 3E-8 -	- 3E-7 -
90	Thorium-234	W. see ^{226}Th Y. see ^{226}Th	3E+2 L11 wall (4E+2)	2E+2 -	8E-8 -	3E-10 -	- 5E-6	- 5E-5
91	Protactinium-227 ²	W. all compounds except those given for Y Y. oxides and hydroxides	4E+3 -	1E+2 1E+2	5E-8 4E-8	2E-10 1E-10	5E-5 -	5E-4 -
91	Protactinium-228	W. see ^{227}Pa Y. see ^{227}Pa	1E+3 -	1E+1 Bone surf (2E+1) 1E+1	5E-9 - 5E-9	- 3E-11 2E-11	2E-5 -	2E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
91	Protactinium-230	W. see ^{227}Pa Y. see ^{227}Pa	6E+2 Bone surf (9E+2)	5E+0 -	2E-9 -	7E-12 -	- 1E-5	- 1E-4
91	Protactinium-231	W. see ^{227}Pa Y. see ^{227}Pa	2E-1 Bone surf (5E-1)	2E-3 Bone surf (4E-3) 4E-3 Bone surf (6E-3)	6E-13 - 2E-12 -	- 6E-15 - 8E-15	- 6E-9 -	- 6E-8 -
91	Protactinium-232	W. see ^{227}Pa Y. see ^{227}Pa	1E+3 -	2E+1 Bone surf (6E+1) 6E+1 Bone surf (7E+1)	9E-9 - 2E-8 -	- 8E-11 - 1E-10	2E-5 -	2E-4 -
91	Protactinium-233	W. see ^{227}Pa Y. see ^{227}Pa	1E+3 LLI wall (2E+3)	7E+2 -	3E-7 -	1E-9 -	- 2E-5	- 2E-4
91	Protactinium-234	W. see ^{227}Pa Y. see ^{227}Pa	2E+3 -	8E+3 7E+3	3E-6 3E-6	1E-8 9E-9	3E-5 -	3E-4 -
92	Uranium-230	D. UF_6 , UO_2F_2 , $\text{UO}_2(\text{NO}_3)_2$ W. UO_3 , UF_4 , UCl_4 Y. UO_2 , U_3O_8	4E+0 Bone surf (6E+0)	4E-1 Bone surf (6E-1) 4E-1 3E-1	2E-10 - 1E-10 1E-10	- 8E-13 5E-13 4E-13	- 8E-8 -	- 8E-7 -
92	Uranium-231	D. see ^{230}U W. see ^{230}U Y. see ^{230}U	5E+3 LLI wall (4E+3)	8E+3 -	3E-6 -	1E-8 -	- 6E-5	- 6E-4
			-	6E+3 5E+3	2E-6 2E-6	8E-9 6E-9	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
92	Uranium-232	D. see ^{230}U W. see ^{230}U Y. see ^{230}U	2E+0 Bone surf (4E+0)	2E-1 Bone surf (4E-1)	9E-11 - 2E-10	- 6E-13 5E-13	- 6E-8 -	- 6E-7 -
92	Uranium-233	D. see ^{230}U W. see ^{230}U Y. see ^{230}U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 - 3E-10	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-234 ³	D. see ^{230}U W. see ^{230}U Y. see ^{230}U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 - 3E-10	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-235 ³	D. see ^{230}U W. see ^{230}U Y. see ^{230}U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	6E-10 - 3E-10	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-236	D. see ^{230}U W. see ^{230}U Y. see ^{230}U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 - 3E-10	- 3E-12 1E-12	- 3E-7 -	- 3E-6 -
92	Uranium-237	D. see ^{230}U W. see ^{230}U Y. see ^{230}U	2E+3 LLI wall (2E+3)	3E+3 -	1E-6 - 7E-7	4E-9 - 2E-9	- 3E-5 -	- 3E-4 -

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
92	Uranium-238 ³	D. see ²³⁸ U W. see ²³⁸ U Y. see ²³⁸ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	6E-10 - 3E-10 2E-11	- 3E-12 1E-12 6E-14	- 3E-7 -	- 3E-6 -
92	Uranium-239 ²	D. see ²³⁹ U W. see ²³⁹ U Y. see ²³⁹ U	7E+4 - -	2E+5 2E+5 2E+5	8E-5 7E-5 6E-5	3E-7 2E-7 2E-7	9E-4 -	9E-3 - -
92	Uranium-240	D. see ²⁴⁰ U W. see ²⁴⁰ U Y. see ²⁴⁰ U	1E+3 - -	4E+3 3E+3 2E+3	2E-6 1E-6 1E-6	5E-9 4E-9 3E-9	2E-5 -	2E-4 - -
92	Uranium-natural ¹	D. see ²³⁸ U W. see ²³⁸ U Y. see ²³⁸ U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 - 3E-10 2E-11	- 3E-12 9E-13 9E-14	- 3E-7 -	- 3E-6 -
93	Neptunium-232 ²	W. all compounds	1E+5 -	2E+3 Bone surf (5E+2)	7E-7 -	- 6E-9	2E-3 -	2E-2 -
93	Neptunium-233 ²	W. all compounds	8E+5	3E+6	1E-3	4E-6	1E-2	1E-1
93	Neptunium-234	W. all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
93	Neptunium-235	W. all compounds	2E+4 LLI wall (2E+4)	8E+2 Bone surf (1E+3)	3E-7 -	- 2E-9	- 3E-4	- 3E-3
93	Neptunium-236 (1.15E+5 y)	W. all compounds	3E+0 Bone surf (6E+0)	2E-2 Bone surf (5E-2)	9E-12 -	- 8E-14	- 9E-8	- 9E-7
93	Neptunium-236 (22.5 h)	W. all compounds	3E+3 Bone surf (4E+3)	3E+1 Bone surf (7E+1)	1E-8 -	- 1E-10	- 5E-5	- 5E-4

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion AI (μCi)	Inhalation AI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
93	Neptunium-237	W. all compounds	5E-1 Bone surf (1E+0)	4E-3 Bone surf (1E-2)	2E-12	-	-	-
93	Neptunium-238	W. all compounds	1E+3	6E+1 Bone surf (2E+2)	3E-8	-	2E-5	2E-4
93	Neptunium-239	W. all compounds	2E+3 LLI wall (2E+3)	2E+3	9E-7	3E-9	-	-
93	Neptunium-240 ²	W. all compounds	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
94	Plutonium-234	W. all compounds except PuO ₂ Y. PuO ₂	8E+3	2E+2 2E+2	9E-8 8E-8	3E-10 3E-10	1E-4	1E-3
94	Plutonium-235 ²	W. see ²³⁴ Pu Y. see ²³⁴ Pu	9E+5	3E+6 3E+6	1E-3 1E-3	4E-6 3E-6	1E-2	1E-1
94	Plutonium-236	W. see ²³⁴ Pu Y. see ²³⁴ Pu	2E+0 Bone surf (4E+0)	2E-2 Bone surf (4E-2)	8E-12	-	-	-
94	Plutonium-237	W. see ²³⁴ Pu Y. see ²³⁴ Pu	1E+4	3E+3 3E+3	1E-6 1E-6	5E-9 4E-9	2E-4	2E-3
94	Plutonium-238	W. see ²³⁴ Pu Y. see ²³⁴ Pu	9E-1 Bone surf (2E+0)	7E-3 Bone surf (1E-2)	3E-12	-	-	-
			-	2E-2	8E-12	2E-14 2E-14	2E-8	2E-7

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci/ml}$)	Col. 1 Air ($\mu\text{Ci/ml}$)	Col. 2 Water ($\mu\text{Ci/ml}$)	Monthly Average Concentration ($\mu\text{Ci/ml}$)
94	Plutonium-239	W. see ^{239}Pu	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	-
		Y. see ^{239}Pu	-	2E-2 Bone surf (2E-2)	7E-12	2E-14	2E-8	2E-7
94	Plutonium-240	W. see ^{240}Pu	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	-
		Y. see ^{240}Pu	-	2E-2 Bone surf (2E-2)	7E-12	2E-14	2E-8	2E-7
94	Plutonium-241	W. see ^{241}Pu	4E+1 Bone surf (7E+1)	3E-1 Bone surf (6E-1)	1E-10	-	-	-
		Y. see ^{241}Pu	-	8E-1 Bone surf (1E+0)	3E-10	8E-13	1E-6	1E-5
94	Plutonium-242	W. see ^{242}Pu	8E-1 Bone surf (1E+0)	7E-3 Bone surf (1E-2)	3E-12	-	-	-
		Y. see ^{242}Pu	-	2E-2 Bone surf (2E-2)	7E-12	2E-14	2E-8	2E-7
94	Plutonium-243	W. see ^{243}Pu	2E+4	4E+4	2E-5	5E-8	2E-4	2E-3
		Y. see ^{243}Pu	-	4E+4	2E-5	5E-8	-	-
94	Plutonium-244	W. see ^{244}Pu	8E-1 Bone surf (2E+0)	7E-3 Bone surf (1E-2)	3E-12	-	-	-
		Y. see ^{244}Pu	-	2E-2 Bone surf (2E-2)	7E-12	2E-14	2E-8	2E-7

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci}/\text{ml}$)	Col. 1 Air ($\mu\text{Ci}/\text{ml}$)	Col. 2 Water ($\mu\text{Ci}/\text{ml}$)	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
94	Plutonium-245	W. see ^{239}Pu Y. see ^{239}Pu	$2\text{E}+3$	$5\text{E}+3$	$2\text{E}-6$	$6\text{E}-9$	$3\text{E}-5$	$3\text{E}-4$
94	Plutonium-246	W. see ^{239}Pu Y. see ^{239}Pu	$4\text{E}+2$ LLI wall ($4\text{E}+2$)	$3\text{E}+2$	$1\text{E}-7$	$4\text{E}-10$	-	-
95	Americium-237 ²	W. all compounds	$8\text{E}+4$	$3\text{E}+5$	$1\text{E}-4$	$4\text{E}-7$	$1\text{E}-3$	$1\text{E}-2$
95	Americium-238 ²	W. all compounds	$4\text{E}+4$	$3\text{E}+3$ Bone surf ($6\text{E}+3$)	$1\text{E}-6$	-	$5\text{E}-4$	$5\text{E}-3$
95	Americium-239	W. all compounds	$5\text{E}+3$	$1\text{E}+4$	$5\text{E}-6$	$2\text{E}-8$	$7\text{E}-5$	$7\text{E}-4$
95	Americium-240	W. all compounds	$2\text{E}+3$	$3\text{E}+3$	$1\text{E}-6$	$4\text{E}-9$	$3\text{E}-5$	$3\text{E}-4$
95	Americium-241	W. all compounds	$8\text{E}-1$ Bone surf ($1\text{E}+0$)	$6\text{E}-3$ Bone surf ($1\text{E}-2$)	$3\text{E}-12$	-	-	-
95	Americium-242m	W. all compounds	$8\text{E}-1$ Bone surf ($1\text{E}+0$)	$6\text{E}-3$ Bone surf ($1\text{E}-2$)	$3\text{E}-12$	-	-	-
95	Americium-242	W. all compounds	$4\text{E}+3$	$8\text{E}+1$ Bone surf ($9\text{E}+1$)	$4\text{E}-8$	-	$5\text{E}-5$	$5\text{E}-4$
95	Americium-243	W. all compounds	$8\text{E}-1$ Bone surf ($1\text{E}+0$)	$6\text{E}-3$ Bone surf ($1\text{E}-2$)	$3\text{E}-12$	-	-	-
95	Americium-244m ²	W. all compounds	$6\text{E}+4$ St wall ($8\text{E}+4$)	$4\text{E}+3$ Bone surf ($7\text{E}+3$)	$2\text{E}-6$	-	-	-
						$1\text{E}-8$	$1\text{E}-3$	$1\text{E}-2$

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci/ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
95	Americium-244	W. all compounds	3E+3	2E+2 Bone surf (3E+2)	8E-8	-	4E-5	4E-4
95	Americium-245	W. all compounds	3E+4	8E+4	3E-5	1E-7	4E-4	4E-3
95	Americium-246m ²	W. all compounds	5E+4 St wall (6E+4)	2E+5	8E-5	3E-7	-	-
95	Americium-246 ²	W. all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
96	Curium-238	W. all compounds	2E+4	1E+3	5E-7	2E-9	2E-4	2E-3
96	Curium-240	W. all compounds	6E+1 Bone surf (8E+1)	6E-1 Bone surf (6E-1)	2E-10	-	-	-
96	Curium-241	W. all compounds	1E+3	3E+1 Bone surf (4E+1)	1E-8	-	2E-5	2E-4
96	Curium-242	W. all compounds	3E+1 Bone surf (5E+1)	3E-1 Bone surf (3E-1)	1E-10	-	-	-
96	Curium-243	W. all compounds	1E+0 Bone surf (2E+0)	9E-3 Bone surf (2E-2)	4E-12	-	-	-
96	Curium-244	W. all compounds	1E+0 Bone surf (3E+0)	1E-2 Bone surf (2E-2)	5E-12	-	-	-
96	Curium-245	W. all compounds	7E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	-
						2E-14	2E-8	2E-7

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)	
			Oral Ingestion AI (μCi)	Inhalation AI (μCi)	DAC ($\mu\text{Ci}/\text{m}$)	Air ($\mu\text{Ci}/\text{m}$)	Water ($\mu\text{Ci}/\text{m}$)		
96	Curium-246	W. all compounds	7E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	2E-8	2E-7
96	Curium-247	W. all compounds	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12	-	-	2E-8	2E-7
96	Curium-248	W. all compounds	2E-1 Bone surf (4E-1)	2E-3 Bone surf (3E-3)	7E-13	-	-	5E-9	5E-8
96	Curium-249 ²	W. all compounds	5E+4	2E+4 Bone surf (3E+4)	7E-6	-	7E-4	-	7E-3
96	Curium-250	W. all compounds	4E-2 Bone surf (6E-2)	3E-4 Bone surf (5E-4)	1E-13	-	-	8E-16	9E-9
97	Berkelium-245	W. all compounds	2E+3	1E+3	5E-7	2E-9	3E-5	-	3E-4
97	Berkelium-246	W. all compounds	3E+3	3E+3	1E-6	4E-9	4E-5	-	4E-4
97	Berkelium-247	W. all compounds	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12	-	-	1E-14	2E-8
97	Berkelium-249	W. all compounds	2E+2 Bone surf (5E+2)	2E+0 Bone surf (4E+0)	7E-10	-	-	5E-12	6E-6
97	Berkelium-250	W. all compounds	9E+3	3E+2 Bone surf (7E+2)	1E-7	-	1E-4	-	1E-3

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
98	Californium-244 ²	W. all compounds except those given for Y	3E+4 St wall (3E+4)	6E+2	2E-7	8E-10	-	-
		Y. oxides and hydroxides	-	6E+2	2E-7	8E-10	4E-4	4E-3
98	Californium-246	W. see ²⁴⁴ Cf	4E+2	9E+0	4E-9	1E-11	5E-6	5E-5
		Y. see ²⁴⁴ Cf	-	9E+0	4E-9	1E-11	-	-
98	Californium-248	W. see ²⁴⁴ Cf	8E+0 Bone surf (2E+1)	6E-2 Bone surf (1E-1)	3E-11	-	-	-
		Y. see ²⁴⁴ Cf	-	1E-1	4E-11	2E-13 1E-13	2E-7	2E-6
98	Californium-249	W. see ²⁴⁴ Cf	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12	-	-	-
		Y. see ²⁴⁴ Cf	-	1E-2 Bone surf (1E-2)	4E-12	1E-14	2E-8	2E-7
			-	-	-	2E-14	-	-
98	Californium-250	W. see ²⁴⁴ Cf	1E+0 Bone surf (2E+0)	9E-3 Bone surf (2E-2)	4E-12	-	-	-
		Y. see ²⁴⁴ Cf	-	3E-2	1E-11	3E-14 4E-14	3E-8	3E-7
98	Californium-251	W. see ²⁴⁴ Cf	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12	-	-	-
		Y. see ²⁴⁴ Cf	-	1E-2 Bone surf (1E-2)	4E-12	1E-14	2E-8	2E-7
			-	-	-	2E-14	-	-
98	Californium-252	W. see ²⁴⁴ Cf	2E+0 Bone surf (5E+0)	2E-2 Bone surf (4E-2)	8E-12	-	-	-
		Y. see ²⁴⁴ Cf	-	3E-2	1E-11	5E-14 5E-14	7E-8	7E-7

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
			Oral Ingestion ALI (μCi)	Inhalation ALI (μCi)	DAC ($\mu\text{Ci}/\text{ml}$)	Air ($\mu\text{Ci}/\text{ml}$)	Water ($\mu\text{Ci}/\text{ml}$)	
98	Californium-253	W. see ^{244}Cf Y. see ^{244}Cf	2E+2 Bone surf (4E+2)	2E+0	8E-10	3E-12	-	-
98	Californium-254	W. see ^{244}Cf Y. see ^{244}Cf	2E+0	2E-2 2E-2	9E-12 7E-12	3E-14 2E-14	3E-8	3E-7
99	Einsteinium-250	W. all compounds	4E+4	5E+2 Bone surf (1E+3)	2E-7	-	6E-4	6E-3
99	Einsteinium-251	W. all compounds	7E+3	9E+2 Bone surf (1E+3)	4E-7	-	1E-4	1E-3
99	Einsteinium-253	W. all compounds	2E+2	1E+0	6E-10	2E-12	2E-6	2E-5
99	Einsteinium-254m	W. all compounds	3E+2 L11 wall (3E+2)	1E+1	4E-9	1E-11	-	-
99	Einsteinium-254	W. all compounds	8E+0 Bone surf (2E+1)	7E-2 Bone surf (1E-1)	3E-11	-	-	-
100	Fermium-252	W. all compounds	5E+2	1E+1	5E-9	2E-11	6E-6	6E-5
100	Fermium-253	W. all compounds	1E+3	1E+1	4E-9	1E-11	1E-5	1E-4
100	Fermium-254	W. all compounds	3E+3	9E+1	4E-8	1E-10	4E-5	4E-4
100	Fermium-255	W. all compounds	5E+2	2E+1	9E-9	3E-11	7E-6	7E-5
100	Fermium-257	W. all compounds	2E+1 Bone surf (4E+1)	2E-1 Bone surf (2E-1)	7E-11	-	-	-
						3E-13	5E-7	5E-6

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci}/\text{m}$)	Col. 1 Air ($\mu\text{Ci}/\text{m}$)	Col. 2 Water ($\mu\text{Ci}/\text{m}$)	Monthly Average Concentration ($\mu\text{Ci}/\text{m}$)
101	Mendelevium-257	W. all compounds	7E+3	8E+1 Bone surf (9E+1)	4E-8	-	1E-4	1E-3
101	Mendelevium-258	W. all compounds	3E+1 Bone surf (5E+1)	2E-1 Bone surf (3E-1)	1E-10	-	-	-
-	Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life less than 2 hours		-	2E+2	1E-7	1E-9	-	-
-	Any single radionuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours		-	2E-1	1E-10	1E-12	1E-8	1E-7
-	Any single radionuclide not listed above that decays by alpha emission or spontaneous fission, or any mixture for which either the identity or the concentration of any radionuclide in the mixture is not known		-	4E-4	2E-13	1E-15	2E-9	2E-8

FOOTNOTES:

¹"Submersion" means that values given are for submersion in a hemispherical semi-infinite cloud of airborne material.

²These radionuclides have radiological half-lives of less than two hours. The total effective dose equivalent received during operations with these radionuclides might include a significant contribution from external exposure. The derived air concentration values for all radionuclides, other than those designated class "submersion," are based upon the committed effective dose equivalent due to the intake of the radionuclide into the body and do NOT include potentially significant contributions to dose equivalent from external exposures. The licensee may substitute 1E-7 $\mu\text{Ci}/\text{m}$ for the listed derived air concentration to account for the submersion dose prospectively, but should use individual monitoring devices or other radiation measuring instruments that measure external exposure to demonstrate compliance with the limits (see subsection 3 of section 33-10 04 1-06).

³For soluble mixtures of U-238, U-234, and U-235 in air, chemical toxicity may be the limiting factor (see subdivision e of subsection 1 of section 33-10-04 1 - 06). If the percent by weight (enrichment) of U-235 is not greater than five, the concentration value for a forty-hour workweek is two tenths milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a forty-hour workweek shall not exceed $8E-3$ (SA) $\mu\text{Ci-hr/ml}$, where SA is the specific activity of the uranium inhaled. The specific activity for natural uranium is $6.77E-7$ curies per gram U. The specific activity for other mixtures of U-238, U-235, and U-234, if not known, shall be:

$$\text{SA} = 3.6E-7 \text{ curies/gram U} \quad \text{U-depleted}$$

$$\text{SA} = [0.4 + 0.38 (\text{enrichment}) + 0.0034 (\text{enrichment})^2] E-6, \quad \text{enrichment} > 0.72$$

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

NOTE:

1. 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 for the mixture shall be the most restrictive derived air concentration of any radionuclide in the mixture.
2. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in this appendix are not present in the mixture, the inhalation annual limit on intake, derived air concentration, and effluent and sewage concentrations for the mixture are the lowest values specified in this appendix for any radionuclide that is not known to be absent from the mixture; or

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci}/\text{ml}$)	Col. 1 Air ($\mu\text{Ci}/\text{ml}$)	Col. 2 Water ($\mu\text{Ci}/\text{ml}$)	Monthly Average Concentration ($\mu\text{Ci}/\text{ml}$)
	If it is known that Ac-227-D and Cm-250-W are not present		-	7E-4	3E-13	-	-	-
	If, in addition, it is known that Ac-227-W,Y, Th-229-W,Y, Th-230-W, Th-232-W,Y, Pa-231-W,Y, Np-237-W, Pu-239-W, Pu-240-W, Pu-242-W, Am-241-W, Am-242m-W, Am-243-W, Cm-245-W, Cm-246-W, Cm-247-W, Cm-248-W, Bk-247-W, Cf-249-W, and Cf-251-W are not present		-	7E-3	3E-12	-	-	-
	If, in addition, it is known that Sm-146-W, Sm-147-W, Gd-148-D,W, Gd-152-D,W, Th-228-W,Y, Th-230-Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, Np-236-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-Y, Pu-240-Y, Pu-242-Y, Pu-244-W,Y, Cm-243-W, Cm-244-W, Cf-248-W, Cf-249-Y, Cf-250-W,Y, Cf-251-Y, Cf-252-W,Y, and Cf-254-W,Y are not present		-	7E-2	3E-11	-	-	-
	If, in addition, it is known that Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-Y, Es-254-W, Fm-257-W, and Md-258-W are not present		-	7E-1	3E-10	-	-	-
	If, in addition, it is known that Si-32-Y, Ti-44-Y, Fe-60-D, Sr-90-Y, Zr-93-D, Cd-113m-D, Cd-113-D, In-115-D,W, La-138-D, Lu-176-W, Hf-178m-D,W, Hf-182-D,W, Bi-210m-D, Ra-224-W, Ra-228-W, Ac-226-D,W,Y, Pa-230-W,Y, U-233-D,W, U-234-D,W, U-235-D,W, U-236-D,W, U-238-D,W, Pu-241-Y, Bk-249-W, Cf-253-W,Y, and Es-253-W are not present		7E+0	3E-9	-	-	-	-

Atomic No.	Radionuclide	Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Col. 2 Inhalation ALI (μCi)	Col. 3 DAC ($\mu\text{Ci/ml}$)	Col. 1 Air ($\mu\text{Ci/ml}$)	Col. 2 Water ($\mu\text{Ci/ml}$)	Monthly Average Concentration ($\mu\text{Ci/ml}$)
	If it is known that Ac-227-D,W,Y, Th-229-W,Y, Th-232-W,Y, Pa-231-W,Y, Cm-248-W, and Cm-250-W are not present		-	-	-	1E-14	-	-
	If, in addition, it is known that Sm-146-W, Gd-148-D,W, Gd-152-D, Th-228-W,Y, Th-230-W,Y, U-232-Y, U-233-Y, U-234-Y, U-235-Y, U-236-Y, U-238-Y, U-Nat-Y, Np-236-W, Np-237-W, Pu-236-W,Y, Pu-238-W,Y, Pu-239-W,Y, Pu-240-W,Y, Pu-242-W,Y, Pu-244-W,Y, Am-241-W, Am-242m-W, Am-243-W, Cm-243-W, Cm-244-W, Cm-245-W, Cm-246-W, Cm-247-W, Bk-247-W, Cf-249-W,Y, Cf-250-W,Y, Cf-251-W,Y, Cf-252-W,Y, and Cf-254-W,Y are not present		-	-	-	1E-13	-	-
	If, in addition, it is known that Sm-147-W, Gd-152-W, Pb-210-D, Bi-210m-W, Po-210-D,W, Ra-223-W, Ra-225-W, Ra-226-W, Ac-225-D,W,Y, Th-227-W,Y, U-230-D,W,Y, U-232-D,W, U-Nat-W, Pu-241-W, Cm-240-W, Cm-242-W, Cf-248-W,Y, Es-254-W, Fm-257-W, and Md-258-W are not present		-	-	-	1E-12	-	-
	If, in addition it is known that Fe-60, Sr-90, Cd-113m, Cd-113, In-115, I-129, Cs-134, Sm-145, Sm-147, Gd-148, Gd-152, Hg-194 (organic), Bi-210m, Ra-223, Ra-224, Ra-225, Ac-225, Th-228, Th-230, U-233, U-234, U-235, U-236, U-238, U-Nat, Cm-242, Cf-248, Es-254, Fm-257, and Md-258 are not present		-	-	-	-	1E-6	1E-5

3. If a mixture of radionuclides consists of uranium and its daughters in ore dust (10 μm activity median aerodynamic diameter particle distribution assumed) prior to chemical separation of the uranium from the ore, the following values may be used for the derived air concentration of the mixture: $6\text{E-11 } \mu\text{Ci}$ of gross alpha activity from uranium-238, uranium-234, thorium-230, and radium-226 per milliliter of air; $3\text{E-11 } \mu\text{Ci}$ of natural uranium per milliliter of air; or forty-five micrograms of natural uranium per cubic meter of air.

4. If the identity and concentration of each radionuclide in a mixture are known, the limiting values should be derived as follows: determine, for each radionuclide in the mixture, the ratio between the concentration present in the mixture and the concentration otherwise established in this appendix for the specific radionuclide when not in a mixture. The sum of such ratios for all of the radionuclides in the mixture may not exceed "one" (i.e., "unity").

