

**6 NYCRR Part 380**  
**Prevention and Control of Environmental Pollution by Radioactive Materials**  
**New York State Department of Environmental Conservation**

**Effective May 10, 2018**

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## Subpart 380-1 General Provisions

### Section 380-1.1 Purpose.

(a) The regulations in this Part establish standards for protection against ionizing radiation resulting from the disposal and release of radioactive material to the environment. These regulations are issued under Articles 1, 3, 17, 19, 27, 29, and 37 of the Environmental Conservation Law.

(b) It is the purpose of the regulations in this Part to control the disposal and release of radioactive material to the environment in such a manner that the total dose to an individual member of the public (including doses resulting from licensed and unlicensed radioactive material and from radiation sources other than background radiation) does not exceed the standards for protection against radiation prescribed in Subpart 380-5 of this Part. However, nothing in this Part limits actions that may be necessary to protect public health and safety or the environment.

### Section 380-1.2 Applicability.

(a) Except as otherwise specifically provided, this Part applies to any person who disposes of or releases licensed radioactive material within the State, uses licensed radioactive material in the environment, or whose loss of control of licensed radioactive material results or may result in the disposal or release of such material to the environment.

(b) This Part applies to any person who disposes of radioactive tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, where such tailings or wastes are not regulated by the U.S. Nuclear Regulatory Commission.

(c) This Part does not apply to the protection of radiation workers, and the limits in this Part do not apply to doses due to background radiation, to exposure of patients to radiation for the purpose of medical diagnosis or therapy, or to voluntary participation in medical research programs.

(d) This Part does not apply to persons who dispose of or release radioactive material in forms and quantities that are specifically exempt from general or specific licensing and regulatory control pursuant to regulations of the New York State Department of Health, New York City Department of Health and Mental Hygiene, U.S. Nuclear Regulatory Commission, or licensing agency of an agreement state.

(e) This Part applies to any person who disposes of or releases processed and concentrated naturally occurring radioactive material, also commonly referred to as technologically-enhanced naturally occurring radioactive material (TENORM).

(f) This Part does not apply to any person who disposes of or releases radioactive materials to the extent that such disposal or release is subject to regulation by the U.S. Nuclear Regulatory Commission or the U.S. Department of Energy.

(g) This Part does not apply to the following categories of U.S. Department of Energy or U.S. Nuclear Regulatory Commission contractor or subcontractor to the extent that such contractor or subcontractor receives, possesses, uses, transfers, or acquires sources of radiation under contract:

(1) prime contractors performing work for the U.S. Department of Energy at U.S. Government-owned or -controlled sites, including transportation of sources of radiation to or from such sites and the performance of contract services during temporary interruptions of such transportation;

(2) prime contractors of the U.S. Department of Energy performing research in, or development, manufacture, storage, testing, or transportation of, atomic weapons or components thereof;

(3) prime contractors of the U.S. Department of Energy using or operating nuclear reactors or other nuclear devices in a U.S. Government-owned vehicle or vessel; and

(4) any other prime contractor or subcontractor of the U.S. Department of Energy or of the U.S. Nuclear Regulatory Commission when the State and the U.S. Nuclear Regulatory Commission jointly determine:

(i) that the exemption of the prime contractor or subcontractor is authorized by law; and

(ii) that, under the terms of the contract or subcontract, there is adequate assurance that the work thereunder can be accomplished without undue risk to public health and safety or the environment.

(h) This Part applies to any person who owns or maintains a site containing buried radioactive material.

(i) This Part does not apply to persons who dispose of or release the following radioactive materials:

(1) intact smoke detectors containing Am-241 sources manufactured and distributed in accordance with a radioactive material license; or

(2) household solid waste containing excreted residues of radiopharmaceuticals that were administered to an individual in accordance with a radioactive material license.

### Section 380-1.3 Communications.

(a) Written Reports. Unless otherwise specified, written communications or reports required by this Part must be addressed to the New York State Department of Environmental Conservation, Radiation Control Permit Section, Division of Materials Management, 625 Broadway, Albany, NY 12233-7255.

(b) Telephoned Reports. All persons who make telephoned reports required by this Part must call the Radiation Control Permit Section at (518)-402-9625 during business hours (8:00 am - 4:30 pm), and the Department's Spill Hotline at (800)-457-7362 during all other times.

#### Section 380-1.4 Severability.

If any provision in this Part or its application or circumstances is held invalid, the remainder of this Part and the application of those provisions to persons or circumstances, other than those to which it is held invalid, will not be affected thereby.

#### Section 380-1.5 Transition.

The following constitute the transition rules for this Part.