Example: If radionuclides "A," "B," and "C" are present in concentrations C_A , C_B , and C_C , and if the applicable derived air concentrations are DAC_A , DAC_B , and DAC_C , respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_A}{DAC_A} + \frac{C_B}{DAC_B} + \frac{C_C}{DAC_C} \leq 1$$

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Hydrogen-3	1.000	Chromium-48	1.000
Beryllium-7	1.000	Chromium-49	1.000
Beryllium-10	1	Chromium-51	1.000
Carbon-11	1.000	Manganese-51	1.000
Carbon-14	1.000	Manganese-52m	1.000
Fluorine-18	1.000	Manganese-52	100
Sodium-22	10	Manganese-53	1.000
Sodium-24	100	Manganese-54	100
Magnesium-28	100	Manganese-56	1.000
Aluminum-26	10	Iron-52	100
Silicon-31	1.000	Iron-55	100
Silicon-32	1	Iron-59	10
Phosphorus-32	10	Iron-60	1
Phosphorus-33	100	Cobalt-55	100
Sulfur-35	100	Cobalt-56	10
Chlorine-36	10	Cobalt-57	100
Chlorine-38	1.000	Cobalt-58m	1.000
Chlorine-39	1.000	Cobalt-58	100
Argon-39	1.000	Cobalt-60m	1.000
Argon-41	1.000	Cobalt-60	1
Potassium-40	100	Cobalt-61	1.000
Potassium-42	1.000	Cobalt-62m	1.000
Potassium-43	1.000	Nickel-56	100
Potassium-44	1.000	Nickel-57	100
Potassium-45	1.000	Nickel-59	100
Calcium-41	100	Nickel-63	100
Calcium-45	100	Nickel-65	1.000
Calcium-47	100	Nickel-66	10
Scandium-43	1.000	Copper-60	1.000
Scandium-44m	100	Copper-61	1.000
Scandium-44	100	Copper-64	1.000
Scandium-46	10	Copper-67	1.000
Scandium-47	100	Zinc-62	100
Scandium-48	100	Zinc-63	1.000
Scandium-49	1.000	Zinc-65	10
Titanium-44	1	Zinc-69m	100
Titanium-45	1.000	Zinc-69	1.000
Vanadium-47	1.000	Zinc-71m	1.000
Vanadium-48	100	Zinc-72	100
Vanadium-49	1.000	Gallium-65	1.000

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Gallium-66	100	Krypton-81	1.000
Gallium-67	1.000	Krypton-83m	1.000
Gallium-68	1.000	Krypton-85m	1.000
Gallium-70	1.000	Krypton-85	1.000
Gallium-72	100	Krypton-87	1.000
Gallium-73	1.000	Krypton-88	1.000
Germanium-66	1.000	Rubidium-79	1.000
Germanium-67	1.000	Rubidium-81m	1.000
Germanium-68	10	Rubidium-81	1.000
Germanium-69	1.000	Rubidium-82m	1.000
Germanium-71	1.000	Rubidium-83	100
Germanium-75	1.000	Rubidium-84	100
Germanium-77	1.000	Rubidium-86	100
Germanium-78	1.000	Rubidium-87	100
Arsenic-69	1.000	Rubidium-88	1.000
Arsenic-70	1.000	Rubidium-89	1.000
Arsenic-71	100	Strontium-80	100
Arsenic-72	100	Strontium-81	1.000
Arsenic-73	100	Strontium-83	100
Arsenic-74	100	Strontium-85m	1.000
Arsenic-76	100	Strontium-85	100
Arsenic-77	100	Strontium-87m	1.000
Arsenic-78	1.000	Strontium-89	10
Selenium-70	1.000	Strontium-90	0.1
Selenium-73m	1.000	Strontium-91	100
Selenium-73	100	Strontium-92	100
Selenium-75	100	Yttrium-86m	1.000
Selenium-79	100	Yttrium-86	100
Selenium-81m	1.000	Yttrium-87	100
Selenium-81	1.000	Yttrium-88	10
Selenium-83	1.000	Yttrium-90m	1.000
Bromine-74m	1.000	Yttrium-90	10
Bromine-74	1.000	Yttrium-91m	1.000
Bromine-75	1.000	Yttrium-91	10
Bromine-76	100	Yttrium-92	100
Bromine-77	1.000	Yttrium-93	100
Bromine-80m	1.000	Yttrium-94	1.000
Bromine-80	1.000	Yttrium-95	1.000
Bromine-82	100	Zirconium-86	100
Bromine-83	1.000	Zirconium-88	10
Bromine-84	1.000	Zirconium-89	100
Krypton-74	1.000	Zirconium-93	1
Krypton-76	1.000	Zirconium-95	10
Krypton-77	1.000	Zirconium-97	100
Krypton-79	1.000		

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Niobium-88	1.000	Palladium-101	1.000
Niobium-89m (66 min)	1.000	Palladium-103	100
Niobium-89 (122 min)	1.000	Palladium-107	10
Niobium-90	100	Palladium-109	100
Niobium-93m	10	Silver-102	1.000
Niobium-94	1	Silver-103	1.000
Niobium-95m	100	Silver-104m	1.000
Niobium-95	100	Silver-104	1.000
Niobium-96	100	Silver-105	100
Niobium-97	1.000	Silver-106m	100
Niobium-98	1.000	Silver-106	1.000
Molybdenum-90	100	Silver-108m	1
Molybdenum-93m	100	Silver-110m	10
Molybdenum-93	10	Silver-111	100
Molybdenum-99	100	Silver-112	100
Molybdenum-101	1.000	Silver-115	1.000
Technetium-93m	1.000	Cadmium-104	1.000
Technetium-93	1.000	Cadmium-107	1.000
Technetium-94m	1.000	Cadmium-109	1
Technetium-94	1.000	Cadmium-113m	0.1
Technetium-96m	1.000	Cadmium-113	100
Technetium-96	100	Cadmium-115m	10
Technetium-97m	100	Cadmium-115	100
Technetium-97	1.000	Cadmium-117m	1.000
Technetium-98	10	Cadmium-117	1.000
Technetium-99m	1.000	Indium-109	1.000
Technetium-99	100	Indium-110 (69.1 min)	1.000
Technetium-101	1.000	Indium-110 (4.9 h)	1.000
Technetium-104	1.000	Indium-111	100
Ruthenium-94	1.000	Indium-112	1.000
Ruthenium-97	1.000	Indium-113m	1.000
Ruthenium-103	100	Indium-114m	10
Ruthenium-105	1.000	Indium-115m	1.000
Ruthenium-106	1	Indium-115	100
Rhodium-99m	1.000	Indium-116m	1.000
Rhodium-99	100	Indium-117m	1.000
Rhodium-100	100	Indium-117	1.000
Rhodium-101m	1.000	Indium-119m	1.000
Rhodium-101	10	Tin-110	100
Rhodium-102m	10	Tin-111	1.000
Rhodium-102	10	Tin-113	100
Rhodium-103m	1.000	Tin-117m	100
Rhodium-105	100	Tin-119m	100
Rhodium-106m	1.000	Tin-121m	100
Rhodium-107	1.000	Tin-121	1.000
Palladium-100	100		

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Tin-123m	1,000	Tellurium-133	1,000
Tin-123	10	Tellurium-134	1,000
Tin-125	10	Iodine-120m	1,000
Tin-126	10	Iodine-120	100
Tin-127	1,000	Iodine-121	1,000
Tin-128	1,000	Iodine-123	100
Antimony-115	1,000	Iodine-124	10
Antimony-116m	1,000	Iodine-125	1
Antimony-116	1,000	Iodine-126	1
Antimony-117	1,000	Iodine-128	1,000
Antimony-118m	1,000	Iodine-129	1
Antimony-119	1,000	Iodine-130	10
Antimony-120		Iodine-131	1
(16 min)	1,000	Iodine-132m	100
Antimony-120		Iodine-132	100
(5.76 d)	100	Iodine-133	10
Antimony-122	100	Iodine-134	1,000
Antimony-124m	1,000	Iodine-135	100
Antimony-124	10	Xenon-120	1,000
Antimony-125	100	Xenon-121	1,000
Antimony-126m	1,000	Xenon-122	1,000
Antimony-126	100	Xenon-123	1,000
Antimony-127	100	Xenon-125	1,000
Antimony-128		Xenon-127	1,000
(10.4 min)	1,000	Xenon-129m	1,000
Antimony-128		Xenon-131m	1,000
(9.01 h)	100	Xenon-133m	1,000
Antimony-129	100	Xenon-133	1,000
Antimony-130	1,000	Xenon-135m	1,000
Antimony-131	1,000	Xenon-135	1,000
Tellurium-116	1,000	Xenon-138	1,000
Tellurium-121m	10	Cesium-125	1,000
Tellurium-121	100	Cesium-127	1,000
Tellurium-123m	10	Cesium-129	1,000
Tellurium-123	100	Cesium-130	1,000
Tellurium-125m	10	Cesium-131	1,000
Tellurium-127m	10	Cesium-132	100
Tellurium-127	1,000	Cesium-134m	1,000
Tellurium-129m	10	Cesium-134	10
Tellurium-129	1,000	Cesium-135m	1,000
Tellurium-131m	10	Cesium-135	100
Tellurium-131	100	Cesium-136	10
Tellurium-132	10	Cesium-137	10
Tellurium-133m	100	Cesium-138	1,000

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Barium-126	1.000	Promethium-141	1.000
Barium-128	100	Promethium-143	100
Barium-131m	1.000	Promethium-144	10
Barium-131	100	Promethium-145	10
Barium-133m	100	Promethium-146	1
Barium-133	100	Promethium-147	10
Barium-135m	100	Promethium-148m	10
Barium-139	1.000	Promethium-148	10
Barium-140	100	Promethium-149	100
Barium-141	1.000	Promethium-150	1.000
Barium-142	1.000	Promethium-151	100
Lanthanum-131	1.000	Samarium-141m	1.000
Lanthanum-132	100	Samarium-141	1.000
Lanthanum-135	1.000	Samarium-142	1.000
Lanthanum-137	10	Samarium-145	100
Lanthanum-138	100	Samarium-146	1
Lanthanum-140	100	Samarium-147	100
Lanthanum-141	100	Samarium-151	10
Lanthanum-142	1.000	Samarium-153	100
Lanthanum-143	1.000	Samarium-155	1.000
Cerium-134	100	Samarium-156	1.000
Cerium-135	100	Europium-145	100
Cerium-137m	100	Europium-146	100
Cerium-137	1.000	Europium-147	100
Cerium-139	100	Europium-148	10
Cerium-141	100	Europium-149	100
Cerium-143	100	Europium-150	
Cerium-144	1	(12.62 h)	100
Praseodymium-136	1.000	Europium-150	
Praseodymium-137	1.000	(34.2 y)	1
Praseodymium-138m	1.000	Europium-152m	100
Praseodymium-139	1.000	Europium-152	1
Praseodymium-142m	1.000	Europium-154	1
Praseodymium-142	100	Europium-155	10
Praseodymium-143	100	Europium-156	100
Praseodymium-144	1.000	Europium-157	100
Praseodymium-145	100	Europium-158	1.000
Praseodymium-147	1.000	Gadolinium-145	1.000
Neodymium-136	1.000	Gadolinium-146	10
Neodymium-138	100	Gadolinium-147	100
Neodymium-139m	1.000	Gadolinium-148	0.001
Neodymium-139	1.000	Gadolinium-149	100
Neodymium-141	1.000	Gadolinium-151	10
Neodymium-147	100	Gadolinium-152	100
Neodymium-149	1.000	Gadolinium-153	10
Neodymium-151	1.000	Gadolinium-159	100

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Terbium-147	1.000	Ytterbium-162	1.000
Terbium-149	100	Ytterbium-166	100
Terbium-150	1.000	Ytterbium-167	1.000
Terbium-151	100	Ytterbium-169	100
Terbium-153	1.000	Ytterbium-175	100
Terbium-154	100	Ytterbium-177	1.000
Terbium-155	1.000	Ytterbium-178	1.000
Terbium-156m (5.0 h)	1.000	Lutetium-169	100
Terbium-156m (24.4 h)	1.000	Lutetium-170	100
Terbium-156	100	Lutetium-171	100
Terbium-157	10	Lutetium-172	100
Terbium-158	1	Lutetium-173	10
Terbium-160	10	Lutetium-174m	10
Terbium-161	100	Lutetium-174	10
Dysprosium-155	1.000	Lutetium-176m	1.000
Dysprosium-157	1.000	Lutetium-176	100
Dysprosium-159	100	Lutetium-177m	10
Dysprosium-165	1.000	Lutetium-177	100
Dysprosium-166	100	Lutetium-178m	1.000
Holmium-155	1.000	Lutetium-178	1.000
Holmium-157	1.000	Lutetium-179	1.000
Holmium-159	1.000	Hafnium-170	100
Holmium-161	1.000	Hafnium-172	1
Holmium-162m	1.000	Hafnium-173	1.000
Holmium-162	1.000	Hafnium-175	100
Holmium-164m	1.000	Hafnium-177m	1.000
Holmium-164	1.000	Hafnium-178m	0.1
Holmium-166m	1	Hafnium-179m	10
Holmium-166	100	Hafnium-180m	1.000
Holmium-167	1.000	Hafnium-181	10
Erbium-161	1.000	Hafnium-182m	1.000
Erbium-165	1.000	Hafnium-182	0.1
Erbium-169	100	Hafnium-183	1.000
Erbium-171	100	Hafnium-184	100
Erbium-172	100	Tantalum-172	1.000
Thulium-162	1.000	Tantalum-173	1.000
Thulium-166	100	Tantalum-174	1.000
Thulium-167	100	Tantalum-175	1.000
Thulium-170	10	Tantalum-176	100
Thulium-171	10	Tantalum-177	1.000
Thulium-172	100	Tantalum-178	1.000
Thulium-173	100	Tantalum-179	100
Thulium-175	1.000	Tantalum-180m	1.000
		Tantalum-180	100
		Tantalum-182m	1.000

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Tantalum-182	10	Iridium-188	100
Tantalum-183	100	Iridium-189	100
Tantalum-184	100	Iridium-190m	1.000
Tantalum-185	1.000	Iridium-190	100
Tantalum-186	1.000	Iridium-192m (1.4 min)	10
Tungsten-176	1.000	Iridium-192 (73.8 d)	1
Tungsten-177	1.000	Iridium-194m	10
Tungsten-178	1.000	Iridium-194	100
Tungsten-179	1.000	Iridium-195m	1.000
Tungsten-181	1.000	Iridium-195	1.000
Tungsten-185	100	Platinum-186	1.000
Tungsten-187	100	Platinum-188	100
Tungsten-188	10	Platinum-189	1.000
Rhenium-177	1.000	Platinum-191	100
Rhenium-178	1.000	Platinum-193m	100
Rhenium-181	1.000	Platinum-193	1.000
Rhenium-182 (12.7 h)	1.000	Platinum-195m	100
Rhenium-182 (64.0 h)	100	Platinum-197m	1.000
Rhenium-184m	10	Platinum-197	100
Rhenium-184	100	Platinum-199	1.000
Rhenium-186m	10	Platinum-200	100
Rhenium-186	100	Gold-193	1.000
Rhenium-187	1.000	Gold-194	100
Rhenium-188m	1.000	Gold-195	10
Rhenium-188	100	Gold-198m	100
Rhenium-189	100	Gold-198	100
Osmium-180	1.000	Gold-199	100
Osmium-181	1.000	Gold-200m	100
Osmium-182	100	Gold-200	1.000
Osmium-185	100	Gold-201	1.000
Osmium-189m	1.000	Mercury-193m	100
Osmium-191m	1.000	Mercury-193	1.000
Osmium-191	100	Mercury-194	1
Osmium-193	100	Mercury-195m	100
Osmium-194	1	Mercury-195	1.000
Iridium-182	1.000	Mercury-197m	100
Iridium-184	1.000	Mercury-197	1.000
Iridium-185	1.000	Mercury-199m	1.000
Iridium-186	100	Mercury-203	100
Iridium-187	1.000		

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Thallium-194m	1.000	Francium-223	100
Thallium-194	1.000	Radium-223	0.1
Thallium-195	1.000	Radium-224	0.1
Thallium-197	1.000	Radium-225	0.1
Thallium-198m	1.000	Radium-226	0.1
Thallium-198	1.000	Radium-227	1.000
Thallium-199	1.000	Radium-228	0.1
Thallium-201	1.000	Actinium-224	1
Thallium-200	1.000	Actinium-225	0.01
Thallium-202	100	Actinium-226	0.1
Thallium-204	100	Actinium-227	0.001
Lead-195m	1.000	Actinium-228	1
Lead-198	1.000	Thorium-226	10
Lead-199	1.000	Thorium-227	0.01
Lead-200	100	Thorium-228	0.001
Lead-201	1.000	Thorium-229	0.001
Lead-202m	1.000	Thorium-230	0.001
Lead-202	10	Thorium-231	100
Lead-203	1.000	Thorium-232	100
Lead-205	100	Thorium-234	10
Lead-209	1.000	Thorium-natural	100
Lead-210	0.01	Protactinium-227	10
Lead-211	100	Protactinium-228	1
Lead-212	1	Protactinium-230	0.1
Lead-214	100	Protactinium-231	0.001
Bismuth-200	1.000	Protactinium-232	1
Bismuth-201	1.000	Protactinium-233	100
Bismuth-202	1.000	Protactinium-234	100
Bismuth-203	100	Uranium-230	0.01
Bismuth-205	100	Uranium-231	100
Bismuth-206	100	Uranium-232	0.001
Bismuth-207	10	Uranium-233	0.001
Bismuth-210m	0.1	Uranium-234	0.001
Bismuth-210	1	Uranium-235	0.001
Bismuth-212	10	Uranium-236	0.001
Bismuth-213	10	Uranium-237	100
Bismuth-214	100	Uranium-238	100
Polonium-203	1.000	Uranium-239	1.000
Polonium-205	1.000	Uranium-240	100
Polonium-207	1.000	Uranium-natural	100
Polonium-210	0.1	Neptunium-232	100
Astatine-207	100	Neptunium-233	1.000
Astatine-211	10	Neptunium-234	100
Radon-220	1	Neptunium-235	100
Radon-222	1	Neptunium-236	
Francium-222	100	(1.15E+5 y)	0.001

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Neptunium-236 (22.5 h)	1	Curium-242	0.01
Neptunium-237	0.001	Curium-243	0.001
Neptunium-238	10	Curium-244	0.001
Neptunium-239	100	Curium-245	0.001
Neptunium-240	1.000	Curium-246	0.001
Plutonium-234	10	Curium-247	0.001
Plutonium-235	1.000	Curium-248	0.001
Plutonium-236	0.001	Curium-249	1.000
Plutonium-237	100	Berkelium-245	100
Plutonium-238	0.001	Berkelium-246	100
Plutonium-239	0.001	Berkelium-247	0.001
Plutonium-240	0.001	Berkelium-249	0.1
Plutonium-241	0.01	Berkelium-250	10
Plutonium-242	0.001	Californium-244	100
Plutonium-243	1.000	Californium-246	1
Plutonium-244	0.001	Californium-248	0.01
Plutonium-245	100	Californium-249	0.001
Americium-237	1.000	Californium-250	0.001
Americium-238	100	Californium-251	0.001
Americium-239	1.000	Californium-252	0.001
Americium-240	100	Californium-253	0.1
Americium-241	0.001	Californium-254	0.001
Americium-242m	0.001	Einsteinium-250	100
Americium-242	10	Einsteinium-251	100
Americium-243	0.001	Einsteinium-253	0.1
Americium-244m	100	Einsteinium-254m	1
Americium-244	10	Einsteinium-254	0.01
Americium-245	1.000	Fermium-252	1
Americium-246m	1.000	Fermium-253	1
Americium-246	1.000	Fermium-254	10
Curium-238	100	Fermium-255	1
Curium-240	0.1	Fermium-257	0.01
Curium-241	1	Mendelevium-257	10
		Mendelevium-258	0.01

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX C

QUANTITIES¹ OF LICENSED OR REGISTERED MATERIAL REQUIRING LABELING

Radionuclide	Quantity (μ Ci)*	Radionuclide	Quantity (μ Ci)*
Any alpha-emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition	0.001	Any radionuclide other than alpha-emitting radionuclides not listed above, or mixtures of beta emitters of unknown composition	0.01

NOTE: For purposes of subdivision e of subsection 2 of section 33-10-04.1.1-13, subdivision a of subsection 5 of section 33-10-04.1.1-13, and subdivision a of subsection 1 of section 33-10-04.1.1-16 where there is involved a combination of radionuclides in known amounts, the limit for the combination shall be derived as follows: determine, for each radionuclide in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific radionuclide when not in combination. The sum of such ratios for all radionuclides in the combination may not exceed "1" -- that is, unity.

¹The quantities listed above were derived by taking 1/10th of the most restrictive ALI listed in Table I, Columns 1 and 2, of Appendix B to Chapter 33-10-04.1.1, rounding to the nearest factor of 10, and constraining the values listed between 37 Bq and 37 MBq (0.001 and 1,000 μ Ci). Values of 3.7 MBq (100 μ Ci) have been assigned for radionuclides having a radioactive half-life in excess of E+9 years, except rhenium, 37 MBq (1,000 μ Ci), to take into account their low specific activity.

* To convert μ Ci to kBq, multiply the μ Ci value by 37.

APPENDIX E
CLASSIFICATION AND CHARACTERISTICS OF LOW-LEVEL
RADIOACTIVE WASTE

1. Classification of radioactive waste for land disposal.

- a. Considerations. Determination of the classification of radioactive waste involves two considerations. First, consideration must be given to the concentration of long-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements on institutional controls, waste form, and disposal methods are effective.
- b. Classes of waste.
- (1) Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of class A waste must meet the minimum requirements set forth in subdivision a of subsection 2. If class A waste also meets the stability requirements set forth in subdivision b of subsection 2, it is not necessary to segregate the waste for disposal.
 - (2) Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of class B waste must meet both the minimum and stability requirements set forth in subsection 2.
 - (3) Class C waste is waste that not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of class C waste must meet both the minimum and stability requirements set forth in subsection 2.
- c. Classification determined by long-lived radionuclides. If the radioactive waste contains only radionuclides listed in table I, classification shall be determined as follows:
- (1) If the concentration does not exceed one-tenth times the value in table I, the waste is class A.

- (2) If the concentration exceeds one tenth times the value in table I, but does not exceed the value in table I, the waste is class C.
- (3) If the concentration exceeds the value in table I, the waste is not generally acceptable for land disposal.
- (4) For wastes containing mixtures of radionuclides listed in table I, the total concentration shall be determined by the sum of fractions rule described in subdivision g.

TABLE I

Radionuclide	Concentration curie/cubic meter ^a	Concentration nanocurie/gram ^b
C-14	8	
C-14 in activated metal	80	
Ni-59 in activated metal	220	
Nb-94 in activated metal	0.2	
Tc-99	3	
I-129	0.08	
Alpha-emitting transuranic radionuclides with half-life greater than five years		100
Pu-241		3,500
Cm-242		20,000
Ra-226		100

^a To convert the curie per cubic meter values to gigabecquerel per cubic meter, multiply the curie per cubic meter value by thirty-seven.

^b To convert the nanocurie per gram values to becquerel per gram, multiply the nanocurie per gram value by thirty-seven.

d. Classification determined by short-lived radionuclides. If the waste does not contain any of the radionuclides listed in table I, classification shall be determined based on the concentrations shown in table II. However, as specified in subdivision f, if radioactive waste does not contain any nuclides listed in either table I or II, it is class A.

- (1) If the concentration does not exceed the value in column 1, the waste is class A.

- (2) If the concentration exceeds the value in column 1 but does not exceed the value in column 2, the waste is class B.
- (3) If the concentration exceeds the value in column 2 but does not exceed the value in column 3, the waste is class C.
- (4) If the concentration exceeds the value in column 3, the waste is not generally acceptable for near-surface disposal.
- (5) For wastes containing mixtures of the radionuclides listed in table II, the total concentration shall be determined by the sum of fractions rule described in subdivision g.

TABLE II

Radionuclide	Concentration, curie per cubic meter*		
	Column 1	Column 2	Column 3
Total of all radionuclides with less than 5-year half-life	700	*	*
H-3	40	*	*
Co-60	700	*	*
Ni-63	3.5	70	700
Ni-63 in activated metal	35	700	7000
Sr-90	0.04	150	7000
Cs-137	1	44	4600

*To convert the curie per cubic meter value to gigabecquerel per cubic meter, multiply the curie per cubic meter value by thirty-seven. There are no limits established for these radionuclides in class B or class C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations for these wastes. These wastes shall be class B unless the concentrations of other radionuclides in table II determine the waste to be class C independent of these radionuclides.

- e. Classification determined by both long-lived and short-lived radionuclides. If the radioactive waste contains a mixture of radionuclides, some of which are listed in table I and some of which are listed in table II, classification shall be determined as follows:

- (1) If the concentration of a radionuclide listed in table I is less than one-tenth times the value listed in table I, the class shall be that determined by the concentration of radionuclides listed in table II.
 - (2) If the concentration of a radionuclide listed in table I exceeds one-tenth times the value listed in table I, but does not exceed the value in table I, the waste shall be class C, provided the concentration of radionuclides listed in table II does not exceed the value shown in column 3 of table II.
- f. Classification of wastes with radionuclides other than those listed in tables I and II. If the waste does not contain any radionuclides listed in either table I or II, it is class A.
- g. The sum of the fractions rule for mixtures of radionuclides. For determining classification for waste that contains a mixture of radionuclides, it is necessary to determine the sum of fractions by dividing each radionuclide's concentration by the appropriate limit and adding the resulting values. The appropriate limits must all be taken from the same column of the same table. The sum of the fractions for the column must be less than one if the waste class is to be determined by that column. Example: A waste contains strontium-90 in a concentration of one and eighty-five-hundredths terabecquerels per cubic meter (50 Ci/m^3) and cesium-137 in a concentration of eight hundred fourteen gigabecquerels per cubic meter (22 Ci/m^3). Since the concentrations both exceed the values in column 1, table II, they must be compared to column 2 values. For strontium-90 fraction, fifty divided by one hundred fifty is one-third, for cesium-137 fraction, twenty-two divided by forty-four is one-half; the sum of the fractions is eighty-three-hundredths. Since the sum is less than one, the waste is class B.
- h. Determination of concentrations in wastes. The concentration of a radionuclide may be determined by indirect methods such as use of scaling factors which relate the inferred concentration of one radionuclide to another that is measured, or radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may be averaged over the volume of the waste, or weight of the waste if the units are expressed as becquerel (nanocurie) per gram.

2. Radioactive waste characteristics.

- a. The following are minimum requirements for all classes of waste and are intended to facilitate handling and provide protection of health and safety of personnel at the disposal site.
- (1) Wastes shall be packaged in conformance with the conditions of the license issued to the site operator to which the waste will be shipped. Where the conditions of the site license are more restrictive than the provisions of chapter 33-10-04.1, the site license conditions shall govern.
 - (2) Wastes shall not be packaged for disposal in cardboard or fiberboard boxes.
 - (3) Liquid waste shall be packaged in sufficient absorbent material to absorb twice the volume of the liquid.
 - (4) Solid waste containing liquid shall contain as little freestanding and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one percent of the volume.
 - (5) Waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.
 - (6) Waste shall not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste. This does not apply to radioactive gaseous waste packaged in accordance with paragraph 8.
 - (7) Waste must not be pyrophoric material. Pyrophoric materials contained in wastes shall be treated, prepared, and packaged to be nonflammable. (See section 33-10-01-04 for the definition of pyrophoric.)
 - (8) Wastes in a gaseous form shall be packaged at an absolute pressure that does not exceed one and one-half atmospheres at twenty degrees Celsius. Total activity shall not exceed three and seven-tenths terabecquerels (100 Ci) per container.
 - (9) Wastes containing hazardous, biological, pathogenic, or infectious material shall be treated to reduce to the maximum extent practicable the potential hazard from the nonradiological materials.

b. The following requirements are intended to provide stability of the waste. Stability is intended to ensure that the waste does not degrade and affect overall stability of the site through slumping, collapse, or other failure of the disposal unit and thereby lead to water infiltration. Stability is also a factor in limiting exposure to an inadvertent intruder, since it provides a recognizable and nondispersible waste.

(1) Waste shall have structural stability. A structurally stable waste form will generally maintain its physical dimensions and its form, under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, and microbial activity, and internal factors such as radiation effects and chemical changes. Structural stability can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability after disposal.

(2) Notwithstanding the provisions in paragraphs 3 and 4 of subdivision a of subsection 2, liquid wastes, or wastes containing liquid, shall be converted into a form that contains as little freestanding and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one percent of the volume of the waste when the waste is in a disposal container designed to ensure stability, or 0.5 percent of the volume of the waste for waste processed to a stable form.

(3) Void spaces within the waste and between the waste and its package shall be reduced to the extent practicable.

3. Labeling.

Each package of waste shall be clearly labeled to identify whether it is class A, class B, or class C waste, in accordance with subsection 1.

APPENDIX F

Standards for Unrestricted Areas

(a) Surface contamination limits

(1) Alpha emitters

(i) Removable:	$\frac{0.555 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{15 \text{ pCi}}{100 \text{ cm}^2}$	=	$\frac{33 \text{ dpm}}{100 \text{ cm}^2}$	average over any one surface
	$\frac{1.665 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{45 \text{ pCi}}{100 \text{ cm}^2}$	=	$\frac{100 \text{ dpm}}{100 \text{ cm}^2}$	maximum
(ii) Total (fixed):	$\frac{166.5 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{450 \text{ pCi}}{100 \text{ cm}^2}$	=	$\frac{1000 \text{ dpm}}{100 \text{ cm}^2}$	average over any one surface
	$\frac{832.5 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{2250 \text{ pCi}}{100 \text{ cm}^2}$	=	$\frac{5000 \text{ dpm}}{100 \text{ cm}^2}$	maximum or

$$\frac{2.5 \text{ } \mu\text{Sv}}{\text{hr}} = \frac{(0.25 \text{ mrem})}{\text{hr}} \text{ maximum at 1 cm from surface}$$

(2) Beta-Gamma emitters

(i) Removable:	$\frac{3.7 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{100 \text{ pCi}}{100 \text{ cm}^2}$		average over any one surface
(all beta- gamma emitters except hydrogen-3)	$\frac{18.5 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{500 \text{ pCi}}{100 \text{ cm}^2}$		maximum
Removable:	$\frac{37 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{1000 \text{ pCi}}{100 \text{ cm}^2}$		average over any one surface
(hydrogen-3)	$\frac{185 \text{ Bq}}{100 \text{ cm}^2}$	=	$\frac{5000 \text{ pCi}}{100 \text{ cm}^2}$		maximum

(ii) Total (fixed): $\frac{2.5 \text{ } \mu\text{Sv}}{\text{hr}} = \frac{(0.25 \text{ mrem})}{\text{hr}}$ maximum at 1 cm from surface

(b) Concentration in air and water: appendix B, table II of chapter 33-10-04.1.1.

(c) Concentrations in soil and other materials except water:

- (1) Radioactive material except source material and radium: Schedule A, column II of chapter 33-10-03.
- (2) Source material and radium in soil: Concentration of radionuclides above background concentrations for total radium, averaged over areas of 100 square meters, shall not exceed:
 - (i) 5 picocuries per gram of dry soil, averaged over the first 15 centimeters below the surface; and
 - (ii) 5 picocuries per gram of dry soil, averaged over layers of 15 centimeters thickness more than 15 centimeters below the surface.
- (3) Source material and radium in other materials: Concentration of radionuclides above background concentrations for total radium shall not exceed 5 picocuries per gram.

(d) The level of gamma radiation measured at a distance of 100 centimeters from the surface shall not exceed background.

CHAPTER 33-10-06

33-10-06-02. Definitions. As used in this chapter, the following definitions apply:

1. "Accessible surface" means the external surface of the enclosure or housing provided by the manufacturer.
2. "Added filtration" means any filtration which is in addition to the inherent filtration.
3. "Aluminum equivalent" means the thickness of type 1100 aluminum alloy affording the same attenuation, under specified conditions, as the material in question. (The nominal chemical composition of type 1100 aluminum alloy is ninety-nine percent minimum aluminum, twelve-hundredths percent copper.)
4. "Assembler" means any person engaged in the business of assembling, replacing, or installing one or more components into an X-ray system or subsystem. The term includes the owner of an X-ray system or the employee or agent who assembles components into an X-ray system that is subsequently used to provide professional or commercial services.
5. "Attenuation block" means a block or stack, having dimensions twenty centimeters by twenty centimeters by three and eight-tenths centimeters, of type 1100 aluminum alloy or other materials having equivalent attenuation.
6. "Automatic exposure control" means a device which automatically controls one or more technique factors in order to obtain at a preselected location or locations a required quantity of radiation (See also "phototimer").
7. "Barrier" (see "protective barrier").
8. "Beam axis" means a line from the source through the centers of the X-ray fields.
9. "Beam-limiting device" means a device which provides a means to restrict the dimensions of the X-ray field.
10. "Beam monitoring system" means a system designed to detect and measure the radiation present in the useful beam.
11. "Cephalometric device" means a device intended for the radiographic visualization and measurement of the dimensions of the human head.

12. "Certified components" means components of X-ray systems which are subject to regulations promulgated under the Radiation Control for Health and Safety Act of 1968 [Pub. L. 90-602].
13. "Certified system" means any X-ray system which has one or more certified component or components.
14. "Changeable filters" means any filter, exclusive of inherent filtration, which can be removed from the useful beam through any electronic, mechanical, or physical process.
15. "Coefficient of variation" or "C" means the ratio of the standard deviation to the mean value of a population of observations. It is estimated using the following equation:

$$C = \frac{s}{\bar{X}} = \frac{1}{\bar{X}} \left[\sum_{i=1}^n \frac{(X_i - \bar{X})^2}{n-1} \right]^{1/2}$$

where:

s = Estimated standard deviation of the population.

\bar{X} = Mean value of observations in sample.

X_i = i^{th} observation in sample.

n = Number of observations in sample.

16. "Computed tomography" means the production of a tomogram by the acquisition and computer processing of X-ray transmission data.
17. "Contact therapy system" means an X-ray system used for therapy with the X-ray tube port placed in contact with or within five centimeters of the surface being treated.
18. "Control panel" means that part of the X-ray control upon which are mounted the switches, knobs, pushbuttons, and other hardware necessary for manually setting the technique factors.
19. "Cooling curve" means the graphical relationship between heat units stored and cooling time.
20. "CT" (see "computed tomography").
21. "Dead-man switch" means a switch so constructed that a circuit closing contact can be maintained only by continuous pressure on the switch by the operator.
22. "Detector" (see "radiation detector").
23. "Diagnostic source assembly" means the tube housing assembly with a beam-limiting device attached.

24. "Diagnostic X-ray system" means an X-ray system designed for irradiation of any part of the human body for the purpose of diagnosis or visualization.
25. "Direct scattered radiation" means that scattered radiation which has been deviated in direction only by materials irradiated by the useful beam (see "scattered radiation").
26. "Entrance exposure rate" means the exposure per unit time at the point where the center of the useful beam enters the patient.
27. "Equipment" (see "X-ray equipment").
28. "Field emission equipment" means equipment which uses an X-ray tube in which electron emission from the cathode is due solely to the action of an electric field.
29. "Filter" means material placed in the useful beam to absorb preferentially selected radiations.
30. "Fluoroscopic imaging assembly" means a subsystem in which X-ray photons produce a fluoroscopic image. It includes the image receptor or receptors such as the image intensifier and spot-film device, electrical interlocks, if any, and structural material providing linkage between the image receptor and diagnostic source assembly.
31. "Focal spot" means the area projected on the anode of the X-ray tube by the electrons accelerated from the cathode and from which the useful beam originates.
32. "General purpose radiographic X-ray system" means any radiographic X-ray system which, by design, is not limited to radiographic examination of specific anatomical regions.
33. "Gonad shield" means a protective barrier for the testes or ovaries.
34. "Half-value layer" means the thickness of specified material which attenuates the beam of radiation to an extent such that the radiation exposure rate is reduced to one-half of its original value. In this definition the contribution of all scattered radiation, other than any which might be present initially in the beam concerned, is deemed to be excluded.
35. "Healing arts screening" means the testing of human beings using X-ray machines for the detection or evaluation of health indications when such tests are not specifically and individually ordered by a licensed practitioner of the healing arts legally authorized to prescribe such X-ray tests for the purpose of diagnosis or treatment.

36. "Heat unit" means a unit of energy equal to the product of the peak kilovoltage, milliamperes, and seconds, i.e., kVp x mA x seconds.
37. "HVL" (see "half-value layer").
38. "Image intensifier" means a device, installed in its housing, which instantaneously converts an X-ray pattern into a corresponding light image of higher energy density.
39. "Image receptor" means any device, such as a fluorescent screen or radiographic film, which transforms incident X-ray photons either into a visible image or into another form which can be made into a visible image by further transformations.
40. "Image receptor support" means, for mammographic systems, that part of the system designed to support the image receptor in a horizontal plane during a mammographic examination.
41. "Inherent filtration" means the filtration of the useful beam provided by the permanently installed components of the tube housing assembly.
42. "Irradiation" means the exposure of matter to ionizing radiation.
43. "Kilovolts peak" (see "peak tube potential").
44. "kV" means kilovolts.
45. "kVp" (see "peak tube potential").
46. "kWs" means kilowatt second. It is equivalent to 10^3 kV·mA·s, i.e.,

$$(A) \text{ kWs} = (X) \text{ kV} \times (Y) \text{ mA} \times (Z) \text{ s} \times \frac{\text{kWs}}{10^3 \text{ kV} \times \text{mA} \times \text{s}} = \frac{XYZ \text{ kWs}}{10^3}$$

47. "Lead equivalent" means the thickness of lead affording the same attenuation, under specified conditions, as the material in question.
48. "Leakage radiation" means radiation emanating from the diagnostic or therapeutic source assembly except for:
 - a. The useful beam.
 - b. Radiation produced when the exposure switch or timer is not activated.

49. "Leakage technique factors" means the technique factors associated with the diagnostic or therapeutic assembly which are used in measuring leakage radiation. They are defined as follows:
- a. For diagnostic source assemblies intended for capacitor energy storage equipment, the maximum-rated peak tube potential and the maximum-rated number of exposures in an hour for operation at the maximum-rated peak tube potential with the quantity of charge per exposure being ten millicoulombs, i.e., ten milliampere seconds, or the minimum obtainable from the unit, whichever is larger.
 - b. For diagnostic source assemblies intended for field emission equipment rated for pulsed operation, the maximum-rated peak tube potential and the maximum-rated number of X-ray pulses in an hour for operation at the maximum-rated peak tube potential.
 - c. For all other diagnostic or therapeutic source assemblies, the maximum-rated peak tube potential and the maximum-rated continuous tube current for the maximum-rated peak tube potential.
50. "Light field" means that area of the intersection of the light beam from the beam-limiting device and one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the illumination is one-fourth of the maximum in the intersection.
51. "Linear attenuation coefficient" or "u" means the quotient of dN/N divided by dl when dN/N is the fraction of uncharged ionizing radiation that experience interactions in traversing a distance dl in a specified material.
52. "Line-voltage regulation" means the difference between the no-load and the ~~load~~ load line potentials expressed as a percent of the ~~load~~ load line potential. It is calculated using the following equation:
- $$\text{Percent line-voltage regulation} = 100 (V_n - V_l) / V_l$$
- where:
 V_n = No-load line potential and
 V_l = Load line potential
53. "mA" means milliampere.
54. "mAs" means milliampere second.
55. "Maximum line current" means the root-mean-square current in the supply line of an X-ray machine operating at its maximum rating.

56. "Mobile X-ray equipment" (See "X-ray equipment").
57. "Patient" means an individual subjected to healing arts examination, diagnosis, or treatment.
58. "Peak tube potential" means the maximum value of the potential difference across the X-ray tube during an exposure.
59. "Phantom" means a volume of material behaving in a manner similar to tissue with respect to the attenuation and scattering of radiation.
60. "Phototimer" means a method for controlling radiation exposures to image receptors by the amount of radiation which reaches a radiation monitoring device. The radiation monitoring device is part of an electronic circuit which controls the duration of time the tube is activated (See "automatic exposure control").
61. "PID" (see "position indicating device").
62. "Portable X-ray equipment" (see "X-ray equipment").
63. "Position indicating device" means a device on dental X-ray equipment used to indicate the beam position and to establish a definite source-surface (skin) distance. It may or may not incorporate or serve as a beam-limiting device.
64. "Primary dose monitoring system" means a system which will monitor the useful beam during irradiation and which will terminate irradiation when a preselected number of dose monitor units have been acquired.
65. "Primary protective barrier" (see "protective barrier").
66. "Protective apron" means an apron made of radiation ~~absorbing~~ attenuating materials used to reduce radiation exposure.
67. "Protective barrier" means a barrier of radiation absorbing material or materials used to reduce radiation exposure. The types of protective barriers are as follows:
 - a. "Primary protective barrier" means the material, excluding filters, placed in the useful beam, for protection purposes, to reduce the radiation exposure.
 - b. "Secondary protective barrier" means a barrier sufficient to attenuate the stray radiation to the required degree.
68. "Protective glove" means a glove made of radiation absorbing materials used to reduce radiation exposure.

69. "Qualified expert" means an individual who has demonstrated to the satisfaction of the department that such individual possesses the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs having the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs, for example, individuals certified in the appropriate field by the American board of radiology, or the American board of health physics, or the American board of medical physics, or those having equivalent qualifications. With reference to the calibration of radiation therapy equipment, "qualified expert" means an individual having, in addition to the above qualifications, training and experience in the clinical applications of radiation physics to radiation therapy, for example, individuals certified in therapeutic radiological physics or X-ray and radium physics by the American board of radiology, or those having equivalent qualifications.
70. "Radiation detector" means a device which in the presence of radiation provides a signal or other indication suitable for use in measuring one or more quantities of incident radiation.
71. "Radiation therapy simulation system" means a radiographic or fluoroscopic X-ray system intended for localizing the volume to be exposed during radiation therapy and confirming the position and size of the therapeutic irradiation field.
72. "Radiograph" means an image receptor on which the image is created directly or indirectly by an X-ray pattern and results in a permanent record.
73. "Radiographic imaging system" means any system whereby a permanent or semipermanent image is recorded on an image receptor by the action of ionizing radiation.
74. "Radiological physicist" means an individual who:
- a. Is certified by the American board of radiology in therapeutic radiological physics, radiological physics, or X-ray and gamma-ray physics; or
 - b. Has a bachelor's degree in one of the physical sciences or engineering and three year's full-time experience working in therapeutic radiological physics under the direction of a physicist certified by the American board of radiology. The work duties must include duties involving the calibration and spot checks of a medical accelerator or a sealed source teletherapy unit; or
 - c. Has a master's or a doctor's degree in physics, biophysics, radiological physics, health physics, or

engineering; has had one year's full-time training in therapeutic radiological physics; and has had one year's full-time work experience in a radiotherapy facility where the individual's duties involve calibration and spot checks of a medical accelerator or a sealed source teletherapy unit.

75. "Rating" means the operating limits as specified by the component manufacturer.
76. "Recording" means producing a permanent form of an image resulting from X-ray photons.
77. "Response time" means the time required for an instrument system to reach ninety percent of its final reading when the radiation-sensitive volume of the instrument system is exposed to a step change in radiation flux from zero sufficient to provide a steady-state midscale reading.
78. "Scattered radiation" means radiation that, during passage through matter, has been deviated in direction (See "direct scattered radiation").
79. "Secondary dose monitoring system" means a system which will terminate irradiation in the event of failure of the primary system.
80. "Secondary protective barrier" (see "protective barrier").
81. "Shutter" means a device attached to the tube housing assembly which can totally intercept the useful beam and which has a lead equivalency not less than that of the tube housing assembly.
82. "SID" (see "source-image receptor distance").
83. "Source" means the focal spot of the X-ray tube.
84. "Source-image receptor distance" means the distance from the source to the center of the input surface of the image receptor.
85. "Spot check" means a procedure which is performed to assure that a previous calibration continues to be valid.
86. "Spot film" means a radiograph which is made during a fluoroscopic examination to permanently record conditions which exist during that fluoroscopic procedure.
87. "Spot-film device" means a device intended to transport or position a radiographic image receptor between the X-ray source and fluoroscopic image receptor. It includes a device

- intended to hold a cassette over the input end of an image intensifier for the purpose of making a radiograph.
88. "SSD" means the distance between the source and the skin of the patient.
 89. "Stationary X-ray equipment" (see "X-ray equipment").
 90. "Stray radiation" means the sum of leakage and scattered radiation.
 91. "Technique factors" means the conditions of operation. They are specified as follows:
 - a. For capacitor energy storage equipment, peak tube potential in kilovolts and quantity of charge in milliamperes second.
 - b. For field emission equipment rated for pulsed operation, peak tube potential in kilovolts and number of X-ray pulses.
 - c. For CT X-ray systems designed for pulsed operation, peak tube potential in kilovolts, scan time in seconds, and either tube current in milliamperes, X-ray pulse width in seconds, and the number of X-ray pulses per scan, or the product of tube current, X-ray pulse width, and the number of X-ray pulses in milliamperes second.
 - d. For CT X-ray systems not designed for pulsed operation, peak tube potential in kilovolts, and either tube current in milliamperes and scan time in seconds, or the product of tube current and exposure time in milliamperes second and the scan time when the scan time and exposure time are equivalent.
 - e. For all other equipment, peak tube potential in kilovolt and either tube current in milliamperes and exposure time in seconds, or the product of tube current and exposure time in milliamperes second.
 92. "Termination of irradiation" means the stopping of irradiation in a fashion which will not permit continuance of irradiation without the resetting of operating conditions at the control panel.
 93. "Tomogram" means the depiction of X-ray attenuation properties of a section through the body.
 94. "Traceable to a national standard" means that a quantity or a measurement has been compared to a national standard directly or indirectly through one or more intermediate steps and that all comparisons have been documented.

95. "Tube" means an X-ray tube, unless otherwise specified.
96. "Tube housing assembly" means the tube housing with tube installed. It includes high-voltage and/or filament transformers and other appropriate elements when such are contained within the tube housing.
97. "Tube rating chart" means the set of curves which specify the rated limits of operation of the tube in terms of the technique factors.
98. "Useful beam" means the radiation emanating from the tube housing port or the radiation head and passing through the aperture of the beam-limiting device when the exposure controls are in a mode to cause the system to produce radiation.
99. "Variable-aperture beam-limiting device" means a beam-limiting device which has capacity for stepless adjustment of the X-ray field size at a given source-image receptor distance.
100. "Visible area" means that portion of the input surface of the image receptor over which incident X-ray photons are producing a visible image.
101. "Wedge filter" means an added filter effecting continuous progressive attenuation on all or part of the useful beam.
102. "X-ray control" means a device which controls input power to the X-ray high-voltage generator or the X-ray tube. It includes equipment such as timers, phototimers, automatic brightness stabilizers, and similar devices, which control the technique factors of an X-ray exposure.
103. "X-ray equipment" means an X-ray system, subsystem, or component thereof. Types of X-ray equipment are as follows:
 - a. "Mobile X-ray equipment" means X-ray equipment mounted on a permanent base with wheels or casters for moving while completely assembled.
 - b. "Portable X-ray equipment" means X-ray equipment designed to be hand-carried.
 - c. "Stationary X-ray equipment" means X-ray equipment which is installed in a fixed location.
104. "X-ray field" means that area of the intersection of the useful beam and any one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the radiation exposure rate is one-fourth of the maximum in the intersection.

105. "X-ray high-voltage generator" means a device which transforms electrical energy from the potential supplied by the X-ray control to the tube operating potential. The device may also include means for transforming alternating current to direct current, filament transformers for the X-ray tube, high-voltage switches, electrical protective devices, and other appropriate elements.
106. "X-ray subsystem" means any combination of two or more components of an X-ray system.
107. "X-ray system" means an assemblage of components for the controlled production of X-rays. It includes minimally an X-ray high-voltage generator, and an X-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components which function with the system are considered integral parts of the system.
- ~~107-108.~~ "X-ray tube" means any electron tube which is designed to be used primarily for the production of X-rays.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-06-03. General requirements.

1. Administrative controls.

- a. Registrant. The registrant shall be responsible for directing the operation of the X-ray systems which have been registered with the department. The registrant or the registrant's agent shall assure that the following requirements are met in the operation of the X-ray system.

- (1) An X-ray system which does not meet the requirements of this article shall not be operated for diagnostic or therapeutic purposes, if so directed by the department.
- (2) Individuals who will be operating the X-ray systems shall be adequately instructed in the safe operating procedures and be competent in the safe use of the equipment commensurate with the size, scope, and nature of the service. As a minimum, such instruction should consist of subjects outlined in appendix F of this chapter. Records must be maintained by the registrant to demonstrate compliance with this paragraph.

- (3) A chart shall be provided in the vicinity of the diagnostic X-ray system's control panel, which specifies for all examinations performed with that system the following information:
- (a) Patient's anatomical size versus technique factors to be utilized.
 - (b) Type and size of the film or film-screen combination to be used.
 - (c) Type and focal distance of the grid to be used, if any.
 - (d) Source-image receptor distance to be used.
 - (e) Type and location of placement of gonad shielding to be used.
- (4) Written safety procedures and rules shall be provided to each individual operating X-ray equipment, including any restrictions of the operating technique required for the safe operation of the particular X-ray system. The operator shall be able to demonstrate familiarity with ~~this--article~~ these procedures.
- (5) Except for patients who cannot be moved out of the room, only the staff and ancillary personnel required for the medical procedure or training shall be in the room during the radiographic exposure. Other than the patient being examined:
- (a) All individuals shall be positioned such that no part of the body will be struck by the useful beam unless protected by five-tenths millimeter lead equivalent.
 - (b) Staff and ancillary personnel shall be protected from the direct scatter radiation by protective aprons or whole body protective barriers of not less than twenty-five one-hundredths millimeter lead equivalent.
 - (c) Patients who cannot be removed from the room shall be protected from the direct scatter radiation by whole body protective barriers of twenty-five one-hundredths millimeter lead equivalent or shall be so positioned that the nearest portion of the body is at least two meters from both the tube head and the nearest edge of the image receptor.

- (6) Gonad shielding of not less than twenty-five one-hundredths millimeter lead equivalent must be used for patients who have not passed the reproductive age during radiographic procedures in which the gonads are in the useful beam, except for cases in which this would interfere with the diagnostic procedure.
- (7) Individuals may not be exposed to the useful beam except for healing arts purposes and when such exposure has been authorized by a licensed practitioner of the healing arts. This provision specifically prohibits deliberate exposure for the following purposes:
 - (a) Exposure of an individual for training, demonstration or other non-healing-arts purposes.
 - (b) Exposure of an individual for the purpose of healing arts screening except as authorized by paragraph 11.
- (8) When a patient or film must be provided with auxiliary support during a radiation exposure:
 - (a) Mechanical holding devices shall be used when the technique permits. The safety rules, required by this section shall list individual projections where holding devices cannot be utilized.
 - (b) Written safety procedures, as required by paragraph 4, shall indicate the requirements for selecting a holder and the procedure the holder shall follow.
 - (c) The human holder shall be protected as required by paragraph 5.
 - (d) No individual shall be used routinely to hold film or patients.
 - (e) In those cases where the patient must hold the film, except during intraoral examinations, any portion of the body other than the area of clinical interest struck by the useful beam shall be protected by not less than five-tenths millimeter lead equivalent material.
 - (f) A record shall be made of the examination and shall include the name of the human holder, date

of the examination, number of exposures, and technique factors utilized for the exposure.

- (9) Procedures and auxiliary equipment designed to minimize patient and personnel exposure commensurate with the needed diagnostic information shall be utilized. This is interpreted to include but not limited to:
 - (a) The speed of film or screen and film combinations shall be the fastest speed consistent with the diagnostic objective of the examinations.
 - (b) The radiation exposure to the patient shall be the minimum exposure required to produce images of good diagnostic quality.
 - (c) Proper film processing procedures:
 - [1] Time temperature film processing must be as recommended by the film manufacturer or as noted in appendix D for manual processing.
 - [2] Automatic processors temperature and "replenishment rates" must be maintained as specified by the processor manufacturer or as noted in subsection 3 of appendix D.
 - [3] The darkroom integrity must be maintained as noted in subsection 4 of appendix D.
 - (d) Portable or mobile equipment shall be used only for examinations where it is impractical to transfer the patients to a stationary X-ray installation.
 - (e) X-ray systems subject to section 33-10-06-06 shall not be utilized in procedures where the source to patient distance is less than thirty centimeters.
- (10) All individuals who are associated with the operation of an X-ray system are subject to the requirements of section 33-10-04.1-06. In addition:
 - (a) When protective clothing or devices are worn on portions of the body and a monitoring device is required, at least one such monitoring device shall be utilized as follows:

[1] When an apron is worn, the monitoring device shall be worn at the collar outside of the apron.

[2] The dose to the whole body based on the maximum dose attributed to the most critical organ shall be recorded in the reports required by subsection 7 of section 33-10-04.1-15. If more than one device is used and a record is made of the data, each dose shall be identified with the area where the device was worn on the body.

(b) Exposure of a personnel monitoring device to deceptively indicate a dose delivered to an individual is prohibited.

(11) Healing arts screening. Any person proposing to conduct a healing arts screening program shall not initiate such a program without prior approval of the department. When requesting such approval, that person shall submit the information outlined in appendix E of this chapter. If any information submitted to the department becomes invalid or outdated, the department shall be immediately notified.

b. Information and maintenance record and associated information. The registrant shall maintain the following information for each X-ray system for inspection by the department:

(1) Maximum rating of technique factors.

(2) Model and serial numbers of all certifiable components.

(3) Aluminum equivalent filtration of the useful beam, including any routine variation.

(4) Tube rating charts and cooling curves.

(5) Records of surveys, calibrations, maintenance, and modifications performed on the X-ray system after the effective date of section 33-10-06-03 with the names of persons who performed such services.

(6) A scale drawing of the room in which a stationary X-ray system is located with such drawing indicating the use of areas adjacent to the room and an estimation of the extent of occupancy by an individual in such areas. In addition, the drawing shall include:

- (a) The results of a survey for radiation levels present at the operator's position and at pertinent points outside the room at specified test conditions; or
 - (b) The type and thickness of materials, or lead equivalency, ~~or~~ of each protective barrier.
- (7) A copy of all correspondence with this department regarding that X-ray system.
- c. X-ray log. Each facility shall maintain an X-ray log containing the patient's name, the type of examinations, and the dates those examinations were performed. When the patient or film must be provided with human auxiliary support, the name of the human holder shall be recorded.

2. Plan review.

- a. Prior to construction, the floor plans and equipment arrangement ~~or~~ of all new installations, ~~or~~ modifications of existing installations, utilizing X-rays for diagnostic or therapeutic purposes shall be submitted to the department for review and approval. The required information is denoted in appendices A, B, and C of this chapter.
- b. The department may require the applicant to utilize the services of a qualified expert to determine the shielding requirements prior to the plan review and approval.
- c. The approval of such plans shall not preclude the requirement of additional modifications should a subsequent analysis of operating conditions indicate the possibility of an individual receiving a dose in excess of the limits prescribed in sections 33-10-04.1-06 and 33-10-04.1-07.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-06-04. General requirements for all diagnostic X-ray systems. In addition to other requirements of this chapter, all diagnostic X-ray systems shall meet the following requirements:

- 1. **Warning label.** The control panel containing the main power switch shall bear the warning statement, legible and accessible to view: "WARNING: This X-ray unit may be dangerous to patient and operator unless safe exposure factors and operating instructions are observed."

2. **Battery charge indicator.** On battery-powered X-ray generators, visual means shall be provided on the control panel to indicate whether the battery is in a state of charge adequate for proper operation.
3. **Leakage radiation from the diagnostic source assembly.** The leakage radiation from the diagnostic source assembly measured at a distance of one meter in any direction from the source shall not exceed one hundred milliroentgens in one hour when the X-ray tube is operated at its leakage technique factors. Compliance shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.
4. **Radiation from components other than the diagnostic source assembly.** The radiation emitted by a component other than the diagnostic source assembly shall not exceed two milliroentgens in one hour at five centimeters from any accessible surface of the component when it is operated in an assembled X-ray system under any conditions for which it was designed. Compliance shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.
5. **Beam quality.**
 - a. Half-value layer.
 - (1) The half-value layer (HVL) of the useful beam for a given X-ray tube potential shall not be less than the values shown in table I. If it is necessary to determine such half-value layer at an X-ray tube potential which is not listed in table I, linear interpolation or extrapolation may be made.

TABLE I

Design Operating Range (Kilovolts Peak)	Measured Potential (Kilovolts peak)	Half-value Layer (Millimeters of aluminum)
Below 50 -----	30	0.3
	40	0.4
	49	0.5
50 to 70 -----	50	1.2
	60	1.3
	70	1.5
Above 70 -----	71	2.1
	80	2.3
	90	2.5
	100	2.7
	110	3.0
	120	3.2
	130	3.5
	140	3.8
150	4.1	

- (2) The above half-value layer (HVL) criteria will be considered to have been met if it can be demonstrated that the aluminum equivalent of the total filtration in the primary beam is not less than that shown in table II.

TABLE II

<u>Filtration Required vs. Operating Voltage</u>	
Operating Voltage (kVp)	Total Filtration (inherent plus added) (millimeters aluminum equivalent)
Below 50	0.5 millimeters
50 - 70	1.5 millimeters
Above 70	2.5 millimeters

- (3) In addition to the requirements of paragraph 1, all intraoral dental radiographic systems manufactured on and after December 1, 1980, shall have a minimum half-value layer not less than one and one-half

millimeters aluminum equivalent filtration permanently installed in the useful beam.

- (4) For capacitor energy storage equipment, compliance with the requirements of this subsection shall be determined with the maximum quantity of charge per exposure.
- (5) The required minimal aluminum equivalent filtration shall include the filtration contributed by all materials which are always present between the source and the patient.
- (6) For mammography systems with molybdenum filter and molybdenum target, measured half-value layer (HVL) with compression device in the X-ray beam shall be greater than or equal to the kilovolts peak (kVp) divided by one hundred, millimeters aluminum and less than or equal to the kilovolts peak (kVp) divided by one hundred plus one-tenth millimeter aluminum.

$$\text{HVL} \geq (\text{kVp}/100) \text{ mmAl} \text{ and } \leq (\text{kVp}/100) + 0.1 \text{ mmAl}$$

- b. Filtration controls. For X-ray systems which have variable kilovolts peak and variable filtration for the useful beam, a device shall link the kilovolts peak selector with the filters and shall prevent an exposure unless the minimum amount of filtration required by paragraphs 1 or 2 of subdivision a is in the useful beam for the given kilovolts peak which has been selected.
6. **Multiple tubes.** Where two or more radiographic tubes are controlled by one exposure switch, the tube or tubes which have been selected shall be clearly indicated prior to initiation of the exposure. This indication shall be both on the X-ray control panel and at or near the tube housing assembly which has been selected.
 7. **Mechanical support of tube head.** The tube housing assembly supports shall be adjusted such that the tube housing assembly will remain stable during an exposure unless tube housing movement is a designed function of the X-ray system.
 8. **Technique indicators.**
 - a. The technique factors to be used during an exposure shall be indicated before the exposure begins, except when automatic exposure controls are used, in which case the technique factors which are set prior to the exposure shall be indicated.
 - b. The requirements of subdivision a may be met by permanent markings on equipment having fixed technique factors.

Indication of technique factors shall be visible from the operators position except in the case of spot films made by the fluoroscopist.

9. Structural shielding requirements (see appendix C).

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-06-05. Fluoroscopic X-ray systems except for computed tomography X-ray systems. All fluoroscopic X-ray systems shall meet the following requirements:

1. Limitation of useful beam.

a. Primary barrier.

- (1) The fluoroscopic imaging assembly shall be provided with a primary protective barrier which intercepts the entire cross section of the useful beam at any source-image receptor distance (SID).
- (2) The X-ray tube used for fluoroscopy shall not produce X-rays unless the barrier is in position to intercept the entire useful beam.

b. X-ray field.

- (1) The X-ray field produced by non-image-intensified fluoroscopic equipment shall not extend beyond the entire visible area of the image receptor. This requirement applies to field size for both fluoroscopic procedures and spot filming procedures. In addition:
 - (a) Means shall be provided for stepless adjustment of the field size.
 - (b) The minimum field size at the greatest source-image receptor distance shall be equal to or less than five centimeters by five centimeters.
 - (c) For equipment manufactured after February 25, 1978, when the angle between the image receptor and the beam axis of the X-ray beam is variable, means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor.

- (d) Compliance with this paragraph shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor.
- (2) For image-intensified fluoroscopic equipment, neither the length nor the width of the X-ray field in the plane of the image receptor shall exceed that of the visible area of the image receptor by more than three percent of the source-image receptor distance. The sum of the excess length and the excess width shall be no greater than four percent of the source-image receptor distance. In addition:
- (a) Means shall be provided to permit further limitation of the field. Beam-limiting devices manufactured after May 22, 1979, and incorporated in equipment with a variable source-image receptor distance and/or a visible area of greater than three hundred square centimeters shall be provided with means for stepless adjustment of the X-ray field.
 - (b) All equipment with a fixed source-image receptor distance and a visible area of three hundred square centimeters or less shall be provided with either stepless adjustment of the X-ray field or with means to further limit the X-ray field size at the plane of the image receptor to one hundred twenty-five square centimeters or less. Stepless adjustment shall, at the greatest source-image receptor distance, provide continuous field sizes from the maximum obtainable to a field size of five by five centimeters or less.
 - (c) For equipment manufactured after February 25, 1978, when the angle between the image receptor and beam axis is variable, means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor.
 - (d) Compliance shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor. For rectangular X-ray fields used with circular image reception, the error in alignment shall be determined along the length and width dimensions of the X-ray field which pass through the center of the visible area of the image receptor.

- (3) Spot-film devices which are certified components shall meet the following additional requirements:
- (a) Means shall be provided between the source and the patient for adjustment of the X-ray field size in the plane of the film to the size of that portion of the film which has been selected on the spot-film selector. Such adjustment shall be automatically accomplished except when the X-ray field size in the plane of the film is smaller than that of the selected portion of the film. For spot-film devices manufactured after June 21, 1979, if the X-ray field size is less than the size of the selected portion of the film, the means for adjustment of the field size shall be only at the operator's option.
 - (b) It shall be possible to adjust the X-ray field size in the plane of the film to a size smaller than the selected portion of the film. The minimum field size at the greatest source-image receptor distance shall be equal to, or less than, five centimeters by five centimeters.
 - (c) The center of the X-ray field in the plane of the film shall be aligned with the center of the selected portion of the film to within two percent of the source-image receptor distance.
 - (d) On spot-film devices manufactured after February 25, 1978, if the angle between the plane of the image receptor and beam axis is variable, means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor, and compliance shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor.
- (4) If a means exists to override any of the automatic X-ray field size adjustments required in subdivision b of subsection 1 that means:
- (a) Must be designed for use only in the event of system failure.
 - (b) Must incorporate a signal visible at the fluoroscopist's position which will indicate whenever the automatic field size adjustment is overridden.
 - (c) Must be clearly and durably labeled as follows:

FOR X-RAY FIELD
LIMITATION SYSTEM FAILURE

2. **Activation of the fluoroscopic tube.** X-ray production in the fluoroscopic mode shall be controlled by a device which requires continuous pressure by the fluoroscopist for the entire time of any exposure. When recording serial fluoroscopic images, the fluoroscopist shall be able to terminate the X-ray exposure or exposures at any time, but means may be provided to permit completion of any single exposure of the series in process.
3. **Radiation exposure rate limits.**
 - a. Entrance exposure rate allowable limits.
 - (1) The exposure measured at the point where the center of the useful beam enters the patient shall not exceed ten roentgens [2.58 millicoulomb per kilogram] per minute, except during recording of fluoroscopic images or when provided with optional high level control.
 - (2) When provided with optional high level control, the equipment shall not be operable at any combination of tube potential and current which will result in a radiation exposure rate in excess of five roentgens [1.29 millicoulomb per kilogram] per minute at the point where the center of the useful beam enters the patient unless the high level control is activated.
 - (a) When the high-level control is activated, the equipment shall not be operable at any combination of tube potential and current that will result in an exposure rate in excess of twenty roentgen [5.16 millicoulomb per kilogram] per minute at the point where the center of the useful beam enters the patient.
 - (b) Special means of activation of high level controls shall be required. The high level control shall only be operable when continuous manual activation is provided by the operator.
 - ~~(b)~~ (c) A continuous signal audible to the fluoroscopist shall indicate that the high level control is being employed.
 - (3) In addition to the other requirements of this section, certified equipment which does not incorporate an automatic exposure control shall not be operable at any combination of tube potential and current which will result in any radiation exposure

rate in excess of five roentgens [1.29 millicoulomb per kilogram] per minute at the point where the center of beam enters the patient except during recording of fluoroscopic images or when provided with an optional high level control is activated.

- (4) Compliance with the requirements of subsection 3 of this section shall be determined as follows:
 - (a) Movable grids and compression devices shall be removed from the useful beam during the measurement.
 - (b) If the source is below the table, the radiation exposure rate shall be measured one centimeter above the tabletop or cradle.
 - (c) If the source is above the table, the radiation exposure rate shall be measured at thirty centimeters above the tabletop with the end of the beam-limiting device or spacer positioned as closely as possible to the point of measurement.
 - (d) All In a C-arm fluoroscopes type of fluoroscope, both stationary and mobile, units shall meet the entrance exposure rate limits specified in paragraphs 1, 2, and 3 of subdivision a of subsection 3, shall be measured thirty centimeters from the input surface of the fluoroscopic imaging assembly with the source positioned at any available source-image receptor distance provided that the end of the spacer assembly or beam-limiting device is not closer than thirty centimeters from the input surface of the fluoroscopic imaging assembly.
 - (e) In a lateral type of fluoroscope, the exposure rate shall be measured at a point fifteen centimeters from the centerline of the X-ray table and in the direction of the X-ray source with the end of the beam-limiting device or spacer positioned as closely as possible to the point of measurement. If the tabletop is movable, it shall be positioned as closely as possible to the lateral X-ray source, with the end of the beam-limiting device or spacer no closer than fifteen centimeters to the centerline of the X-ray table.
- (5) Periodic measurement of entrance exposure rate shall be performed as follows:

- (a) Such measurements shall be made annually or after any maintenance of the system which might affect the radiation exposure rate.
- (b) Results of these measurements shall be posted where any fluoroscopist may have ready access to such results while using the fluoroscope and in the record required in paragraph 5 of subdivision b of subsection 1 of section 33-10-06-03. Results of the measurements shall include the roentgen per minute, as well as the technique factors used to determine such results. The name of the person performing the measurements and the date the measurements were performed shall be included in the results.
- (c) Personnel monitoring devices may be used to perform the measurements required by subparagraph a provided the measurements are made as described in subparagraph d.
- (d) Conditions of periodic measurements of entrance exposure rate are as follows:
 - [1] The measurement shall be made under the conditions that satisfy the requirements of paragraph 4.
 - [2] The kilovolts peak shall be the kilovolts typical of clinical use of the X-ray system.
 - [3] The X-ray systems that incorporates automatic exposure control shall have sufficient material placed in the useful beam to produce a milliamperage typical of the use of the X-ray system.
 - [4] X-ray systems that do not incorporate an automatic exposure control shall utilize a milliamperage typical of clinical use of the X-ray system. Materials should be placed in the useful beam when conducting these periodic measurements to protect the imaging system.

4. Barrier transmitted radiation rate limits.

- a. The radiation exposure rate due to transmission through the primary protective barrier with the attenuation block in the useful beam, combined with radiation from the image intensifier, if provided, shall not exceed two milliroentgens [0.516 microcoulomb kilogram] per hour at

ten centimeters from any accessible surface of the fluoroscopic imaging assembly beyond the plane of the image receptor for each roentgen per minute of entrance exposure rate.

b. **Measuring compliance of barrier transmission.**

(1) The exposure rate due to transmission through the primary protective barrier combined with radiation from the image intensifier shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.

(2) If the source is below the tabletop, the measurement shall be made with the input surface of the fluoroscopic imaging assembly positioned thirty centimeters above the tabletop.

(3) If the source is above the tabletop and the source-image receptor distance is variable, the measurement shall be made with the end of the beam-limiting device or spacer as close to the tabletop as it can be placed, provided that it shall not be closer than thirty centimeters.

(4) Movable grids and compression devices shall be removed from the useful beam during the measurement.

(5) The attenuation block shall be positioned in the useful beam ten centimeters from the point of measurement of entrance exposure rate and between this point and the input surface of the fluoroscopic imaging assembly.

5. **Indication of potential and current.** During fluoroscopy and cinefluorography, the kilovolt and the milliamperere shall be continuously indicated.

6. **Source-skin distance.** The source to skin distance shall not be less than:

a. Thirty-eight centimeters on stationary fluoroscopes installed after September 1, 1968.

b. Thirty-five and one-half centimeters on stationary fluoroscopes which were in operation prior to September 1, 1968.

c. Thirty centimeters on all mobile fluoroscopes.

d. Twenty centimeters for image intensified fluoroscopes used for specific surgical application. The written safety

procedures must provide precautionary measures to be adhered to during the use of this device.

7. Fluoroscopic timer.

- a. Means shall be provided to preset the cumulative on-time of the fluoroscopic tube. The maximum cumulative time of the timing device shall not exceed five minutes without resetting.
- b. A signal audible to the fluoroscopist shall indicate the completion of any preset cumulative on-time. Such signal shall continue to sound while X-rays are produced until the timing device is reset.

8. Mobile fluoroscopes. In addition to the other requirements of this section, mobile fluoroscopes shall provide intensified imaging.

9. Control of scattered radiation.

- a. Fluoroscopic table designs when combined with procedures utilized shall be such that no unprotected part of any staff or ancillary individual's body shall be exposed to unattenuated scattered radiation which originates from under the table. The attenuation required shall be not less than twenty-five one-hundredths millimeter lead equivalent.
- b. Equipment configuration when combined with procedures shall be such that no portion of any staff or ancillary individual's body, except the extremities, shall be exposed to the unattenuated scattered radiation emanating from above the tabletop unless that individual:
 - (1) Is at least one hundred twenty centimeters from the center of the useful beam; or
 - (2) The radiation has passed through not less than twenty-five one-hundredths millimeter lead equivalent material, e.g., drapes, bucky-slot cover-sliding or folding panel, or self-supporting curtains, in addition to any lead equivalency provided by the protective apron referred to in paragraph 5 of subdivision a of subsection 1 of section 33-10-06-03.
- c. The department may grant exceptions to subdivision b of this subsection in some special procedures where a sterile field will not permit the use of the normal protective barriers. Where the use of prefitted sterilized covers for the barriers is practical, the department shall not permit such exception.

10. **Radiation therapy simulation system.** Radiation therapy simulation systems shall be exempt from all the requirements of subsections 1, 3, 4, and 7 of section 33-10-06-05 provided that:

- a. Such systems are designed and used in such a manner that no individual other than the patient is in the X-ray room during periods of time when the system is producing X-rays; and
- b. Such systems as do not meet the requirements of subsection 7 of section 33-10-06-05 are provided with a means of indicating the cumulative time that an individual patient has been exposed to X-rays. Procedures shall require in such cases that the timer be reset between examinations.

11. **Structural shielding requirements** (see appendix E).

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-06-06. Radiographic systems other than fluoroscopic, dental intraoral, veterinarian, or computed tomography X-ray systems.

1. **Beam limitations.** The useful beam shall be limited to the area of clinical interest.

a. General purpose stationary and mobile X-ray systems.

(1) There shall be provided a means for stepless adjustment of the size of the X-ray field.

(2) Means shall be provided for visually defining the perimeter of the X-ray field. The total misalignment of the edges of the visually defined field with the respective edges of the X-ray field along either the length or width of the visually defined field shall not exceed two percent of the distance from the source to the center of the visually defined field when the surface upon which it appears is perpendicular to the axis of the X-ray beam.

(3) The department may grant an exemption to paragraphs 1 and 2 of this subdivision on noncertified X-ray systems, provided the registrant makes a written application for such exemption and demonstrates in the application:

(a) That it is impractical to comply with paragraphs 1 and 2 of this subdivision; and

(b) The purpose of paragraphs 1 and 2 of this subdivision will be met by other means.

b. Additional requirements for stationary general purpose X-ray systems. In addition to the requirements of subdivision a of this subsection, all stationary X-ray systems shall meet the following requirements:

- (1) Means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor, to align the center of the X-ray field with respect to the center of the image receptor to within two percent of the source-image receptor distance, and to indicate the source-image receptor distance to within two percent.
- (2) The beam-limiting device shall numerically indicate the field size in the plane of the image receptor to which it is adjusted.
- (3) Indication of field size dimensions and source-image receptor distance's shall be specified in inches or centimeters, and shall be such that aperture adjustments result in X-ray field dimensions in the plane of the image receptor which correspond to those indicated by the beam-limiting device to within two percent of the source-image receptor distance when the beam axis is indicated to be perpendicular to the plane of the image receptor.

c. X-ray systems designed for one image receptor size. Radiographic equipment designed for only one image receptor size at the fixed source-image receptor distance shall be provided with means to limit the field at the plane of the image receptor to dimensions no greater than those of the image receptor, and to align the center of the X-ray field with the center of the image receptor to within two percent of the source-image receptor distance, or shall be provided with means to both size and align the X-ray field such that the X-ray field at the plane of the image receptor does not extend beyond any edge of the image receptor.

d. Systems designed for or provided with special attachments for mammography. Radiographic systems designed only for mammography and general purpose radiographic systems, when special attachments for mammography are in service, shall be provided with means to limit the useful beam such that the X-ray field at the plane of the image receptor does not extend beyond any edge of the image receptor at any designated source-image receptor distance except the edge of the image receptor designed to be adjacent to the chest wall where the X-ray field may not extend beyond this edge

by more than two percent of the source-image receptor distance. This requirement can be met with a system which performs as prescribed in paragraph 3 of subdivision e of this subsection. When the beam-limiting device and image receptor support device are designed to be used to immobilize the breast during a mammographic procedure and the source-image receptor distance may vary, the source-image receptor distance indication specified in subparagraphs a and b of paragraph 3 of subdivision e of this subsection shall be the maximum source-image receptor distance for which beam-limiting device or aperture is designed. In addition, each image receptor support intended for installation on a system designed only for mammography shall have clear and permanent markings to indicate the maximum image receptor size for which it is designed.

e. Special--purpose--X-ray--systems. X-ray systems other than those described in subdivisions a, b, c, and d.

- (1) Means shall be provided to limit the X-ray field in the plane of the image receptor so that such field does not exceed each dimension of the image receptor by more than two percent of the source-image receptor distance when the axis of the X-ray beam is perpendicular to the plane of the image receptor.
- (2) Means shall be provided to align the center of the X-ray field with the center of the image receptor to within two percent of the source-image receptor distance, or means shall be provided to both size and align the X-ray field such that the X-ray field at the plane of the image receptor does not extend beyond any edge of the image receptor.
- (3) Paragraphs 1 and 2 of this subdivision may be met with a system that meets the requirements for a general purpose X-ray system as specified in subsection 1 of this section, or, when alignment means are also provided, may be met with either:
 - (a) An assortment of removable, fixed-aperture, beam-limiting devices sufficient to meet the requirement for each combination of image receptor size and source-image receptor distance for which the unit is designed with each such device having clear and permanent markings to indicate the image receptor size and source-image receptor distance for which it is designed; or
 - (b) A beam-limiting device having multiple fixed apertures sufficient to meet the requirement for

each combination of image receptor size and source-image receptor distance for which the unit is designed. Permanent, clearly legible markings shall indicate the image receptor size and source-image receptor distance for which each aperture is designed and shall indicate which aperture is in position for use.

2. Radiation exposure control devices.

- a. Timers. Means shall be provided to terminate the exposure at the preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition, it shall not be possible to make an exposure when the timer is set to a "zero" or "off" position if either position is provided.
- b. X-ray control (exposure switch).
 - (1) A control which shall be the equivalent of a dead-man switch shall be incorporated into each X-ray system such that an exposure can be terminated at any time except for:
 - (a) Exposure of one-half second or less; or
 - (b) During serial radiography when means shall be provided to permit completion of any single exposure of the series in process.
 - (2) Each X-ray control shall be located in such a way as to meet the following requirements:
 - (a) Stationary X-ray systems shall be required to have the X-ray control permanently mounted in a protected area so that the operator is required to remain in that protected area during the entire exposure (See appendix B).
 - (b) Mobile and portable X-ray systems which are:
 - [1] Used for greater than one week in one location (one room or suite) shall meet the requirements of subparagraph a of this paragraph.
 - [2] Used for greater than one hour and less than one week at one location, (one room or suite) shall meet the requirement of item 1 of this subparagraph or be provided with a six and one-half feet [1.98 meters] high protective barrier which is placed at least six feet [1.83 meters] from the tube

housing assembly and at least six feet [1.83 meters] from the patient.

[3] Used to make an exposure of only one patient at the use location shall meet the requirement of item 1 or 2 of this subparagraph or be provided with a method of X-ray control which will permit the operator to be at least twelve feet [3.66 meters] from the tube housing assembly during an exposure.

(c) The X-ray control shall provide visual indication observable at or from the operator's protected position whenever X-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.

(d) Mammography systems shall be operable only from a shielded position.

c. Automatic exposure controls. When an automatic exposure control is provided:

- (1) Indication shall be made on the control panel when this mode of operation is selected;
- (2) If the X-ray tube potential is equal to or greater than fifty kilovolts peak, the minimum exposure time for field emission equipment rated for pulsed operation shall be equal to or less than a time interval equivalent to two pulses;
- (3) The minimum exposure time for all equipment other than that specified in paragraph 2 shall be equal to or less than one-sixtieth second or a time interval required to deliver five milliamperere seconds, whichever is greater;
- (4) Either the product of the peak X-ray tube potential, current, and exposure time shall be limited to not more than sixty kilowatt seconds per exposure or the product of X-ray tube current and exposure time shall be limited to not more than six hundred milliamperere seconds per exposure except when the X-ray tube potential is less than fifty kilovolts peak in which case the product of X-ray tube current and exposure time shall be limited to not more than two thousand milliamperere seconds per exposure; and
- (5) A visible signal shall indicate when an exposure has been terminated at the limits required by paragraph 4 of this subdivision, and manual resetting shall be

required before further automatically timed exposures can be made.

- d. **Reproducibility.** With a timer setting of five-tenths seconds or less, the average exposure period (\bar{T}) shall be greater than or equal to five times the maximum exposure period (T_{\max}) minus the minimum exposure period (T_{\min}) when four tests are performed.

$$\bar{T} \geq 5(T_{\max} - T_{\min})$$

3. **Source-to-skin distance.** All mobile or portable radiographic systems shall be provided with means to limit the source-to-skin distance to not less than thirty centimeters.
4. **Radiation exposure reproducibility.** The coefficient of variation of exposure shall not exceed ten-hundredths when all technique factors are held constant. This requirement shall be deemed to have been met if, when four radiation exposures are made at identical technique factors, the value of the average radiation exposure (\bar{E}) is greater than or equal to five times the maximum radiation exposure (E_{\max}) minus the minimum radiation exposure (E_{\min}),

$$\bar{E} \geq 5(E_{\max} - E_{\min})$$

5. **Radiation from capacitor energy storage equipment in standby status.** Radiation emitted from the X-ray tube when the exposure switch or timer is not activated shall not exceed a rate of two milliroentgens per hour at five centimeters from any accessible surface of the diagnostic source assembly, with the beam-limiting device fully open.
6. **Additional requirements applicable to certified systems only.** Diagnostic X-ray systems incorporating one or more certified components shall be required to comply with the following additional requirements which relate to that those certified components.
- a. **Reproducibility.** When the equipment is operated on an adequate power supply as specified by the manufacturer in accordance with the requirements of applicable federal standards, the estimated coefficient of variation of radiation exposures shall be no greater than five-hundredths for any specific combination of selected technique factors.
- b. **Linearity.** When the equipment allows a choice of X-ray tube current settings and is operated on a power supply as

specified by the manufacturer in accordance with the requirements of applicable federal standards, for any fixed X-ray tube potential within the range of forty percent to one hundred percent of the maximum rating, the average ratios of radiation exposure to the indicated milliamperere-seconds product, (milliroentgen per milliamperere second) obtained at any two consecutive tube current settings shall not differ by more than ten-hundredths times their sum,

$$| \bar{X}_1 - \bar{X}_2 | \leq 0.10 (\bar{X}_1 + \bar{X}_2)$$

where \bar{X}_1 and \bar{X}_2 are the average milliroentgen per milliamperere second values obtained at each of two consecutive tube current settings.

- c. Accuracy. Deviation of technique factors from indicated values shall not exceed the limits specified for that system by its manufacturer.
- d. Beam limitation for stationary and mobile general purpose X-ray systems.
 - (1) There shall be provided a means of stepless adjustment of the size of the X-ray field. The minimum field size at a source-image receptor distance of one hundred centimeters shall be equal to or less than five centimeters by five centimeters.
 - (2) When a light localizer is used to define the X-ray field, it shall provide an average illumination of not less than one hundred sixty lux or fifteen foot-candles at one hundred centimeters or at the maximum source-image receptor distance, whichever is less. The average illumination shall be based upon measurements made in the approximate center of each quadrant of the light field.
 - (3) The edge of the light field at one hundred centimeters or at the maximum source-image receptor distance, whichever is less, shall have a contrast ratio, corrected for ambient lighting, of not less than four in the case of beam-limiting devices designed for use on stationary equipment, and a contrast ratio of not less than three in the case of beam-limiting devices designed for use on mobile equipment. The contrast ratio is defined as I_1/I_2 where I_1 is the illumination three millimeters

from the edge of the light field toward the center of the field; and I_2 is the illumination three millimeters from the edge of the light field away from the center of the field. Compliance shall be determined with a measuring instrument aperture of one millimeter in diameter.

- e. Beam limitation for portable X-ray systems. Beam limitation for portable X-ray systems shall meet the beam limitation requirements of subdivision a of subsection 1 and subdivision d of subsection 6 of section 33-10-06-06.
- f. Field limitation and alignment on stationary general purpose X-ray systems. For stationary, general purpose X-ray systems which contain a tube housing assembly, an X-ray control, and, for those systems so equipped, a table, all certified in accordance with 21 CFR 1020.30(c).
 - (1) Positive beam limitation (PBL), shall be provided, when provided, shall function as described in paragraph 2 of subdivision f of subsection 6 of section 33-10-06-06 whenever all of the following conditions are met:
 - (a) The image receptor is inserted into a permanently mounted cassette holder.
 - (b) The image receptor length and width are each less than fifty centimeters.
 - (c) The X-ray beam axis is within plus or minus three degrees of vertical and the source-image receptor distance is ninety centimeters to one hundred thirty centimeters inclusive; or the X-ray beam axis is within plus or minus three degrees of horizontal and the source-image receptor distance is ninety centimeters to two hundred five centimeters inclusive.
 - (d) The X-ray beam axis is perpendicular to the plane of the image receptor to within plus or minus three degrees.
 - (e) Neither tomographic nor stereoscopic radiography is being performed.
 - (f) The positive beam limitation system has not been intentionally overridden. The override provision is subject to paragraph 3.
 - (2) Positive beam limitation (PBL), when provided, shall prevent the production of X-rays when:

- (a) Either the length or width of the X-ray field in the plane of the image receptor differs, except as permitted by paragraph 5, from the corresponding image receptor dimensions by more than three percent of the source-image receptor distance.
 - (b) The sum of the length and width differences as stated in subparagraph a, without regard to sign, exceeds four percent of the source-image receptor distance.
 - (c) The beam-limiting device is at a source-image receptor distance for which positive beam limitation (PBL) is not designed for sizing.
- (3) If a means of overriding the positive beam limitation (PBL) system exists, that means:
- (a) Must be designed for use only in the event of positive beam limitation system failure or if the system is being serviced.
 - (b) If in a position that the operator would consider it part of the operational controls or if it is referenced in the operator's manual or in other materials intended for the operator.
 - [1] Must require that a key be utilized to defeat the positive beam limitation;
 - [2] Must require that the key remain in place during the entire time the positive beam limitation system is overridden; and
 - [3] Must require that the key or key switch be clearly and durably labeled as follows:

FOR X-RAY FIELD LIMITATION
SYSTEM FAILURE

- (4) Compliance with paragraph 2 must be determined when the equipment indicates that the beam axis is perpendicular to the plane of the image receptor and the requirements of paragraph 1 are met. Compliance must be determined no sooner than five seconds after insertion of the image receptor.
- (5) The positive beam limitation system must be capable of operation, at the discretion of the operator, such that the size of the field may be made smaller than the size of the image receptor through stepless adjustment of the field size. The minimum field size

at the source-image receptor distance of one hundred centimeters must be equal to or less than five centimeters by five centimeters.

- (6) The positive beam limitation system must be designed such that if a change in image receptor does not cause an automatic return to positive beam limitation function as described in paragraph 2, then any change of image receptor size or source-image receptor distance must cause the automatic return.
- g. Timers. Except for dental panoramic systems, termination of exposure shall cause automatic resetting of the timer to its initial setting or to "zero".
- h. Transmission limit for image receptor supporting devices used for mammography. For X-ray systems manufactured after September 5, 1978, which are designed only for mammography, the transmission of the primary beams through the image receptor support provided with the system will be limited such that the exposure five centimeters from any accessible surface beyond the plane of the image receptor supporting device does not exceed one-tenth milliroentgen [25.8 microcoulomb per kilogram] for each activation of the tube. Exposure shall be measured with the system operated at the minimum source-image receptor distance for which it is designed. Compliance shall be determined at the maximum rated peak tube potential for the system and at the maximum rated product of tube current and exposure time (milliamperes second) for that peak tube potential. Compliance shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20-04, 23-20.1-03, 23-20.1-04

33-10-06-07. Intraoral dental radiographic systems. In addition to the requirements of sections 33-10-06-03 and 33-10-06-04, the requirements of this section apply to X-ray equipment and associated facilities used for dental radiography. Criteria for extraoral dental radiographic systems are covered in section 33-10-06-06.

1. **Source-to-skin distance.** X-ray systems designed for use with an intraoral image receptor shall be provided with means to limit source-to-skin distance to not less than:
 - a. Eighteen centimeters if operable above fifty kilovolts peak.

- b. Ten centimeters if not operable above fifty kilovolts peak.
2. **Field limitation.** Radiographic systems designed for use with an intraoral image receptor shall be provided with means to limit ~~source-to-skin distance, to not less than~~ the X-ray beam such that:
- If the minimum source-to-skin distance (SSD) is eighteen centimeters or more, the X-ray field, at the minimum source-to-skin distance, shall be containable in a circle having a diameter of no more than seven centimeters.
 - If the minimum source-to-skin distance is less than eighteen centimeters, the X-ray field, at the minimum source-to-skin distance, shall be containable in a circle having a diameter of no more than six centimeters.
 - An open-ended shielded position indicating device shall be used. The shielding shall be equivalent to the requirements of subsection 4 of section 33-10-06-04.
3. **Timers.** Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition:
- It shall not be possible to make an exposure when the timer is set to a zero or off position if either position is provided.
 - Reproducibility. With a timer setting of five-tenths seconds or less, the average exposure period (\bar{T}) must be greater than or equal to five times the maximum exposure period (T_{max}) minus the minimum exposure period (T_{min}) when four timer tests are performed:

$$\bar{T} \geq 5(T_{max} - T_{min})$$

$$\bar{T} \geq 5(T_{max} - T_{min})$$

4. **X-ray control (exposure switch).**
- An X-ray control shall be incorporated into each X-ray system such that an exposure can be terminated by the operator at any time, except for exposures of one-half second or less.
 - Each X-ray control shall be located in such a way as to meet the following criteria:

- (1) Stationary X-ray systems shall be required to have the X-ray control permanently mounted in a protected area, so that the operator is required to remain in that protected area during the entire exposure.
- (2) Mobile and portable X-ray systems which are:
 - (a) Used for greater than one week in one location (one room or suite) shall meet the requirements of paragraph 1 of this subdivision.
 - (b) Used for greater than one hour and less than one week at one location (one room or suite) shall meet the requirements of subparagraph a of this paragraph or be provided with a six and one-half-foot [1.98-meter] high protective barrier which is placed at least six feet [1.83 meters] from the tube housing assembly and at least six feet [1.83 meters] from the patient.
 - (c) Used to make exposures of a patient at the use location shall meet the requirements of subparagraph a or b of this paragraph or be provided with a method of X-ray control which will permit the operator to be at least twelve feet [3.66 meters] from the tube head assembly during an exposure.
- c. The X-ray control shall provide visual indication observable at or from the operator's protected position whenever X-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.
5. **Exposure reproducibility.** The coefficient of variation shall not exceed ten-hundredths when all technique factors are held constant. This requirement shall be deemed to have been met if, when four radiation exposures are made at identical technique factors, the value of the average radiation exposure (\bar{E}) is greater than or equal to five times the maximum radiation exposure (E_{\max}) minus the minimum radiation exposure (E_{\min}),

$$\bar{E} \geq 5(E_{\max} - E_{\min})$$

6. **Administrative controls.**

- a. Patient and film holding devices shall be used when the techniques permit.

- b. The tube housing and the position indicating device shall not be handheld during an exposure.
 - c. The X-ray system shall be operated in such a manner that the useful beam at the patient's skin does not exceed the requirements of subdivision a of subsection 2 of this section.
 - d. Dental fluoroscopy without image intensification shall not be used.
7. **Additional requirements applicable to certified systems only.** Only diagnostic X-ray systems incorporating one or more certified components shall be required to comply with the following additional requirements which relate to that certified component.

- a. **Reproducibility.** When the equipment is operated on an adequate power supply as specified by the manufacturer, the estimated coefficient of variation of radiation exposures shall be no greater than five-hundredths for any specific combination of selected technique factors.
- b. **Linearity.** When the equipment allows a choice of X-ray tube current settings and is operated on a power supply as specified by the manufacturer in accordance with the requirements of applicable federal standards, for any fixed X-ray tube potential within the range of forty percent to one hundred percent of the maximum rating, the average ratios of radiation exposure to the indicated milliamperere-seconds product (milliroentgen per milliamperere second), obtained at any two consecutive tube current settings shall not differ by more than ten-hundredths times their sum,

$$|\bar{X}_1 - \bar{X}_2| \leq 0.10 (\bar{X}_1 + \bar{X}_2),$$

where \bar{X}_1 and \bar{X}_2 are the average millirem per milliamperere seconds values obtained at each of two consecutive tube current settings.

- c. **Accuracy.** Deviation of technique factors from indicated values shall not exceed the limits specified for that system by its manufacturer.
- d. **Timers.** Termination of exposure shall cause automatic resetting of the timer to its initial setting or to "zero".

e. Beam quality. All certified dental X-ray systems manufactured on and after December 1, 1980, shall have a minimum half-value layer not less than one and one-half millimeters aluminum equivalent. Systems operating above seventy kilovolts peak are subject to the filtration requirements of subdivision a of subsection 5 of section 33-10-06-04.

8. **Structural shielding requirements** (see appendix C).

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

APPENDIX C
STRUCTURAL SHIELDING REQUIREMENTS

1. General requirements.
 - a. Each installation must be provided with such primary or secondary barriers as are necessary to assure compliance with sections 33-10-04.1-06 and 33-10-04.1-07. This requirement must be deemed to be met if the thicknesses of such barriers are equivalent to those as computed in accordance with Appendices B, C, and D of the National Council on Radiation Protection and Measurements Report No. 49, "Medical X-Ray and Gamma-Ray Protection For Energies Up to 10 MeV-", modified to meet current dose limits.
 - b. Lead barriers must be mounted in such manner that they will not sag or cold-flow because of their own weight and shall be protected against mechanical damage.
 - c. Joints between different kinds of protective materials must be designed so that the overall protection of the barrier is not impaired.
 - d. Joints at the floor and ceiling must be designed so that the overall protection is not impaired.
 - e. Windows, window frames, doors, and door frames must have the same lead equivalent as that required of the adjacent wall.
 - f. Holes in protective barriers must be covered so that overall attenuation is not impaired.
2. Fluoroscopic X-ray systems. Ordinarily, only secondary barriers are necessary except combined fluoroscopic-radiographic installations.
3. Radiographic systems other than fluoroscopic, dental intraoral, or veterinarian systems:
 - a. All wall, floor, and ceiling areas exposed to the useful beam must have primary barriers. Primary barriers in walls must extend to a minimum height of eighty-four inches [2.13 meters] above the floor.
 - b. Secondary barriers must be provided in all wall, floor, and ceiling areas not having primary barriers or where the primary barrier requirements are lower than the secondary requirements.
 - c. The operator's station at the control shall be behind a protective barrier, either in a separate room, in a

protected booth, or behind a shield which will intercept the useful beam and any radiation which has been scattered only once.

- d. A window of lead equivalent glass equal to that required by the adjacent barrier or a mirror system shall be provided large enough and so placed that the operator can see the patient without having to leave the protected area during exposure.
 - e. For mobile and portable X-ray systems which are used for greater than one week in one location (one room or suite), the requirements of this appendix shall apply.
4. Intraoral dental radiographic systems.
- a. Dental rooms containing X-ray machines shall be provided with primary barriers at all areas struck by the useful beam. Consideration shall be given to the attenuation provided by the patient.
 - b. When dental X-ray units are installed in adjacent rooms or areas, protective barriers shall be provided between the rooms or areas.
- Note: In many cases, structural materials of ordinary walls suffice as a protective barrier without addition of special shielding material.
5. Therapeutic X-ray installations. The structural shielding requirements shall be deemed to be met if the barriers have been designed and constructed in accordance with the National Council on Radiation Protection and Measurements Report No. 49, "Medical X-Ray and Gamma-Ray Protection for Energies Up to 10 MeV" ~~or its replacement~~, modified to meet current dose limits.
6. Veterinary medicine radiographic installations.
- a. All wall, floor, and ceiling areas exposed to the useful beam shall have primary barriers. Primary barriers in walls shall extend to a minimum height of eighty-four inches [2.13 meters] above the floor.
 - b. Secondary barriers shall be provided in all wall, floor, and ceiling areas not having primary barriers or where the primary barrier requirements are lower than the secondary requirements.

CHAPTER 33-10-07

33-10-07-04. Additional requirements.

1. As low as reasonably achievable program.

- a. Each licensee shall develop and implement a written program to maintain radiation doses and releases of radioactive material in effluents to unrestricted areas as low as reasonably achievable in accordance with subsection 2 of section 33-10-04.1-05.
- b. To satisfy the requirement of subdivision a:
 - (1) The management, radiation safety officer, and all authorized users shall participate in the establishment, implementation, and operation of the program as required by this article or the radiation safety committee; or
 - (2) For licensees that are not medical institutions, management and all authorized users shall participate in the program as required by the radiation safety officer.
- c. The as low as reasonably achievable program must include an annual review by the radiation safety committee for licensees that are medical institutions, or management and the radiation safety officer for licensees that are not medical institutions, of summaries of the types and amounts of radioactive material used, occupational dose reports, and continuing education and training for all personnel who work with or in the vicinity of radioactive material. The purpose of the review is to ensure that individuals make every reasonable effort to maintain occupational doses, doses to the general public, and releases of radioactive material as low as reasonably achievable, taking into account the state of technology, and the cost of improvements in relation to benefits.
- d. The licensee shall retain a current written description of the as low as reasonably achievable program for the duration of the license. The written description must include:
 - (1) A commitment by management to keep occupational doses as low as reasonably achievable;
 - (2) A requirement that the radiation safety officer brief management once each year on the radiation safety program;

- (3) Personnel exposure investigational levels as established in accordance with the requirements of paragraph 8 of subdivision b of subsection 3 that, when exceeded, will initiate an investigation by the radiation safety officer of the cause of the exposure; and
- (4) Personnel exposure investigational levels as established in accordance with the requirements of paragraph 8 of subdivision b of subsection 3 that, when exceeded, will initiate a prompt investigation by the radiation safety officer of the cause of the exposure and consideration of actions that might be taken to reduce the probability of recurrence.

2. Radiation safety officer.

- a. A licensee shall appoint a radiation safety officer responsible for implementing the radiation safety program. The licensee, through the radiation safety officer, shall ensure that radiation safety activities are being performed in accordance with approved procedures and regulatory requirements in the daily operation of the licensee's radioactive material program.
- b. The radiation safety officer shall:
 - (1) Investigate overexposures, accidents, spills, losses, thefts, unauthorized receipts, uses, transfers, and disposals, misadministrations, and other deviations from approved radiation safety practice and implement corrective actions as necessary;
 - (2) Implement written policy and procedures for:
 - (a) Authorizing the purchase of radioactive material;
 - (b) Receiving and opening packages of radioactive material;
 - (c) Storing radioactive material;
 - (d) Keeping an inventory record of radioactive material;
 - (e) Using radioactive material safely;
 - (f) Taking emergency action if control of radioactive material is lost;
 - (g) Performing periodic radiation surveys;

- (h) Performing checks and calibrations of survey instruments and other safety equipment;
 - (i) Disposing of radioactive material;
 - (j) Training personnel who work in or frequent areas where radioactive material is used or stored; and
 - (k) Keeping a copy of all records and reports required by this article, a copy of this article, a copy of each licensing request and license and amendments, and the written policy and procedures required by this article; and
- (3) For medical use not sited at a medical institution, approve or disapprove radiation safety program changes with the advice and consent of management prior to submittal to the department for licensing action; or
 - (4) For medical use sited at a medical institution, assist the radiation safety committee in the performance of its duties.

3. **Radiation safety committee.** Each medical institution licensee shall establish a radiation safety committee to oversee the use of radioactive material.

a. The committee shall meet the following administrative requirements:

- (1) Membership must consist of at least three individuals and must include an authorized user of each type of use permitted by the license, the radiation safety officer, a representative of the nursing service, and a representative of management who is neither an authorized user nor a radiation safety officer. Other members may be included as the licensee deems appropriate.
- (2) The committee shall meet at least once each calendar quarter.
- (3) To establish a quorum and to conduct business, one-half of the committee's membership must be present, including the radiation safety officer and the management's representative.
- (4) The minutes of each radiation safety committee meeting must include:
 - (a) The date of the meeting;

- (b) Members present;
 - (c) Members absent;
 - (d) Summary of deliberations and discussions;
 - (e) Recommended actions and the numerical results of all ballots; and
 - (f) Document any reviews required in subdivision c of subsection 1 and subdivision b of this subsection.
- (5) The committee shall provide each member with a copy of the meeting minutes, and retain one copy until the department authorizes its disposition.
- b. To oversee the use of licensed material, the committee shall:
- (1) Be responsible for monitoring the institutional program to maintain occupational doses as low as reasonably achievable;
 - (2) Review, on the basis of safety and with regard to the training and experience standards of this part, and approve or disapprove any individual who is to be listed as an authorized user, the radiation safety officer, or teletherapy physicist before submitting a license application or request for amendment or renewal;
 - (3) Review on the basis of safety and approve or disapprove each proposed method of use of radioactive material;
 - (4) Review on the basis of safety, and approve with the advice and consent of the radiation safety officer and the management representative, or disapprove procedures and radiation safety program changes prior to submittal to the department for licensing action;
 - (5) Review quarterly, with the assistance of the radiation safety officer, occupational radiation exposure records of all personnel working with radioactive material;
 - (6) Review quarterly, with the assistance of the radiation safety officer, all incidents involving radioactive material with respect to cause and subsequent actions taken;

- (7) Review annually, with the assistance of the radiation safety officer, the radioactive material program; and
- (8) Establish a table of investigational levels for occupational dose that, when exceeded, will initiate investigations and considerations of action by the radiation safety officer.

4. Statement of authorities and responsibilities.

- a. A licensee shall provide sufficient authority and organizational freedom to the radiation safety officer and the radiation safety committee to:
 - (1) Identify radiation safety problems;
 - (2) Initiate, recommend, or provide solutions; and
 - (3) Verify implementation of corrective actions.
- b. A licensee shall establish, in writing, the authorities, duties, responsibilities, and radiation safety activities of the radiation safety officer and the radiation safety committee.

5. Supervision.

- a. A licensee who permits the receipt, possession, use, or transfer of radioactive material by an individual under the supervision of an authorized user as allowed by section 33-10-07-03.1 shall:
 - (1) Instruct the supervised individual in the principles of radiation safety appropriate to that individual's use of radioactive material and in the licensee's written quality management program;
 - (2) Review the supervised individual's use of radioactive material, provide reinstruction as needed and review records kept to reflect this use;
 - (3) Require the authorized user to be immediately available to communicate with the supervised individual;
 - (4) Require the authorized user to be able to be physically present and available to the supervised individual on one hour's notice (the supervising authorized user need not be present for each use of radioactive material); and
 - (5) Require that only those individuals specifically trained, and designated by the authorized user, shall

be permitted to administer radionuclides or radiation to patients.

b. A licensee shall require the supervised individual receiving, possessing, using, or transferring radioactive material under section 33-10-07-03.1 to:

- (1) Follow the instructions of the supervising authorized user;
- (2) Follow the written radiation safety and quality management procedures established by the licensee; and
- (3) Comply with this article and the license conditions with respect to the use of radioactive material.

6. Visiting authorized user.

a. A licensee may permit any visiting authorized user to use licensed material for medical use under the terms of the licensee's license for sixty days each year if:

- (1) The visiting authorized user has the prior written permission of the licensee's management and, if the use occurs on behalf of an institution, the institution's radiation safety committee;
- (2) The licensee has a copy of an agreement state, licensing state, or United States nuclear regulatory commission license that identifies the visiting authorized user by name as an authorized user for medical use; and
- (3) Only those procedures for which the visiting authorized user is specifically authorized by an agreement state, licensing state, or United States nuclear regulatory commission license are performed by that individual.

b. A licensee need not apply for a license amendment in order to permit a visiting authorized user to use licensed material as described in subdivision a.

c. A licensee shall retain copies of the records specified in subdivision a for five years from the date of the last visit.

7. Mobile nuclear medicine service administrative requirements.

a. The department will only license mobile nuclear medicine services in accordance with this chapter and other

applicable requirements of this article to serve clients who do not have a department license.

- b. Mobile nuclear medicine service licensees shall retain for the duration of service a letter signed by the management of each location where services are rendered that authorizes use of radioactive material.
- c. A mobile nuclear medicine service may not have radioactive material delivered directly from the manufacturer or the distributor to the client's address of use.

8. Quality management program.

- a. Each applicant or licensee under this ~~part~~ chapter, as applicable, shall establish and maintain a written quality management program to provide high confidence that radioactive material or radiation from radioactive material will be administered as directed by the authorized user. The quality management program must include written policies and procedures to meet the following specific objectives:

(1) That, prior to administration, a written directive is prepared for:

- (a) Any teletherapy radiation dose;
- (b) Any gamma stereotactic radiosurgery radiation dose;
- (c) Any brachytherapy radiation dose;
- (d) Any administration of quantities greater than thirty microcuries [1110 kilobecquerels] of either sodium iodide I-125 or I-131; or
- (e) Any therapeutic administration of a radiopharmaceutical, other than sodium iodide I-125 or I-131.

(If, because of the patient's condition, a delay in order to provide a written revision to an existing written directive would jeopardize the patient's health, an oral revision to an existing written directive will be acceptable, provided that the oral revision is documented immediately in the patient's record and a revised written directive is signed by the authorized user within forty-eight hours of the oral revision.

Also, a written revision to an existing written directive may be made for any diagnostic or

therapeutic procedure provided that the revision is dated and signed by an authorized user prior to the administration of the radiopharmaceutical dosage, the brachytherapy dose, the gamma stereotactic radiosurgery dose, the teletherapy dose, or the next teletherapy fractional dose.

If, because of the emergent nature of the patient's condition, a delay in order to provide a written directive would jeopardize the patient's health, an oral directive will be acceptable, provided that the information contained in the oral directive is documented immediately in the patient's record and a written directive is prepared within twenty-four hours of the oral directive.)

- (2) That, prior to each administration, the patient's identity is verified by more than one method as the individual named in the written directive;
- (3) That final plans of treatment and related calculations for brachytherapy, teletherapy, and gamma stereotactic radiosurgery are in accordance with the respective written directives;
- (4) That each administration is in accordance with the written directive; and
- (5) That any unintended deviation from the written directive is identified and evaluated, and appropriate action is taken.

b. The licensee shall:

- (1) Develop procedures for and conduct a review of the quality management program including, since the last review, and evaluation of:
 - (a) A representative sample of patient administrations;
 - (b) All recordable events; and
 - (c) All misadministrations;to verify compliance with all aspects of the quality management program (these reviews must be conducted at intervals no greater than twelve months);
- (2) Evaluate each of these reviews to determine the effectiveness of the quality management program and, if required, make modifications to meet the objectives of subdivision a of this section; and

- (3) Retain records of each review, including the evaluations and findings of the review, in an auditable form for three years.
 - c. The licensee shall evaluate and respond, within thirty days after discovery of the recordable event, to each recordable event by:
 - (1) Assembling the relevant facts including the cause;
 - (2) Identifying what, if any, corrective action is required to prevent recurrence; and
 - (3) Retaining a record, in an auditable form, for three years, of the relevant facts and what corrective action, if any, was taken.
 - d. The licensee shall retain:
 - (1) Each written directive; and
 - (2) A record of each administered radiation dose or radiopharmaceutical dosage where a written directive is required in paragraph 1 of subdivision a, in an auditable form, for three years after the date of administration.
 - e. The licensee may make modifications to the quality management program to increase the program's efficiency provided the program's effectiveness is not decreased. The licensee shall furnish the modification to the department within thirty days after the modification has been made.
 - f.
 - (1) Each applicant for a new license, as applicable, shall submit to the department a quality management program as part of the application for a license and implement the program upon issuance of the license by the department.
 - (2) Each existing licensee, as applicable, shall submit to the department by January 1, 1995, a written certification that the quality management program has been implemented along with a copy of the program.
9. **Notifications, reports, and records of misadministrations.**
 - a. For a misadministration:
 - (1) The licensee shall notify the department by telephone no later than the next working day after discovery of the misadministration.

- (2) The licensee shall submit a written report to the department within fifteen days after discovery of the misadministration. The written report must include the licensee's name; the prescribing physician's name; a brief description of the event; why the event occurred; the effect on the patient; what improvements are needed to prevent recurrence; actions taken to prevent recurrence; whether the licensee notified the patient, or the patient's responsible relative or guardian (this person will be subsequently referred to as "the patient" in this subsection), and if not, why not, and if the patient was notified, what information was provided to the patient. The report must not include the patient's name or other information that could lead to identification of the patient.
 - (3) The licensee shall notify the referring physician and also notify the patient of the misadministration no later than twenty-four hours after its discovery, unless the referring physician personally informs the licensee either that the referring physician will inform the patient or that, based on medical judgment, telling the patient would be harmful. The licensee is not required to notify the patient without first consulting the referring physician. If the referring physician or patient cannot be reached within twenty-four hours, the licensee shall notify the patient as soon as possible thereafter. The licensee may not delay any appropriate medical care for the patient, including any necessary remedial care as a result of the misadministration, because of any delay in notification.
 - (4) If the patient was notified, the licensee shall also furnish, within fifteen days after discovery of the misadministration, a written report to the patient by sending either:
 - (a) A copy of the report that was submitted to the department; or
 - (b) A brief description of both the event and the consequences as they may affect the patient, provided a statement is included that the report submitted to the department can be obtained from the licensee.
- b. Each licensee shall retain a record of each misadministration for five years. The record must contain the names of all individuals involved (including the prescribing physician, allied health personnel, the patient, and the patient's referring physician), the

patient's social security number or identification number if one has been assigned, a brief description of the misadministration, why it occurred, the effect on the patient, what improvements are needed to prevent recurrence, and the actions taken to prevent recurrence.

- c. Aside from the notification requirement, nothing in this section affects any rights or duties of licensees and physicians in relation to each other, patients, or the patient's responsible relatives or guardians.

10. **Suppliers.** A licensee shall use for medical use only:

- a. Radioactive material manufactured, labeled, packaged, and distributed in accordance with a license issued pursuant to these rules or the equivalent rules of another agreement state, a licensing state, or the United States nuclear regulatory commission; and
- b. Reagent kits that have been manufactured, labeled, packaged, and distributed in accordance with an approval issued by the United States food and drug administration.
- c. Teletherapy sources manufactured and distributed in accordance with a license issued pursuant to this article, or the equivalent rules of another agreement state, a licensing state, or the United States nuclear regulatory commission.

History: Effective June 1, 1992; amended effective March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-07-12. Specific requirements for training.

1. **Radiation safety officer.** Except as provided in subsection 2 an individual fulfilling the responsibilities of the radiation safety officer as provided in subsection 2 of section 33-10-07-04 shall:

- a. Be certified by the:

- (1) American board of health physics in comprehensive health physics;
- (2) American board of radiology in radiological physics, therapeutic radiological physics, or medical nuclear physics;
- (3) American board of nuclear medicine;

- (4) American board of science in nuclear medicine; or
 - (5) Board of pharmaceutical specialities in nuclear pharmacy or science; or
 - b. Have had two hundred hours of classroom and laboratory training as follows:
 - (1) Radiation physics and instrumentation;
 - (2) Radiation protection;
 - (3) Mathematics pertaining to the use and measurement of radioactivity;
 - (4) Radiation biology;
 - (5) Radiopharmaceutical chemistry; and
 - (6) One year of full-time experience in radiation safety at a medical institution under the supervision of the individual identified as the radiation safety officer by the department, an agreement state, licensing state, or United States nuclear regulatory commission license that authorizes the medical use of radioactive material; or
 - c. Be an authorized user for those radioactive material uses that come within the radiation safety officer's responsibilities.
2. **Training for experienced radiation safety officer.** An individual identified as a radiation safety officer by the department, agreement state, licensing state, or United States nuclear regulatory commission license on October 1, 1986, who oversees only the use of radioactive material for which the licensee was authorized on that date need not comply with the training requirements of subsection 1.
3. **Training for uptake, dilution, or excretion studies.** Except as provided in subsections 11 and 12, the licensee shall require the authorized user of a radiopharmaceutical listed in section 33-10-07-06 to be a physician who:
 - a. Is certified in:
 - (1) Nuclear medicine by the American board of nuclear medicine;
 - (2) Diagnostic radiology by the American board of radiology;

- (3) Diagnostic radiology or radiology within the previous five years by the American osteopathic board of radiology; or
 - (4) Nuclear medicine by the American osteopathic board of nuclear medicine; or
- b. Has completed forty hours of instruction in basic radionuclide handling techniques applicable to the use of prepared radiopharmaceuticals, and twenty hours of supervised clinical experience.
- (1) To satisfy the basic instruction requirement, forty hours of classroom and laboratory instruction must include:
 - (a) Radiation physics and instrumentation;
 - (b) Radiation protection;
 - (c) Mathematics pertaining to the use and measurement of radioactivity;
 - (d) Radiation biology; and
 - (e) Radiopharmaceutical chemistry.
 - (2) To satisfy the requirement for twenty hours of supervised clinical experience, training must be under the supervision of an authorized user at a medical institution and must include:
 - (a) Examining patients and reviewing the patients' case histories to determine the patients' suitability for radionuclide diagnosis, limitations, or contraindications;
 - (b) Selecting the suitable radiopharmaceuticals and calculating and measuring the dosages;
 - (c) Administering dosages to patients and using syringe radiation shields;
 - (d) Collaborating with the authorized user in the interpretation of radionuclide test results; and
 - (e) Patient followup; or
- c. Has successfully completed a six-month training program in nuclear medicine as part of a training program that has been approved by the accreditation council for graduate medical education and that included classroom and laboratory training, work experience, and supervised

clinical experience in all the topics identified in subdivision b.

4. **Training for imaging and localization studies.** Except as provided in subsections 11 and 12, the licensee shall require the authorized user of a radiopharmaceutical, generator, or reagent kit specified in section 33-10-07-07 to be a physician who:

a. Is certified in:

- (1) Nuclear medicine by the American board of nuclear medicine;
- (2) Diagnostic radiology by the American board of radiology;
- (3) Diagnostic radiology or radiology within the previous five years by the American osteopathic board of radiology; or
- (4) Nuclear medicine by the American osteopathic board of nuclear medicine; or

b. Has completed two hundred hours of instruction in basic radionuclide handling techniques applicable to the use of prepared radiopharmaceuticals, generators, and reagent kits, five hundred hours of supervised work experience, and five hundred hours of supervised clinical experience:

- (1) To satisfy the basic instruction requirement, two hundred hours of classroom and laboratory training must include:
 - (a) Radiation physics and instrumentation;
 - (b) Radiation protection;
 - (c) Mathematics pertaining to the use and measurement of radioactivity;
 - (d) Radiopharmaceutical chemistry; and
 - (e) Radiation biology.
- (2) To satisfy the requirement for five hundred hours of supervised work experience, training shall be under the supervision of an authorized user at a medical institution and must include:
 - (a) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;

- (b) Calibrating dose calibrators and diagnostic instruments and performing checks for proper operation of survey meters;
 - (c) Calculating and safely preparing patient dosages;
 - (d) Using administrative controls to prevent the misadministration of radioactive material;
 - (e) Using emergency procedures to contain spilled radioactive material safely and using proper decontamination procedures; and
 - (f) Eluting technetium-99m from generator systems, assaying and testing the eluate for molybdenum-99 and alumina contamination, and processing the eluate with reagent kits to prepare technetium-99m labeled radiopharmaceuticals.
- (3) To satisfy the requirement for five hundred hours of supervised clinical experience, training shall be under the supervision of an authorized user at a medical institution and must include:
- (a) Examining patients and reviewing the patients' case histories to determine the patients' suitability for radionuclide diagnosis, limitations, or contraindications;
 - (b) Selecting the suitable radiopharmaceuticals and calculating and measuring the dosages;
 - (c) Administering dosages to patients and using syringe radiation shields;
 - (d) Collaborating with the authorized user in the interpretation of radionuclide test results; and
 - (e) Patient follow-up; or
- c. Has successfully completed a six-month training program in nuclear medicine that has been approved by the accreditation council for graduate medical education and that included classroom and laboratory training, work experience, and supervised clinical experience in all the topics identified in subdivision b.

5. **Training for therapeutic use of radiopharmaceuticals.** Except as provided in subsection 11, the licensee shall require the authorized user of a radiopharmaceutical listed in section 33-10-07-08 for therapy to be a physician who:

- a. Is certified by:
 - (1) The American board of nuclear medicine; or
 - (2) The American board of radiology in radiology, therapeutic radiology, or radiation oncology; or
- b. Has completed eighty hours of instruction in basic radionuclide handling techniques applicable to the use of therapeutic radiopharmaceuticals, and has had supervised clinical experience.
 - (1) To satisfy the requirement for instruction, eighty hours of classroom and laboratory training must include:
 - (a) Radiation physics and instrumentation;
 - (b) Radiation protection;
 - (c) Mathematics pertaining to the use and measurement of radioactivity; and
 - (d) Radiation biology;
 - (2) To satisfy the requirement for supervised clinical experience, training must be under the supervision of an authorized user at a medical institution and must include:
 - (a) Use of iodine-131 for diagnosis of thyroid function and the treatment of hyperthyroidism or cardiac dysfunction in ten individuals;
 - (b) Use of soluble phosphorus-32 for the treatment of ascites, polycythemia vera, leukemia, or bone metastases in three individuals;
 - (c) Use of iodine-131 for treatment of thyroid carcinoma in three individuals; and
 - (d) Use of colloidal chromic phosphorus-32 or of colloidal gold-198 for intracavitary treatment of malignant effusions in three individuals.
- 6. **Training for therapeutic use of brachytherapy sources.** Except as provided in subsection 11, the licensee shall require the authorized user using a brachytherapy source specified in section 33-10-07-10 for therapy to be a physician who:
 - a. Is certified in:

- (1) Radiology, therapeutic radiology, or radiation oncology by the American board of radiology;
 - (2) Radiation oncology by the American osteopathic board of radiology;
 - (3) Radiology, with a specialization in radiotherapy, as a British "fellow of the faculty of radiology" or "fellow of the royal college of radiology"; or
 - (4) Therapeutic radiology by the Canadian royal college of physicians and surgeons; or
- b. Is in the active practice of therapeutic radiology, has completed two hundred hours of instruction in basic radionuclide handling techniques applicable to the therapeutic use of brachytherapy sources and five hundred hours of supervised work experience and a minimum of three years of supervised clinical experience.
- (1) To satisfy the requirement for instruction, two hundred hours of classroom and laboratory training must include:
 - (a) Radiation physics and instrumentation;
 - (b) Radiation protection;
 - (c) Mathematics pertaining to the use and measurement of radioactivity; and
 - (d) Radiation biology.
 - (2) To satisfy the requirement for five hundred hours of supervised work experience, training must be under the supervision of an authorized user at a medical institution and must include:
 - (a) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
 - (b) Checking survey meters for proper operation;
 - (c) Preparing, implanting, and removing sealed sources;
 - (d) Using administrative controls to prevent the misadministration of radioactive material; and
 - (e) Using emergency procedures to control radioactive material.

(3) To satisfy the requirement for a period of supervised clinical experience, training must include one year in a formal training program approved by the residency review committee for radiology of the accreditation council for graduate medical education or the committee on postdoctoral training of the American osteopathic association, and an additional two years of clinical experience in therapeutic radiology under the supervision of an authorized user at a medical institution. The supervised clinical experience must include:

- (a) Examining individuals and reviewing their case histories to determine their suitability for brachytherapy treatment, and any limitations or contraindications;
- (b) Selecting the proper brachytherapy sources, dose, and method of administration;
- (c) Calculating the dose; and
- (d) Postadministration followup and review of case histories in collaboration with the authorized user.

7. **Training for ophthalmic use of strontium-90.** Except as provided in subsection 11, the licensee shall require the authorized user using only strontium-90 for ophthalmic radiotherapy to be a physician who:

- a. Is certified in radiology, therapeutic radiology, or radiation oncology by the American board of radiology; or
- b. Is in the active practice of therapeutic radiology or ophthalmology, and has completed twenty-four hours of instruction in basic radionuclide handling techniques applicable to the use of strontium-90 for ophthalmic radiotherapy, and a period of supervised clinical training in ophthalmic radiotherapy.

(1) To satisfy the requirement for instruction, the classroom and laboratory training must include:

- (a) Radiation physics and instrumentation;
- (b) Radiation protection;
- (c) Mathematics pertaining to the use and measurement of radioactivity; and
- (d) Radiation biology.

- (2) To satisfy the requirement for a period of supervised clinical training in ophthalmic radiotherapy, training must be under the supervision of an authorized user at a medical institution and must include the use of strontium-90 for the ophthalmic treatment of five individuals that includes:
 - (a) Examination of each individual to be treated;
 - (b) Calculation of the dose to be administered;
 - (c) Administration of the dose; and
 - (d) Followup and review of each individual's case history.
8. **Training for use of sealed sources for diagnosis.** Except as provided in subsection 11, the licensee shall require the authorized user using a sealed source in a device specified in section 33-10-07-09 to be a physician, dentist, or podiatrist who:
- a. Is certified in:
 - (1) Radiology, diagnostic radiology with special competence in nuclear radiology, therapeutic radiology, or radiation oncology by the American board of radiology;
 - (2) Nuclear medicine by the American board of nuclear medicine; or
 - (3) Diagnostic radiology or radiology by the American osteopathic board of radiology; or
 - b. Has completed eight hours of classroom and laboratory instruction in basic radionuclide handling techniques specifically applicable to the use of the device. To satisfy the requirement for instruction, the training must include:
 - (1) Radiation physics, mathematics pertaining to the use and measurement of radioactivity, and instrumentation;
 - (2) Radiation biology; and
 - (3) Radiation protection and training in the use of the device for the purposes authorized by the license.
9. **Training for teletherapy.** Except as provided in subsection 11, the licensee shall require the authorized user

of a sealed source specified in section 33-10-07-11 to be a physician who:

- a. Is certified in:
 - (1) Radiology, therapeutic radiology, or radiation oncology by the American board of radiology;
 - (2) Radiation oncology by the American osteopathic board of radiology;
 - (3) Radiology, with specialization in radiotherapy, as a British "fellow of the faculty of radiology" or "fellow of the royal college of radiology"; or
 - (4) Therapeutic radiology by the Canadian royal college of physicians and surgeons; or
- b. Is in the active practice of therapeutic radiology, and has completed two hundred hours of instruction in basic radionuclide techniques applicable to the use of a sealed source in a teletherapy unit, five hundred hours of supervised work experience, and a minimum of three years of supervised clinical experience.
 - (1) To satisfy the requirement for instruction, the classroom and laboratory training must include:
 - (a) Radiation physics and instrumentation;
 - (b) Radiation protection;
 - (c) Mathematics pertaining to the use and measurement of radioactivity; and
 - (d) Radiation biology.
 - (2) To satisfy the requirement for supervised work experience, training must be under the supervision of an authorized user at an institution and shall include:
 - (a) Review of the full calibration measurements and periodic spot checks;
 - (b) Preparing treatment plans and calculating treatment times;
 - (c) Using administrative controls to prevent misadministrations;

- (d) Implementing emergency procedures to be followed in the event of the abnormal operation of a teletherapy unit or console; and
 - (e) Checking and using survey meters.
- (3) To satisfy the requirement for a period of supervised clinical experience, training must include one year in a formal training program approved by the residency review committee for radiology of the accreditation council for graduate medical education or the committee on postdoctoral training of the American osteopathic association and an additional two years of clinical experience in therapeutic radiology under the supervision of an authorized user at a medical institution. The supervised clinical experience must include:
- (a) Examining individuals and reviewing the individuals' case histories to determine the individuals' suitability for teletherapy treatment, and any limitations or contraindications;
 - (b) Selecting the proper dose and how it is to be administered;
 - (c) Calculating the teletherapy doses and collaborating with the authorized user in the review of patients' progress and consideration of the need to modify originally prescribed doses as warranted by patients' reaction to radiation; and
 - (d) Postadministration followup and review of case histories.
10. **Training for teletherapy physicist.** The licensee shall require the teletherapy physicist to:
- a. Be certified by the American board of radiology in:
 - (1) Therapeutic radiological physics;
 - (2) Roentgen-ray and gamma-ray physics;
 - (3) X-ray and radium physics; or
 - (4) Radiological physics; or
 - b. Hold a master's or doctor's degree in physics, biophysics, radiological physics, or health physics, and have completed one year of full-time training in therapeutic

radiological physics and also one year of full-time work experience under the supervision of a teletherapy physicist at a medical institution. To meet this requirement, the individual shall have performed the tasks listed in subsection 6 of section 33-10-07-05 and subsections 10, 11, and 12 of section 33-10-07-11 under the supervision of a teletherapy physicist during the year of work experience.

11. **Training for experienced authorized users.** Practitioners of the healing arts identified as authorized users for the human use of radioactive material on a department, United States nuclear regulatory commission, agreement state, or licensing state license on April 1, 1987, who perform only those methods of use for which the practitioners were authorized on that date need not comply with the training requirements of this section.
12. **Physician training in a three-month program.** A physician who, before July 1, 1984, began a three-month nuclear medicine training program approved by the accreditation council for graduate medical education and has successfully completed the program, is exempted from the requirements of subsections 3 and 4.
13. **Recentness of training.** The training and experience specified in this section shall have been obtained within the five years preceding the date of application or the individual shall have had continuing applicable experience since the required training and experience was completed.
14. **Training for treatment of hyperthyroidism.** Except as provided in subsection 11, the licensee shall require the authorized user of only iodine-131 for the treatment of hyperthyroidism to be a physician with special experience in thyroid disease who has had classroom and laboratory training in basic radionuclide handling techniques applicable to the use of iodine-131 for treating hyperthyroidism, and supervised clinical experience as follows:
 - a. Eighty hours of classroom and laboratory training that includes:
 - (1) Radiation physics and instrumentation;
 - (2) Radiation protection;
 - (3) Mathematics pertaining to the use and measurement of radioactivity; and
 - (4) Radiation biology; and

- b. Supervised clinical experience under the supervision of an authorized user that includes the use of iodine-131 for diagnosis of thyroid function, and the treatment of hyperthyroidism in ten individuals.

History: Effective June 1, 1992; amended effective March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

CHAPTER 33-10-11

33-10-11-04. Payment of fees. The following fees are nonrefundable:

1. **License and registration fees.** The appropriate licensing or registration fee shall accompany the application for licensure or registration when filed with the department. For radioactive material licenses, the application fee is equal to the appropriate annual fee.
2. **Amendment fees.** The appropriate amendment fee shall accompany the application for amendment when filed with the department.
3. **Renewal fees.** The appropriate renewal fee shall accompany the renewal application when filed with the department. For radioactive material licenses that are current on their annual fee payments, no renewal fee will be assessed.
4. **Reciprocity fee.** The appropriate reciprocity fee shall accompany the written notification as required in sections 33-10-03-06 and ~~33-10-02-12~~ 33-10-02-11.
5. **Special project fees.** Fees for special projects are payable upon notification by the department when the review of the project is completed. Special projects mean those projects submitted to the department for review and for which specific fees are not prescribed in this chapter. Special project fees will be based upon the current professional staff hourly rate (thirty-three percent of the current nuclear regulatory commission rate listed in 10 CFR 170.20).
6. **Annual fees.** Annual fees are required to be paid by all radioactive material licensees no later than ~~the anniversary date of the license expiration date (e.g., a license that expires April 30, 1996, will have the annual fee due not later than April thirtieth of each calendar year).~~ The initial application or renewal fee constitutes the first year annual fee and annual fees for North Dakota licensees will be only required for the second through fifth years of the license. January first of each year, except:
 - a. Licensees with the anniversary date of the license expiration date between May 1, 1995, and December 31, 1995, will be assessed an annual fee on the anniversary date of the license expiration date prorated to January 1, 1996. These licensees will then pay a full annual fee on January 1, 1996, and every year thereafter.
 - b. Licensees with the anniversary date of the license expiration date between January 1, 1996, and April 30,

1996, will not be assessed an annual fee on January 1, 1996. These licensees will be assessed an annual fee on the anniversary date of the license expiration date prorated to January 1, 1997. These licensees will then pay a full annual fee on January 1, 1997, and every year thereafter.

7. **Inspection and survey fees.** Fees for regulatory inspections and surveys of North Dakota licensees are included in the registration or ~~application and renewal fees~~ annual fees for each registration or license type. ~~Special~~ Nonroutine inspections will require the nonroutine inspection fee to be paid upon notification by the department when the inspection has been completed. ~~Reciprocity licensees which are inspected will be billed for the routine or nonroutine inspection for the license type, as appropriate.~~
8. Annual fees for small entities. An industrial radiography or well logging licensee may qualify as a small entity. If a licensee qualifies as a small entity and provides the department with the proper certification, the maximum annual fee shall be one thousand two hundred dollars for industrial radiography or one thousand dollars for well logging.
 - a. A licensee qualifies as a small entity if it meets the following size standards:
 - (1) A small business is a business with annual receipts of three and one-half million dollars or less except private practice physicians for which the standard is annual receipts of one million dollars or less.
 - (2) A small organization is a not-for-profit organization which is independently owned and operated and has annual receipts of three and one-half million dollars or less.
 - (3) Small governmental jurisdictions are governments of cities, counties, towns, townships, villages, school districts, or special districts with a population of less than fifty thousand.
 - (4) A small educational institution is one that is:
 - (a) Supported by a qualifying small governmental jurisdiction; or
 - (b) One that is not state or publicly supported and has five hundred employees or less.
 - (5) A licensee who is a subsidiary of a large entity does not qualify as a small entity for purposes of this section.

b. A licensee who seeks to establish status as a small entity for purposes of paying the fees required under this chapter shall file a certification statement with the department. The licensee shall:

(1) Certify, on the business's letterhead, that the business meets the conditions in subdivision a of subsection 8 of this section;

(2) Sign the certification as the chief executive officer of the business or as an official designee; and

(3) Have the certification notarized.

c. A licensee who seeks to qualify as a small entity shall submit the certification with the reduced annual fee payment.

d. For purposes of this chapter, the licensee shall submit a new certification with its annual fee payment each year.

9. Method of payment. Fee payments shall be by check, draft, or money order made payable to the North Dakota state department of health and consolidated laboratories.

9- 10. Submittal of application and fee payment. The application for licensure or registration shall be accompanied by the fee payment and shall be submitted to:

North Dakota State Department of Health
and Consolidated Laboratories
Division of Environmental Engineering
1200 Missouri Avenue, Room 304
Box 5520
Bismarck, ND 58502-5520 58506-5520

History: Effective October 1, 1982; amended effective June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 23-20.1-04, 23-20.1-04.5

Law Implemented: NDCC 23-20.1-04, 23-20.1-04.5

**APPENDIX A
SCHEDULE OF FEES FOR RADIOACTIVE MATERIAL LICENSES**

Applicants for radioactive material licenses and other regulatory services and holders of radioactive material licenses shall pay the following fees.

Category of Materials Licenses and Types of Fees	Fee (\$)
<p>1. Special nuclear material:</p> <p>A. Licenses for possession and use of 200 grams or more of plutonium in unsealed form or 350 grams or more of contained U-235 in unsealed form or 200 grams or more of U-233 in unsealed form. This includes applications to terminate licenses as well as licenses authorizing possession only:</p> <p>Application New License Full Cost Renewal Full Cost Amendment Full Cost Inspection (routine) Full Cost Inspection (nonroutine) Full Cost Annual Fee 35,725</p>	71,450
<p>B. Licenses for receipt and storage of spent fuel at an independent spent fuel storage installation (ISFSI): (Regulated by NRC)</p>	N/A
<p>C. Licenses for possession and use of special nuclear material in sealed sources contained in devices used in industrial measuring systems, including X-ray fluorescence analyzers:</p> <p>Application New License 320 Renewal 250 Amendment 125 Inspection (routine) 155 Inspection (nonroutine) 435 Annual Fee 375 600</p>	600
<p>D. All other special nuclear material licenses, except licenses authorizing special nuclear material in unsealed form in combination that would constitute a critical quantity.</p> <p>Application New License 460 Renewal 345 Amendment 75 Inspection (routine) 230 Inspection (nonroutine) 265 Annual Fee 625 730</p>	730

<p>2. Source material:</p> <p>A. Licenses for possession and use of source material in recovery operations such as milling, in-situ leaching, heap-leaching, refining uranium mill concentrates to uranium hexafluoride, or buying stations, ion exchange facilities and in processing of ores containing source material for extraction of metals other than uranium or thorium, including licenses authorizing the possession of byproduct waste material (tailings) from source material recovery operations, as well as licenses authorizing the possession and maintenance of a facility in a standby mode:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>Full Cost Full Cost Full Cost Full Cost Full Cost 189,565 <u>371,295</u></p>
<p>B. Licenses for possession and use of source material for shielding:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p> 110 55 40 95 115 105 <u>210</u></p>
<p>C. All other source material licenses:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p> 530 250 150 265 500 765 <u>1530</u></p>
<p>3. Byproduct material and naturally occurring or accelerator-produced radioactive material:</p> <p>A. Licenses of broad scope for possession and use of byproduct material or naturally occurring or accelerator-produced radioactive material issued pursuant to chapter 33-10-03 for processing or manufacturing of items containing byproduct material or naturally occurring or accelerator-produced radioactive material for commercial distribution:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p> 1465 1165 75 700 1050 2200 <u>4400</u></p>

<p>B. Other licenses for possession and use of byproduct material or naturally occurring or accelerator-produced radioactive material issued pursuant to chapter 33-10-03 for processing or manufacturing of items containing byproduct material or naturally occurring or accelerator-produced radioactive material for commercial distribution:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>765 435 185 335 665 1100 2000</p>
<p>C. Licenses issued pursuant to chapter 33-10-03 authorizing the processing or manufacturing and distribution or redistribution of radiopharmaceuticals, generators, reagent kits and/or sources and devices containing byproduct material or naturally occurring or accelerator-produced radioactive material:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1135 465 150 465 635 2500 4000</p>
<p>D. License and approvals issued pursuant to chapter 33-10-03 authorizing distribution or redistribution of radiopharmaceuticals, generators, reagent kits and/or sources or devices not involving processing of byproduct material or naturally occurring or accelerator-produced radioactive material:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>365 165 105 265 400 875 1750</p>
<p>E. Licenses for possession and use of byproduct material or naturally occurring or accelerator-produced radioactive material in sealed sources for irradiation of materials in which the source is not removed from its shield (self-shielded units):</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>165 160 115 155 230 405 810</p>

<p>F. License for possession and use of less than 10,000 curies of byproduct material or naturally occurring or accelerator-produced radioactive material in sealed sources for irradiation of materials in which the source is exposed for irradiation purposes:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>400 135 115 195 425 840 1500</p>
<p>G. Licenses for possession and use of 10,000 curies or more of byproduct material or naturally occurring or accelerator-produced radioactive material in sealed sources for irradiation of materials in which the source is exposed for irradiation purposes:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1535 635 155 335 465 3675 7150</p>
<p>H. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material or naturally occurring or accelerator-produced radioactive material that require device review to persons exempt from the licensing requirements of chapter 33-10-03, except specific licenses authorizing redistribution of items that have been authorized for distribution to persons exempt from the licenses of chapter 33-10-03:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>700 365 85 230 345 1440 2265</p>
<p>I. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material or naturally occurring or accelerator-produced radioactive material, or quantities of byproduct material or naturally occurring or accelerator-produced radioactive material that do not require device evaluation to persons exempt from the licensing requirements of chapter 33-10-03, except for specific licenses authorizing redistribution of items that have been authorized for distribution to persons exempt from the licensing requirements of chapter 33-10-03:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>865 400 115 155 230 1705 3410</p>

<p>J. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material or naturally occurring or accelerator-produced radioactive material that require sealed source and/or device review to persons generally licensed under chapter 33-10-03, except specific licenses authorizing redistribution of items that have been authorized for distribution to persons generally licensed under this chapter:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>835 195 130 230 345 1705 2200</p>
<p>K. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material or naturally occurring or accelerator-produced radioactive material, or quantities of byproduct material or naturally occurring or accelerator-produced radioactive material that do not require sealed source and/or device review to persons generally licensed under this chapter, except specific licenses authorizing for redistribution of items that have been authorized for distribution to persons generally licensed under this chapter:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>635 315 95 230 345 1340 2030</p>
<p>L. Licenses of broad scope for possession and use of byproduct material or naturally occurring or accelerator-produced radioactive material issued pursuant to chapter 33-10-03 for research and development that do not authorize commercial distribution:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>765 665 165 310 400 600 1200</p>
<p>M. Other licenses for possession and use of byproduct material or naturally occurring or accelerator-produced radioactive material issued pursuant to chapter 33-10-03 for research and development that do not authorize commercial distribution:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>365 365 210 265 310 935 1700</p>

<p>N. Licenses that authorize services for other licensees, except (1) licenses that authorize calibration and/or leak testing services only are subject to the fees specified in fee Category 3P, and (2) licenses that authorize waste disposal services are subject to the fees specified in fee Categories 4A, 4B, and 4C:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>465 265 135 230 345 1065 2000</p>
<p>O. License for possession and use of byproduct material or naturally occurring or accelerator-produced radioactive material issued pursuant to chapter 33-10-05 for industrial radiography operations:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1000 600 165 400 835 600 2700</p>
<p>P. All other specific byproduct material or naturally occurring or accelerator-produced radioactive material licenses, except those in Categories 4A through 9D:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>250 165 125 400 600 475 770</p>
<p>4. Waste disposal and processing:</p> <p>A. Licenses specifically authorizing the receipt of waste byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material from other persons for the purpose of contingency storage or commercial land disposal by the licensee; or licenses authorizing contingency storage of low level radioactive waste at the site of nuclear power reactors; or licenses for receipt of waste from other persons for incineration or other treatment, packaging of resulting waste and residues, and transfer of packages to another person authorized to receive or dispose of waste material:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>Full Cost Full Cost Full Cost Full Cost Full Cost 21,295 43,380</p>

<p>B. Licenses specifically authorizing the receipt of waste byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material from other persons for the purpose of packaging or repackaging the material. The license licensee will dispose of the material by transfer to another person authorized to receive or dispose of the material:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>935 635 65 535 700 3165 5465</p>
<p>C. Licenses specifically authorizing the receipt of prepackaged waste byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material from other persons. The licensee will dispose of the material by transfer to another person authorized to receive or dispose of the material:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>635 310 75 535 700 1800 2500</p>
<p>5. Well logging: A. Licenses for possession and use of byproduct material, naturally occurring or accelerator-produced radioactive material, source material, and/or special nuclear material for well logging, well surveys, and tracer studies other than field flooding tracer studies:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1135 665 180 265 400 2305 2300</p>
<p>B. Licenses for possession and use of byproduct material or naturally occurring or accelerator-produced radioactive material, for field flooding tracer studies:</p> <p>Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>Full Cost Full Cost Full Cost 230 335 3435 5130</p>

<p>6. Nuclear laundries:</p> <p>A. Licenses for commercial collection and laundry of items contaminated with byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material:</p> <p>Application New License 700 Renewal 465 Amendment 115 Inspection (routine) 400 Inspection (nonroutine) 635 Annual Fee 1200</p>	<p>2400</p>
<p>7. Human use of byproduct, naturally occurring or accelerator-produced, source, or special nuclear material:</p> <p>A. Licenses issued pursuant to chapter 33-10-03 for human use of byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material in sealed sources contained in teletherapy devices:</p> <p>Application New License 1135 Renewal 265 Amendment 145 Inspection (routine) 400 Inspection (nonroutine) 635 Annual Fee 3205</p>	<p>5630</p>
<p>B. Licenses of broad scope issued to medical institutions or two or more physicians pursuant to chapter 33-10-03 authorizing research and development, including human use of byproduct material, except licenses for byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material in sealed sources contained in teletherapy devices:</p> <p>Application New License 765 Renewal 665 Amendment 120 Inspection (routine) 535 Inspection (nonroutine) 600 Annual Fee 2900</p>	<p>5800</p>
<p>C. Other licenses issued pursuant to chapter 33-10-03 for human use of byproduct material, naturally occurring or accelerator-produced radioactive material, source material, and/or special nuclear material, except licenses for byproduct material, source material, naturally occurring or accelerator-produced radioactive material, or special nuclear material in sealed sources contained in teletherapy devices:</p> <p>Application New License 235 Renewal 335 Amendment 145 Inspection (routine) 335 Inspection (nonroutine) 500 Annual Fee 1140</p>	<p>1965</p>

8.	Civil defense:	
A.	Licenses for possession and use of byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material for civil defense activities:	
	Application New License	196
	Renewal	136
	Amendment	105
	Inspection (routine)	230
	Inspection (nonroutine)	230
	Annual Fee	440 700
9.	Device, product or sealed source safety evaluation:	
A.	Safety evaluation of devices or products containing byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material, except reactor fuel devices, for commercial distribution:	
	Application each device	1100
	Renewal	1100
	Amendment	400
	Inspection (routine)	Full Cost
	Inspection (nonroutine)	Full Cost
	Annual Fee	2040 3200
B.	Safety evaluation of devices or products containing byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material manufactured in accordance with the unique specifications of, and for use by a single applicant, except reactor fuel devices:	
	Application each device	800
	Renewal	536
	Amendment	195
	Inspection (routine)	Full Cost
	Inspection (nonroutine)	Full Cost
	Annual Fee	1040 1630
C.	Safety evaluation of sealed sources containing byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material, except reactor fuel, for commercial distribution:	
	Application each device	346
	Renewal	230
	Amendment	75
	Inspection (routine)	Full Cost
	Inspection (nonroutine)	Full Cost
	Annual Fee	440 700

<p>D. Safety evaluation of sealed sources containing byproduct material, naturally occurring or accelerator-produced radioactive material, source material, or special nuclear material, manufactured in accordance with the unique specifications of, and for use by a single applicant, except reactor fuel:</p> <p>Application each source 175 Renewal 115 Amendment 40 Inspection (routine) Full Cost Inspection (nonroutine) Full Cost Annual Fee 225 330</p>	
<p>10. Transportation of radioactive material: (Regulated by NRC)</p>	N/A
<p>11. Review of standardized spent fuel facilities: (Regulated by NRC)</p>	N/A
<p>12. Special projects:</p>	Full Cost
<p>13. A. Spent fuel storage cask Certificate of Compliance: (Regulated by NRC)</p>	N/A
<p>B. Inspections related to spent fuel storage cask Certificate of Compliance: (Regulated by NRC)</p>	N/A
<p>C. Inspections related to storage of spent fuel under of this chapter: (Regulated by NRC)</p>	N/A
<p>14. Byproduct, naturally occurring or accelerator-produced, source, or special nuclear material licenses and other approvals authorizing decommissioning, decontamination, reclamation or site restoration activities pursuant to 10 CFR parts 30, 40, 70 and 72:</p> <p>Application New License Full Cost Renewal Full Cost Amendment Full Cost Inspection (routine) Full Cost Inspection (nonroutine) Full Cost Annual Fee Full Cost</p>	
<p>15. Import and Export licenses: (Regulated by NRC)</p>	N/A
<p>16. Reciprocity: Other agreement state and NRC licensees who conduct activities in North Dakota under the reciprocity provisions of chapters 33-10-02 and 33-10-03. Application fee (due 3 days prior to entry into State)</p> <p>Inspections (routine and nonroutine)</p>	<p>Fees as specified in annual fees for license type</p> <p>Fees as specified under inspection fees for license type</p>

17. Demonstration and sales of devices containing radioactive materials.	100 <u>160</u> per year
18. Radiation training courses.	100 <u>160</u> per year
19. Decontamination services.	500 <u>800</u> per year
20. Installation, removal, repair and servicing of devices containing radioactive materials.	475 <u>760</u> per year
21. Multiple offices: Add the following fees per additional office location: Application New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee	25% of base fee 25% of base fee same as base fee same as base fee same as base fee 25% of base fee
22. Administrative amendment (limited to the following amendment requests: - Corporate name change - Minor O&E manual changes (industrial sources) - Filing of training certificates (gauge users)	\$55 <u>85</u>
23. Inspection of radioactive materials package shipments to low-level radioactive waste disposal facility.	Full Cost
24. Certificate - in vitro testing with radioactive material under general license. Application - 3 year certificate.	\$75 <u>100</u>

History: Effective October 1, 1982; amended effective June 1, 1986; June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04, 23-20.1-04.5

Shielding Evaluations (Routine)

~~150~~ 200 per
evaluation

Shielding Evaluations (Nonroutine)

Full cost

Reciprocity (X-ray producing machines)

~~150~~ 200 per year
per machine

History: Effective October 1, 1982; amended effective June 1, 1986;
June 1, 1992; March 1, 1994; July 1, 1995.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04, 23-20.1-04.5

CHAPTER 33-10-13

33-10-13-15. Routine determinations. Prior to each shipment of licensed material, the licensee shall determine that:

1. The package is proper for the contents to be shipped;
2. The package is in unimpaired physical condition except for superficial defects such as marks or dents;
3. Each closure device of the packaging, including any required gasket, is properly installed and secured and free of defects;
4. Any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid;
5. Any pressure relief device is operable and set in accordance with written procedures;
6. The package has been loaded and closed in accordance with written procedures;
7. Any structural part of the package which could be used to lift or tie down the package during transport is rendered inoperable for that purpose unless it satisfies design requirements specified by the United States nuclear regulatory commission;
8. a. The level of removable radioactive contamination on the external surfaces of each package offered for shipment is as low as reasonably achievable. The level of removable radioactive contamination may be determined by wiping an area of three hundred square centimeters of the surface concerned with an absorbent material, using moderate pressure, and measuring the activity on the wiping material. Sufficient measurements must be taken in the most appropriate locations to yield a representative assessment of the removable contamination levels. Except as provided in subdivision b of this subsection, the amount of radioactivity measured on any single wiping material, when averaged over the surface wiped, must not exceed the limits given in table 3 below at any time during transport. Other methods of assessment of equal or greater efficiency may be used. When other methods are used, the detection efficiency of the method used must be taken into account and in no case may the removable contamination on the external surfaces of the package exceed ten times the limits listed in table 3.

Table 3
Removable External Radioactive Contamination Wipe Limits

<u>Contaminant</u>	Maximum Permissible Limits	
	<u>* $\mu\text{Ci}/\text{cm}^2$</u>	<u>dpm/cm²</u>
Beta-gamma emitting radionuclides; all radionuclides with half-lives less than ten days; natural uranium; natural thorium; uranium-235; uranium-238; thorium-232; thorium-228 and thorium-230 when contained in ores or physical concentrates	10^{-5}	22
All other alpha emitting radionuclides	10^{-6}	2.2

*To convert microcuries (μCi) to SI units of megabecquerels, multiply the values by ~~37~~ 0.037.

- b. In the case of packages transported as exclusive use shipments by rail or highway only, the removable radioactive contamination at any time during transport must not exceed ten times the levels prescribed in subdivision a. The levels at the beginning of transport must not exceed the levels in subdivision a;
9. External radiation levels around the package and around the vehicle, if applicable, will not exceed two hundred millirems per hour [2 millisieverts per hour] at any point on the external surface of the package at any time during transportation. The transport index may not exceed ten;
 10. For a package transported in exclusive use by rail, highway, or water, radiation levels external to the package may exceed the limits specified in subsection 9 but may not exceed any of the following:
 - a. Two hundred millirems per hour [2 millisieverts per hour] on the accessible external surface of the package unless the following conditions are met, in which case the limit is one thousand millirems per hour [10 millisieverts per hour];
 - (1) The shipment is made in a closed transport vehicle;
 - (2) Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation; and

- (3) There are no loading or unloading operations between the beginning and end of the transportation.
- b. Two hundred millirems per hour [2 millisieverts per hour] at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of a flatbed style vehicle, with a personnel barrier (A flatbed style vehicle with a personnel barrier shall have radiation levels determined at vertical planes. If no personnel barrier, the package cannot exceed 200 millirems per hour [2 millisieverts per hour] at the surface.), at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load (or enclosure, if used) and on the lower external surface of the vehicle;
 - c. Ten millirems per hour [0.1 millisieverts per hour] at any point two meters from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of a flatbed style vehicle, at any point two meters from the vertical planes projected from the outer edges of the vehicle; and
 - d. Two millirems per hour [0.02 millisieverts per hour] in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when individuals occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and training in accordance with subsection 2 of section 33-10-10-02; and
11. A package must be prepared for transport so that in still air at one hundred degrees Fahrenheit [38 degrees Celsius] and in the shade, no accessible surface of a package would have a temperature exceeding one hundred twenty-two degrees Fahrenheit [50 degrees Celsius] in a nonexclusive use shipment or one hundred eighty degrees Fahrenheit [82 degrees Celsius] in an exclusive use shipment. Accessible package surface temperatures may not exceed these limits at any time during transportation.

History: Effective June 1, 1992; amended effective July 1, 1995.

General Authority: NDCC 23-20.1-04, 28-32-02

Law Implemented: NDCC 23-20.1-04, 28-32-02

CHAPTER 33-10-14

STAFF COMMENT: Chapter 33-10-14 contains all new material but is not underscored so as to improve readability.

CHAPTER 33-10-14 LICENSES AND RADIATION SAFETY REQUIREMENTS FOR IRRADIATORS

Section	
33-10-14-01	Purpose and Scope
33-10-14-02	Definitions
33-10-14-03	Specific Licenses for Irradiators
33-10-14-04	Start of Construction
33-10-14-05	Performance Requirements
33-10-14-06	Design Requirements
33-10-14-07	Construction Monitoring and Acceptance Testing
33-10-14-08	Operation of Irradiators
33-10-14-09	Records

33-10-14-01. Purpose and scope.

1. This chapter contains requirements for the issuance of a license authorizing the use of sealed sources containing radioactive materials in irradiators used to irradiate objects or materials using gamma radiation. This chapter also contains radiation safety requirements for operating irradiators. The requirements of this chapter are in addition to other requirements of this article. In particular, the provisions of chapters 33-10-03, 33-10-04.1, 33-10-10, and 33-10-11 apply to applications and licenses subject to this chapter. Nothing in this chapter relieves the licensee from complying with other applicable federal, state, and local regulations governing the siting, zoning, land use, and building code requirements for industrial facilities.
2. The rules in this chapter apply to panoramic irradiators that have either dry or wet storage of the radioactive sealed sources and to underwater irradiators in which both the source and the product being irradiated are under water. Irradiators whose dose rates exceed five grays [500 rads] per hour at one meter from the radioactive sealed sources in air or in water, as applicable for the irradiator type, are covered by this chapter.

3. The rules in this chapter do not apply to self-contained dry-source-storage irradiators (those in which both the source and the area subject to irradiation are contained within a device and are not accessible by personnel), medical radiology or teletherapy, radiography (the irradiation of materials for nondestructive testing purposes), gauging, or open-field (agricultural) irradiators.

History: Effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-14-02. Definitions.

1. "Annually" means either:
 - a. At intervals not to exceed one year; or
 - b. One per year, at about the same time each year (plus or minus one month).
2. "Doubly encapsulated sealed source" means a sealed source in which the radioactive material is sealed within a capsule and that capsule is sealed within another capsule.
3. "Irradiator" means a facility that uses radioactive sealed sources for the irradiation of objects or materials and in which radiation dose rates exceeding five grays [500 rads] per hour exist at one meter from the sealed radioactive sources in air or water, as applicable for the irradiator type, but does not include irradiators in which both the sealed source and the area subject to irradiation are contained within a device and are not accessible to personnel.
4. "Irradiator operator" means an individual who has successfully completed the training and testing described in subsection 1 of section 33-10-14-08 and is authorized by the terms of the license to operate the irradiator without a supervisor present.
5. "Panoramic dry-source-storage irradiator" means an irradiator in which the irradiations occur in air in areas potentially accessible to personnel and in which the sources are stored in shields made of solid materials. The term includes beam-type dry-source-storage irradiators in which only a narrow beam of radiation is produced for performing irradiations.
6. "Panoramic irradiator" means an irradiator in which the irradiations are done in air in areas potentially accessible to personnel. The term includes beam-type irradiators.

7. "Panoramic wet-source-storage irradiator" means an irradiator in which the irradiations occur in air in areas potentially accessible to personnel and in which the sources are stored under water in a storage pool.
8. "Pool irradiator" means any irradiator at which the sources are stored or used in a pool of water including panoramic wet-source-storage irradiators and underwater irradiators.
9. "Product conveyor system" means a system for moving the product to be irradiated to, from, and within the area where irradiation takes place.
10. "Radiation room" means a shielded room in which irradiations take place. Underwater irradiators do not have radiation rooms.
11. "Seismic area" means any area where the probability of a horizontal acceleration in rock of more than three-tenths times the acceleration of gravity in two hundred fifty years is greater than ten percent, as designated by the United States geological survey.
12. "Underwater irradiator" means an irradiator in which the sources always remain shielded under water and humans do not have access to the sealed sources or the space subject to irradiation without entering the pool.

History: Effective July 1, 1995.

General Authority: NDCC 23-20.1-04, 28-32-02

Law Implemented: NDCC 23-20.1-04

33-10-14-03. Specific licenses for irradiators. The department will approve an application for a specific license for the use of licensed material in an irradiator if the the applicant meets the requirements contained in this section.

1. The applicant shall satisfy the general requirements specified in chapter 33-10-03 and the requirements contained in this chapter.
2. The application must describe the training provided to irradiator operators including:
 - a. Classroom training.
 - b. On-the-job or simulator training.
 - c. Safety reviews.
 - d. Means employed by the applicant to test each operator's understanding of the department's rules and licensing

requirements and the irradiator operating and emergency procedures.

- e. Minimum training and experience of personnel who may provide training.
3. The application must include an outline of the written operating and emergency procedures listed in subsection 2 of section 33-10-14-08 that describes the radiation safety aspects of the procedures.
4. The application must describe the organizational structure for managing the irradiator, specifically the radiation safety responsibilities and authorities of the radiation safety officer and those management personnel who have important radiation safety responsibilities or authorities. In particular, the application must specify who, within the management structure, has the authority to stop unsafe operations. The application must also describe the training and experience required for the position of radiation safety officer.
5. The application must include a description of the access control systems required by subsection 2 of section 33-10-14-05, the radiation monitors required by subsection 5 of section 33-10-14-05, the method of detecting leaking sources required by subsection 5 of section 33-10-14-08 including the sensitivity of the method, and a diagram of the facility that shows the locations of all required interlocks and radiation monitors.
6. If the applicant intends to perform leak testing of dry-source-storage sealed sources, the applicant shall establish procedures for leak testing and submit a description of these procedures to the department. The description must include the:
 - a. Instruments to be used.
 - b. Methods of performing the analysis.
 - c. Pertinent experience of the individual who analyzes the samples.
7. If licensee personnel are to load or unload sources, the applicant shall describe the qualifications and training of the personnel and the procedures to be used. If the applicant intends to contract for source loading or unloading at its facility, the loading or unloading must be done by an organization specifically authorized by the department, the United States nuclear regulatory commission, or an agreement state to load or unload irradiator sources.

8. The application must describe the inspection and maintenance checks, including the frequency of the checks required by subsection 6 of section 33-10-14-08.

History: Effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-04

33-10-14-04. Start of construction. The applicant may not begin construction of a new irradiator prior to the submission to the department of both an application for a license for the irradiator and the fee required by chapter 33-10-11. As used in this section, the term "construction" includes the construction of any portion of the permanent irradiator structure on the site but does not include: engineering and design work, purchase of a site, site surveys or soil testing, site preparation, site excavation, construction of warehouse or auxiliary structures, and other similar tasks. Any activities undertaken prior to the issuance of a license are entirely at the risk of the applicant and have no bearing on the issuance of a license with respect to the requirements of this article.

History: Effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-04, 23-20.1-04.5

33-10-14-05. Performance requirements.

1. Performance criteria for sealed sources.

- a. Requirements. Sealed sources installed after July 1, 1993:
 - (1) Must have a certificate of registration issued under 10 Code of Federal Regulations 32.210.
 - (2) Must be doubly encapsulated.
 - (3) Must use radioactive material that is as nondispersible as practical and that is as insoluble as practical if the source is used in a wet-source-storage or wet-source-change irradiator.
 - (4) Must be encapsulated in a material resistant to general corrosion and to localized corrosion, such as 316L stainless steel or other material with equivalent resistance if the sources are for use in irradiator pools.
 - (5) In prototype testing of the sealed source, must have been leak tested and found leak-free after each of the tests described in paragraphs b through g.

- b. Temperature. The test source must be held at minus forty degrees Centigrade for twenty minutes, six hundred degrees Centigrade for one hour, and then be subjected to a thermal shock test with a temperature drop from six hundred degrees Centigrade to twenty degrees Centigrade within fifteen seconds.
- c. Pressure. The test source must be twice subjected for at least five minutes to an external pressure (absolute) of two million newtons per square meter.
- d. Impact. A two kilogram steel weight, two and five-tenths centimeters in diameter, must be dropped from a height of one meter onto the test source.
- e. Vibration. The test source must be subjected three times for ten minutes each to vibrations sweeping from twenty-five hertz to five hundred hertz with a peak amplitude of five times the acceleration of gravity. In addition, each test source must be vibrated for thirty minutes at each resonant frequency found.
- f. Puncture. A fifty gram weight and pin, three-tenths centimeter pin diameter, must be dropped from a height of one meter onto the test source.
- g. Bend. If the length of the source is more than fifteen times larger than the minimum cross-sectional dimension, the test source must be subjected to a force of two thousand newtons at its center equidistant from two support cylinders, the distance between which is ten times the minimum cross-sectional dimension of the source.

2. Access control.

- a. Each entrance to a radiation room at a panoramic irradiator must have a door or other physical barrier to prevent inadvertent entry of personnel if the sources are not in the shielded position. Product conveyor systems may serve as barriers as long as they reliably and consistently function as a barrier. It must not be possible to move the sources out of their shielded position if the door or barrier is open. Opening the door or barrier while the sources are exposed must cause the sources to return promptly to their shielded position. The personnel entrance door or barrier must have a lock that is operated by the same key used to move the sources. The doors and barriers must not prevent any individual in the radiation room from leaving.
- b. In addition, each entrance to a radiation room at a panoramic irradiator must have an independent backup access control to detect personnel entry while the sources

are exposed. Detection of entry while the sources are exposed must cause the sources to return to their fully shielded position and must also activate a visible and audible alarm to make the individual entering the room aware of the hazard. The alarm must also alert at least one other individual who is onsite of the entry. That individual shall be trained on how to respond to the alarm and prepared to promptly render or summon assistance.

- c. A radiation monitor must be provided to detect the presence of high radiation levels in the radiation room of a panoramic irradiator before personnel entry. The monitor must be integrated with personnel access door locks to prevent room access when radiation levels are high. Attempted personnel entry, while the monitor measures high radiation levels, must activate the alarm described in paragraph b. The monitor may be located in the entrance (normally referred to as the maze) but not in the direct radiation beam.
- d. Before the sources move from their shielded position in a panoramic irradiator, the source control must automatically activate conspicuous visible and audible alarms to alert people in the radiation room that the sources will be moved from their shielded position. The alarms must give individuals enough time to leave the room before the sources leave the shielded position.
- e. Each radiation room at a panoramic irradiator must have a clearly visible and readily accessible control that would allow an individual in the room to make the sources return to their fully shielded position.
- f. Each radiation room of a panoramic irradiator must contain a control that prevents the sources from moving from the shielded position unless the control has been activated and the door or barrier to the radiation room has been closed within a preset time after activation of the control.
- g. Each entrance to the radiation room of a panoramic irradiator and each entrance to the area within the personnel access barrier of an underwater irradiator must have a sign bearing the radiation symbol and the words, "Caution (or danger) radioactive material". Panoramic irradiators must also have a sign stating "High radiation area" but the sign may be removed, covered, or otherwise made inoperative when the sources are fully shielded.
- h. If the radiation room of a panoramic irradiator has roof plugs or other movable shielding, it must not be possible to operate the irradiator unless the shielding is in its proper location. This requirement may be met by

interlocks that prevent operation if shielding is not placed properly or by an operating procedure requiring inspection of shielding before operating.

- i. Underwater irradiators must have a personnel access barrier around the pool which must be locked to prevent access when the irradiator is not attended. Only operators and facility management may have access to keys to the personnel access barrier. There must be an intrusion alarm to detect unauthorized entry when the personnel access barrier is locked. Activation of the intrusion alarm must alert an individual (not necessarily onsite) who is prepared to respond or summon assistance.

3. Shielding.

- a. The radiation dose rate in areas that are normally occupied during operation of a panoramic irradiator may not exceed two hundredths millisievert [2 millirems] per hour at any location thirty centimeters or more from the wall of the room when the sources are exposed. The dose rate must be averaged over an area not to exceed one hundred square centimeters having no linear dimension greater than twenty centimeters. Areas where the radiation dose rate exceeds two hundredths millisievert [2 millirems] per hour must be locked, roped off, or posted.
- b. The radiation dose at thirty centimeters over the edge of the pool of a pool irradiator may not exceed two hundredths millisievert [2 millirems] per hour when the sources are in the fully shielded position.
- c. The radiation dose rate at one meter from the shield of a dry-source-storage panoramic irradiator when the source is shielded may not exceed two hundredths millisievert [2 millirems] per hour and at five centimeters from the shield may not exceed two-tenths millisievert [20 millirems] per hours.

4. Fire protection.

- a. The radiation room at a panoramic irradiator must have heat and smoke detectors. The detectors must activate an audible alarm. The alarm must be capable of alerting a person who is prepared to summon assistance promptly. The sources must automatically become fully shielded if a fire is detected.
- b. The radiation room at a panoramic irradiator must be equipped with a fire extinguishing system capable of extinguishing a fire without the entry of personnel into

the room. The system for the radiation room must have a shutoff valve to control flooding into unrestricted areas.

5. Radiation monitors.

- a. Irradiators with automatic product conveyor systems must have a radiation monitor with an audible alarm located to detect loose radioactive sources that are carried toward the product exit. If the monitor detects a source, an alarm must sound and product conveyors must stop automatically. The alarm must be capable of alerting an individual in the facility who is prepared to summon assistance. Underwater irradiators in which the product moves within an enclosed stationary tube are exempt from the requirements of this paragraph.
- b. Underwater irradiators that are not in a shielded radiation room must have a radiation monitor over the pool to detect abnormal radiation levels. The monitor must have an audible alarm and a visible indicator at entrances to the personnel access barrier around the pool. The audible alarm may have a manual shutoff. The alarm must be capable of alerting an individual who is prepared to respond promptly.

6. Control of source movement.

- a. The mechanism that moves the sources of a panoramic irradiator must require a key to actuate. Actuation of the mechanism must cause an audible signal to indicate that the sources are leaving the shielded position. Only one key may be in use at any time, and only operators or facility management may possess it. The key must be attached to a portable radiation survey meter by a chain or cable. The lock for source control must be designed so that the key may not be removed if the sources are in an unshielded position. The door to the radiation room must require the same key.
- b. The console of a panoramic irradiator must have a source position indicator that indicates when the sources are in the fully shielded position, when they are in transit, and when the sources are exposed.
- c. The control console of a panoramic irradiator must have a control that promptly returns the sources to the shielded position.
- d. Each control for a panoramic irradiator must be clearly marked as to its function.

7. Irradiator pools.

- a. For licenses initially issued after July 1, 1993, irradiator pools must either:
 - (1) Have a watertight stainless steel liner or a liner metallurgically compatible with other components in the pool; or
 - (2) Be constructed so that there is a low likelihood of substantial leakage and have a surface designed to facilitate decontamination. In either case, the licensee shall have a method to safely store the sources during repairs of the pool.
 - b. For licenses initially issued after July 1, 1993, irradiator pools must have no outlets more than five-tenths meter below the normal low water level that could allow water to drain out of the pool. Pipes that have intakes more than five-tenths meter below the normal low water level and that could act as siphons must have siphon breakers to prevent the siphoning of pool water.
 - c. A means must be provided to replenish water losses from the pool.
 - d. A visible indicator must be provided in a clearly visible location to indicate if the pool water level is below the normal low water level or above the normal high water level.
 - e. Irradiator pools must be equipped with a purification system designed to be capable of maintaining the water during normal operation at a conductivity of twenty microsiemens per centimeter or less and with a clarity so that the sources can be seen clearly.
 - f. A physical barrier, such as a railing or cover, must be used around or over irradiator pools during normal operation to prevent personnel from accidentally falling into the pool. The barrier may be removed during maintenance, inspection, and service operations.
 - g. If long-handled tools or poles are used in irradiator pools, the radiation dose rate on the handling areas of the tools may not exceed two hundredths millisievert [2 millirems] per hour.
8. **Source rack protection.** If the product to be irradiated moves on a product conveyor system, the source rack and the mechanism that moves the rack must be protected by a barrier or guides to prevent products and product carriers from hitting or touching the rack or mechanism.
9. **Power failures.**

- a. If electrical power at a panoramic irradiator is lost for longer than ten seconds, the sources must automatically return to the shielded position.
- b. The lock on the door of the radiation room of a panoramic irradiator may not be deactivated by a power failure.
- c. During a power failure, the area of any irradiator where sources are located may be entered only when using an operable and calibrated radiation survey meter.

History: Effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-04

33-10-14-06. Design requirements. Irradiators whose construction begins after July 1, 1993, must meet the design requirements of this section.

1. **Shielding.** For panoramic irradiators, the licensee shall design shielding walls to meet generally accepted building code requirements for reinforced concrete and design the walls, wall penetrations, and entranceways to meet the radiation shielding requirements of subsection 3 of section 33-10-14-05. If the irradiator will use more than two hundred thousand terabecquerels [5 million curies] of activity, the licensee shall evaluate the effects of heating of the shielding walls by the irradiator sources.
2. **Foundations.** For panoramic irradiators, the licensee shall design the foundation, with consideration given to soil characteristics, to ensure it is adequate to support the weight of the facility shield walls.
3. **Pool integrity.** For pool irradiators, the licensee shall design the pool to assure that it is leak resistant, that it is strong enough to bear the weight of the pool water and shipping casks, that a dropped cask would not fall on sealed sources, that all outlets or pipes meet the requirements of subdivision b of subsection 7 of section 33-10-14-05, and that metal components are metallurgically compatible with other components in the pool.
4. **Water handling system.** For pool irradiators, the licensee shall verify that the design of the water purification system is adequate to meet the requirements of subdivision e of subsection 7 of section 33-10-14-05. The system must be designed so that water leaking from the system does not drain to unrestricted areas without being monitored.
5. **Radiation monitors.** For all irradiators, the licensee shall evaluate the location and sensitivity of the monitor to detect

sources carried by the product conveyor system as required by subdivision a of subsection 5 of section 33-10-14-05. The licensee shall verify that the product conveyor is designed to stop before a source on the product conveyor would cause a radiation overexposure to any person. For pool irradiators, if the licensee uses radiation monitors to detect contamination under subdivision b of subsection 5 of section 33-10-14-08, the licensee shall verify that the design of radiation monitoring systems to detect pool contamination includes sensitive detectors located close to where contamination is likely to concentrate.

6. **Source rack.** For pool irradiators, the licensee shall verify that there are no crevices on the source or between the source and sourceholder that would promote corrosion on a critical area of the source. For panoramic irradiators, the licensee shall determine that source rack drops due to loss of power will not damage the source rack and that source rack drops due to failure of cables (or alternate means of support) will not cause loss of integrity of sealed sources. For panoramic irradiators, the licensee shall review the design of the mechanism that moves the sources to assure that the likelihood of a stuck source is low and that, if the rack sticks, a means exists to free it with minimal risk to personnel.
7. **Access control.** For panoramic irradiators, the licensee shall verify from the design and logic diagram that the access control system will meet the requirements of subsection 2 of section 33-10-14-05.
8. **Fire protection.** For panoramic irradiators, the licensee shall verify that the number, location, and spacing of the smoke and heat detectors are appropriate to detect fires and that the detectors are protected from mechanical and radiation damage. The licensee shall verify that the design of the fire extinguishing system provides the necessary discharge patterns, densities, and flow characteristics for complete coverage of the radiation room and that the system is protected from mechanical and radiation damage.
9. **Source return.** For panoramic irradiators, the licensee shall verify that the source rack will automatically return to the fully shielded position if offsite power is lost for more than ten seconds.
10. **Seismic.** For panoramic irradiators to be built in seismic areas, the licensee shall design the reinforced concrete radiation shields to retain their integrity in the event of an earthquake by designing to the seismic requirements of an appropriate source such as American concrete institute standard ACI 318-89, "building code requirements for reinforced concrete", chapter 21, "special provisions for seismic design", or local building codes, if current.

11. **Wiring.** For panoramic irradiators, the licensee shall verify that electrical wiring and electrical equipment in the radiation room are selected to minimize failures due to prolonged exposure to radiation.

History: Effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-04

33-10-14-07. Construction monitoring and acceptance testing. The requirements of this section must be met for irradiators whose construction begins after July 1, 1993. The requirements must be met prior to loading sources.

1. **Shielding.** For panoramic irradiators, the licensee shall monitor the construction of the shielding to verify that its construction meets design specifications and generally accepted building code requirements for reinforced concrete.
2. **Foundations.** For panoramic irradiators, the licensee shall monitor the construction of the foundations to verify that their construction meets design specifications.
3. **Pool integrity.** For pool irradiators, the licensee shall verify that the pool meets design specifications and shall test the integrity of the pool. The licensee shall verify that outlets and pipes meet the requirements of subdivision b of subsection 7 of section 33-10-14-05.
4. **Water handling system.** For pool irradiators, the licensee shall verify that the water purification system, the conductivity meter, and the water level indicators operate properly.
5. **Radiation monitors.** For all irradiators, the licensee shall verify the proper operation of the monitor to detect sources carried on the product conveyor system and the related alarms and interlocks required by subdivision a of subsection 5 of section 33-10-14-05. For pool irradiators, the licensee shall verify the proper operation of the radiation monitors and the related alarm if used to meet subdivision b of subsection 4 of section 33-10-14-08. For underwater irradiators, the licensee shall verify the proper operation of the over-the-pool monitor, alarms, and interlocks required by subdivision b of subsection 5 of section 33-10-14-05.
6. **Source rack.** For panoramic irradiators, the licensee shall test the movement of the source racks for proper operation prior to source loading; testing must include source rack lowering due to simulated loss of power. For all irradiators with product conveyor systems, the licensee shall observe and test the operation of the conveyor system to assure that the

requirements in subsection 8 of section 33-10-14-05 are met for protection of the source rack and the mechanism that moves the rack; testing must include tests of any limit switches and interlocks used to protect the source rack and mechanism that moves the rack from moving product carriers.

7. **Access control.** For panoramic irradiators, the licensee shall test the completed access control system to assure that it functions as designed and that all alarms, controls, and interlocks work properly.
8. **Fire protection.** For panoramic irradiators, the licensee shall test the ability of the heat and smoke detectors to detect a fire, to activate alarms, and to cause the source rack to automatically become fully shielded. The licensee shall test the operability of the fire extinguishing system.
9. **Source return.** For panoramic irradiators, the licensee shall demonstrate that the source racks can be returned to their fully shielded positions without offsite power.
10. **Computer systems.** For panoramic irradiators that use a computer system to control the access control system, the licensee shall verify that the access control system will operate properly if offsite power is lost and shall verify that the computer has security features that prevent an irradiator operator from commanding the computer to override the access control system when it is required to be operable.
11. **Wiring.** For panoramic irradiators, the licensee shall verify that the electrical wiring and electrical equipment that were installed meet the design specifications.

History: Effective July 1, 1995.
General Authority: NDCC 23-20.1-04
Law Implemented: NDCC 23-20.1-04

33-10-14-08. Operation of irradiators.

1. Training.

- a. Before an individual is permitted to operate an irradiator without a supervisor present, the individual must be instructed in:
 - (1) The fundamentals of radiation protection applied to irradiators, including the differences between external radiation and radioactive contamination, units of radiation dose, dose limits, why large radiation doses must be avoided, how shielding and access controls prevent large doses, how an irradiator is designed to prevent contamination, the

proper use of survey meters and personnel dosimeters, other radiation safety features of an irradiator, and the basic function of the irradiator;

- (2) The requirements of chapters 33-10-10 and 33-10-14 that are relevant to the irradiator;
 - (3) The operation of the irradiator;
 - (4) Those operating and emergency procedures listed in subsection 2 of section 33-10-14-08 that the individual is responsible for performing; and
 - (5) Case histories of accidents or problems involving irradiators.
- b. Before an individual is permitted to operate an irradiator without a supervisor present, the individual shall pass a written test on the instruction received consisting primarily of questions based on the licensee's operating and emergency procedures that the individual is responsible for performing and other operations necessary to safely operate the irradiator without supervision.
- c. Before an individual is permitted to operate an irradiator without a supervisor present, the individual must have received on-the-job training or simulator training in the use of the irradiator as described in the license application. The individual shall also demonstrate the ability to perform those portions of the operating and emergency procedures that the individual is to perform.
- d. The licensee shall conduct safety reviews for irradiator operators at least annually. The licensee shall give each operator a brief written test on the information. Each safety review must include, to the extent appropriate, each of the following:
- (1) Changes in operating and emergency procedures since the last review, if any;
 - (2) Changes in rules and license conditions since the last review, if any;
 - (3) Reports on recent accidents, mistakes, or problems that have occurred at irradiators, if any;
 - (4) Relevant results of inspections of operator safety performance;
 - (5) Relevant results of the facility's inspection and maintenance checks; and

- (6) A drill to practice an emergency or abnormal event procedure.
- e. The licensee shall evaluate the safety performance of each irradiator operator at least annually to ensure that rules, license conditions, and operating and emergency procedures are followed. The licensee shall discuss the results of the evaluation with the operator and shall instruct the operator on how to correct any mistakes or deficiencies observed.
- f. Individuals who will be permitted unescorted access to the radiation room of the irradiator or the area around the pool of an underwater irradiator, but who have not received the training required for operators and the radiation safety officer, shall be instructed and tested in any precautions they should take to avoid radiation exposure, any procedures or parts of procedures listed in subsection 2 of section 33-10-14-08 that they are expected to perform or comply with, and their proper response to alarms required in this chapter. Tests may be oral.
- g. Individuals who must be prepared to respond to alarms required by subdivision b of subsection 2 of section 33-10-14-05, subdivision i of subsection 2 of section 33-10-14-05, subdivision a of subsection 4 of section 33-10-14-05, subdivision a of subsection 5 of section 33-10-14-05, subdivision b of subsection 5 of section 33-10-14-05, and subdivision b of subsection 5 of this section must be trained and tested on how to respond. Each individual must be retested at least once a year. Tests may be oral.

2. Operating and emergency procedures.

- a. The licensee shall have and follow written operating procedures for:
 - (1) Operation of the irradiator, including entering and leaving the radiation room;
 - (2) Use of personnel dosimeters;
 - (3) Surveying the shielding of panoramic irradiators;
 - (4) Monitoring pool water for contamination while the water is in the pool and before release of pool water to unrestricted areas;
 - (5) Leak testing of sources;
 - (6) Inspection and maintenance checks required by subsection 6 of section 33-10-14-08;

- (7) Loading, unloading, and repositioning sources, if the operations will be performed by the licensee; and
 - (8) Inspection of movable shielding required by subdivision h of subsection 2 of section 33-10-14-05, if applicable.
- b. The licensee shall have and follow emergency or abnormal event procedures, appropriate for the irradiator type, for:
- (1) Sources stuck in the unshielded position;
 - (2) Personnel overexposures;
 - (3) A radiation alarm from the product exit portal monitor or pool monitor;
 - (4) Detection of leaking sources, pool contamination, or alarm caused by contamination of pool water;
 - (5) A low or high water level indicator, an abnormal water loss, or leakage from the source storage pool;
 - (6) A prolonged loss of electrical power;
 - (7) A fire alarm or explosion in the radiation room;
 - (8) An alarm indicating unauthorized entry into the radiation room, area around pool, or another alarmed area;
 - (9) Natural phenomena, including an earthquake, a tornado, flooding, or other phenomena as appropriate for the geographical location of the facility; and
 - (10) The jamming of automatic conveyor systems.
- c. The licensee may revise operating and emergency procedures without department approval only if all of the following conditions are met:
- (1) The revisions do not reduce the safety of the facility;
 - (2) The revisions are consistent with the outline or summary of procedures submitted with the license applications;
 - (3) The revisions have been reviewed and approved by the radiation safety officer; and

- (4) The users or operators are instructed and tested on the revised procedures before they are put into use.

3. Personnel monitoring.

- a. Irradiator operators shall wear either a film badge or a thermoluminescent dosimeter (TLD) while operating a panoramic irradiator or while in the area around the pool of an underwater irradiator. The film badge or TLD processor must be accredited by the national voluntary laboratory accreditation program for high energy photons in the normal and accident dose ranges (see subdivision c of subsection 1 of section 33-10-04.1-09). Each film badge or TLD must be assigned to and worn by only one individual. Film badges must be processed at least monthly, and TLDs must be processed at least quarterly.
- b. Other individuals who enter the radiation room of a panoramic irradiator shall wear a dosimeter, which may be a pocket dosimeter. For groups of visitors, only two people who enter the radiation room are required to wear dosimeters. If pocket dosimeters are used to meet the requirements of this subdivision, a check of their response to radiation must be done at least annually. Acceptable dosimeters must read within plus or minus thirty percent of the true radiation dose.

4. Radiation surveys.

- a. A radiation survey of the area outside the shielding of the radiation room of a panoramic irradiator must be conducted with the sources in the exposed position before the facility starts to operate. A radiation survey of the area above the pool of pool irradiators must be conducted after the sources are loaded but before the facility starts to operate. Additional radiation surveys of the shielding must be performed at intervals not to exceed three years and before resuming operation after addition of new sources or any modification to the radiation room shielding or structure that might increase dose rates.
- b. If the radiation levels specified in subsection 3 of section 33-10-14-05 are exceeded, the facility must be modified to comply with the requirements in subsection 3 of section 33-10-14-05.
- c. Portable radiation survey meters must be calibrated at least annually to an accuracy of plus or minus twenty percent for the gamma energy of the sources in use. The calibration must be done at two points on each scale or, for digital instruments, at one point per decade over the range that will be used. Portable radiation survey meters

must be of a type that does not saturate and read zero at high radiation dose rates.

- d. Water from the irradiator pool, other potentially contaminated liquids, and sediments from pool vacuuming must be monitored for radioactive contamination before release to unrestricted areas. Radioactive concentrations must not exceed those specified in chapter 33-10-04.1, table II, column 2 or table III of appendix B, "Annual Limits on Intake (ALI) and Derived Air Concentrations (DAC) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sanitary Sewerage".
- e. Before releasing resins for unrestricted use, they must be monitored before release in an area with a background level less than five-tenths microsievert [0.05 millirem] per hour. The resins may be released only if the survey does not detect radiation levels above background radiation levels. The survey meter used must be capable of detecting radiation levels of five-tenths microsievert [0.05 millirem] per hour.

5. Detection of leaking sources.

- a. Each dry-source-storage sealed source must be tested for leakage at intervals not to exceed six months using a leak test kit or method approved by the department, the United States nuclear regulatory commission, or an agreement state. In the absence of a certificate from a transferor that a test has been made within the six months before the transfer, the sealed source may not be used until tested. The test must be capable of detecting the presence of two hundred becquerels [0.005 microcurie] of radioactive material and must be performed by a person approved by the department, the United States nuclear regulatory commission, or an agreement state to perform the test.
- b. For pool irradiators, sources may not be put into the pool unless the licensee tests the sources for leaks or has a certificate from a transferor that leak test has been done within the six months before the transfer. Water from the pool must be checked for contamination each day the irradiator operates. The check may be done either by using a radiation monitor on a pool water circulating system or by analysis of a sample of pool water. If a check for contamination is done by analysis of a sample of pool water, the results of the analysis must be available within twenty-four hours. If the licensee uses a radiation monitor on a pool water circulating system, the detection of above normal radiation levels must activate an alarm. The alarm set-point must be set as low as practical, but high enough to avoid false alarms. The

licensee may reset the alarm set-point to a higher level if necessary to operate the pool water purification system to clean up contamination in the pool if specifically provided for in written emergency procedures.

- c. If a leaking source is detected, the licensee shall arrange to remove the leaking source from service and have it decontaminated, repaired, or disposed of by a department, United States nuclear regulatory commission, or agreement state licensee that is authorized to perform these functions. The licensee shall promptly check its personnel, equipment, facilities, and irradiated product for radioactive contamination. No product may be shipped until the product has been checked and found free of contamination. If a product has been shipped that may have been inadvertently contaminated, the licensee shall arrange to locate and survey that product for contamination. If any personnel are found to be contaminated, decontamination must be performed promptly. If contaminated equipment, facilities, or products are found, the licensee shall arrange to have them decontaminated or disposed of by a department, United States nuclear regulatory commission, or agreement state licensee that is authorized to perform these functions. If a pool is contaminated, the licensee shall arrange to clean the pool until the contamination levels do not exceed the appropriate concentration in table II, column 2, appendix B to chapter 33-10-04.1. (See subsection 5 of section 33-10-04.1-16 for reporting requirements.)

6. Inspection and maintenance.

- a. The licensee shall perform inspection and maintenance checks that include, as a minimum, each of the following at the frequency specified in the license or license application:
 - (1) Operability of each aspect of the access control system required by subsection 2 of section 33-10-14-05.
 - (2) Functioning of the source position indicator required by subdivision b of subsection 6 of section 33-10-14-05.
 - (3) Operability of the radiation monitor for radioactive contamination in pool water required by subdivision b of subsection 5 of section 33-10-14-08 using a radiation check source, if applicable.

- (4) Operability of the over-pool radiation monitor at underwater irradiators as required by subdivision b of subsection 5 of section 33-10-14-05.
 - (5) Operability of the product exit monitor required by subdivision a of subsection 5 of section 33-10-14-05.
 - (6) Operability of the emergency source return control required by subdivision c of subsection 6 of section 33-10-14-05.
 - (7) Leak-tightness of systems through which pool water circulates (visual inspection).
 - (8) Operability of the heat and smoke detectors and extinguisher system required by subsection 4 of section 33-10-14-05, but without turning extinguishers on.
 - (9) Operability of the means of pool water replenishment required by subdivision c of subsection 7 of section 33-10-14-05.
 - (10) Operability of the indicators of high and low pool water levels required by subdivision d of subsection 7 of section 33-10-14-05.
 - (11) Operability of the intrusion alarm required by subdivision i of subsection 2 of section 33-10-14-05, if applicable.
 - (12) Functioning and wear of the system, mechanisms, and cables used to raise and lower sources.
 - (13) Condition of the barrier to prevent products from hitting the sources or source mechanism as required by subsection 8 of section 33-10-14-05.
 - (14) Amount of water added to the pool to determine if the pool is leaking.
 - (15) Electrical wiring on required safety systems for radiation damage.
 - (16) Pool water conductivity measurements and analysis as required by subdivision b of subsection 7 of section 33-10-14-08.
- b. Malfunctions and defects found during inspection and maintenance checks must be repaired without undue delay.

7. Pool water purity.

- a. Pool water purification system must be run sufficiently to maintain the conductivity of the pool water below twenty microsiemens per centimeter under normal circumstances. If pool water conductivity rises above twenty microsiemens per centimeter, the licensee shall take prompt actions to lower the pool water conductivity and shall take corrective actions to prevent future recurrences.
- b. The licensee shall measure the pool water conductivity frequently enough, but no less than weekly, to assure that the conductivity remains below twenty microsiemens per centimeter. Conductivity meters must be calibrated at least annually.

8. Attendance during operation.

- a. Both an irradiator operator and at least one other individual, who is trained on how to respond and prepared to promptly render or summon assistance if the access control alarm sounds, shall be present onsite:
 - (1) Whenever the irradiator is operated using an automatic product conveyor system; and
 - (2) Whenever the product is moved into or out of the radiation room when the irradiator is operated in a batch mode.
- b. At a panoramic irradiator at which static irradiations (no movement of the product) are occurring, a person who has received the training on how to respond to alarms described in subdivision g of subsection 1 of section 33-10-14-08 must be onsite.
- c. At an underwater irradiator, an irradiator operator must be present at the facility whenever the product is moved into or out of the pool. Individuals who move the product into or out of the pool of an underwater irradiator need not be qualified as irradiator operators; however, they must have received the training described in subdivisions f and g of subsection 1 of section 33-10-14-08. Static irradiations may be performed without a person present at the facility.

9. Entering and leaving the radiation room.

- a. Upon first entering the radiation room of a panoramic irradiator after an irradiation, the irradiator operator shall use a survey meter to determine that the source has returned to its fully shielded position. The operator

shall check the functioning of the survey meter with a radiation check source prior to entry.

- b. Before exiting from and locking the door to the radiation room of a panoramic irradiator prior to a planned irradiation, the irradiator operator shall:
 - (1) Visually inspect the entire radiation room to verify that no one else is in it.
 - (2) Activate a control in the radiation room that permits the sources to be moved from the shielded position only if the door to the radiation room is locked within a preset time after setting the control.
- c. During a power failure, the area around the pool of an underwater irradiator may not be entered without using an operable and calibrated radiation survey meter unless the over-the-pool monitor required by subdivision b of subsection 5 of section 33-10-14-05 is operating with backup power.

10. Irradiation of explosive or flammable materials.

- a. Irradiation of explosive material is prohibited unless the licensee has received prior written authorization from the department. Authorization will not be granted unless the licensee can demonstrate that detonation of the explosive would not rupture the sealed sources, injure personnel, damage safety systems, or cause radiation overexposures of personnel.
- b. Irradiation of more than small quantities of flammable material (flashpoint below 140 degrees Fahrenheit [60 degrees Celsius]) is prohibited in panoramic irradiators unless the licensee has received prior written authorization from the department. Authorization will not be granted unless the licensee can demonstrate that a fire in the radiation room could be controlled without damage to sealed sources or safety systems and without radiation overexposures of personnel.

History: Effective July 1, 1995.
General Authority: NDCC 23-20.1-04
Law Implemented: NDCC 23-20.1-04

33-10-14-09. Records.

- 1. **Records and retention periods.** The licensee shall maintain the following records at the irradiator for the periods specified.

- a. A copy of the license, license conditions, documents incorporated into a license by reference, and amendments thereto until superseded by new documents or until the department terminates the license for documents not superseded.
- b. Records of each individual's training, tests, and safety reviews provided to meet the requirements of subdivisions a, b, c, d, f, and g of subsection 1 of section 33-10-14-08 until three years after the individual terminates work.
- c. Records of the annual evaluations of the safety performance of irradiator operators required by subdivision e of subsection 1 of section 33-10-14-08 for three years after the evaluation.
- d. A copy of the current operating and emergency procedures required by subsection 2 of section 33-10-14-08 until superseded or the department terminates the license. Records of the radiation safety officer's review and approval of changes in procedures as required by paragraph 3 of subdivision c of subsection 2 of section 33-10-14-08 retained for three years from the date of the change.
- e. Film badge and TLD results required by subsection 3 of section 33-10-14-08 until the department terminates the license.
- f. Records of radiation surveys required by subsection 4 of section 33-10-14-08 for three years from the date of the survey.
- g. Records of radiation survey meter calibrations required by subsection 4 of section 33-10-14-08 and pool water conductivity meter calibrations required by subdivision b of subsection 7 of section 33-10-14-08 until three years from the date of calibration.
- h. Records of the results of leak tests required by subdivision a of subsection 5 of section 33-10-14-08 and the results of contamination checks required by subdivision b of subsection 5 of section 33-10-14-08 for three years from the date of each test.
- i. Records of inspection and maintenance checks required by subsection 6 of section 33-10-14-08 for three years.
- j. Records of major malfunctions, significant defects, operating difficulties or irregularities, and major operating problems that involve required radiation safety equipment for three years after repairs are completed.

- k. Records of the receipt, transfer, and disposal of all licensed sealed sources as required by sections 33-10-04.1-15 and 33-10-01-06.
- l. Records on the design checks required by section 33-10-14-06 and the construction control checks as required by section 33-10-14-07 until the license is terminated. The records must be signed and dated. The title or qualification of the person signing must be included.
- m. Records related to decommissioning of the irradiator as required by subdivision g of subsection 14 of section 33-10-03-05.

2. Reports.

- a. In addition to the reporting requirements in chapter 33-10-04.1, the licensee shall report the following events:
 - (1) Source struck in an unshielded position.
 - (2) Any fire or explosion in a radiation room.
 - (3) Damage to the source racks.
 - (4) Failure of the cable or drive mechanism used to move the source racks.
 - (5) Inoperability of the access control system.
 - (6) Detection of radiation source by the product exit monitor.
 - (7) Detection of radioactive contamination attributable to licensed radioactive material.
 - (8) Structural damage to the pool liner or walls.
 - (9) Abnormal water loss or leakage from the source storage pool.
 - (10) Pool water conductivity exceeding one hundred microsiemens per centimeter.

- b. The report must include a telephone report within twenty-four hours as described in paragraph 1 of subdivision c of subsection 5 of section 33-10-04.1-16, and a written report within thirty days as described in paragraph 2 of subdivision c of subsection 5 of section 33-10-04.1-16.

History: Effective July 1, 1995.

General Authority: NDCC 23-20.1-04

Law Implemented: NDCC 23-20.1-03, 23-20.1-09.1