##### (a) Existing permits.

(1) This subdivision applies to permittees having a permit in effect on the day before the effective date of this Part.

(2) Each permit is hereby continued until the expiration date of the permit. The permittee must comply with the conditions of the permit, except as they may be modified by the Department pursuant to Part 621 of this Title, until the permit expires, is discontinued, or is modified pursuant to Part 621 of this Title.

(3) Except as otherwise provided by this Part, the permittee must comply with all provisions of this Part beginning on the effective date of this Part or of any amendment to this Part.

##### (b) Persons currently in violation.

Persons operating in violation of this Part on the day before the effective date of this Part or of any amendment to the Part are subject to the requirements of this Part as of such effective date. Each enforcement action pending on the day before such effective date of this Part is hereby continued, and the standards for compliance are those contained in this Part.

##### (c) Persons currently not in violation.

(1) This subdivision applies to persons who first become subject to the permit requirements of section 380-3.1 of this Part due to amendment of this Part.

(2) No later than six months after the effective date of this subdivision, the person for whom a permit was not required on the day before such effective date must submit to the Department a complete permit application pursuant to section 380-3.2 of this Part.

(3) Upon receipt of a notice of complete application from the Department, the applicant will be authorized to continue activities regulated pursuant to this Part pending a final determination of the Department on the pending application. This authorization may cease if, subsequent to the completeness determination, the applicant fails to submit, by a reasonable deadline specified in writing by the Department, any additional information requested by the Department as necessary to review and act on the application.

## Subpart 380-2 Definitions

### Section 380-2.1 General Definitions.

(a) The following terms have the following meanings when used in this Part.

(1) 'Absorbed dose' means the energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).

(2) 'Activity' is the rate of disintegration (transformation) or decay of radioactive material. The units of activity are the curie (Ci) and the becquerel (Bq).

(3) 'Adult' means an individual 18 or more years of age.

(4) 'Agreement state' means any state that has entered into an effective agreement with the U.S. Nuclear Regulatory Commission pursuant to Section 274b. of the Atomic Energy Act of 1954, as amended.

(5) 'ALARA' (as low as reasonably achievable) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in this Part as is practical consistent with the purpose for which the action is undertaken, taking into account the state of technology, the economics of improvements in relation to the 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 radioactive materials in the public interest.

(6) 'Annual limit on intake' (ALI) means the derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by the reference man that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue. (ALI values for intake by ingestion and by inhalation of selected radionuclides are given in Table I, Columns 1 and 2, of section 380-11.7 of this Part).

(7) 'Applicant' means the person applying for a permit issued pursuant to this Part.

(8) '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 global fallout as it exists in the environment from the testing of nuclear explosive devices or from nuclear accidents such as Chernobyl that are not under the control of the licensee. "Background radiation" does not include radiation from source, byproduct, or special nuclear material regulated by the U.S. Nuclear Regulatory Commission, the State, or another agreement state.

(9) 'Biological material' means material derived from living organisms.

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

(11) ‘Collective dose’ is 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.

(12) ‘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 50-year period following the intake.

(13) ‘Committed effective dose equivalent’ ( $H_{E,50}$ ) is the sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues ( $H_{E,50} = \sum W_T H_{T,50}$ ).

(14) ‘Constraint’ (or dose constraint) means a value above which specified permittee actions are required.

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

(16) ‘Department’ means the New York State Department of Environmental Conservation.

Newly renumbered paragraphs 380-2.1(a)(17) and (19) are amended to read as follows:

(17) ‘Derived air concentration’ (DAC) means the concentration of a given radionuclide in air which, if breathed by the reference man for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an intake of one ALI. DAC values are given in Table I, Column 3, in section 380-11.7 of this Part.

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

(19) ‘Discharge’ means a release of material to the ground or surface water of the State.

(20) ‘Disposal’ means the act of discarding regulated radioactive material. Depositing or injecting radioactive material in the environment is disposal unless the radioactive material is being used in the environment, as authorized by a permit issued under section 380-3.1 of this Part.

(21) ‘Dose’ (or radiation dose) is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent, as defined in section 380-2.3 of this Subpart.

(22) ‘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 rem and sievert (Sv). Rem is the special unit and sievert is the SI unit used for any of the quantities expressed as dose equivalent.



(23) ‘Effective dose equivalent’ ( $H_E$ ) is the sum of the products of the dose equivalent to the organ or issue ( $H_T$ ) and the weighting factors ( $W_T$ ) applicable to each of the body organs or tissues that are irradiated ( $H_E = \sum W_T H_T$ ).

(24) ‘Effluent’ means material released to the air or water.

(25) ‘Effluent treatment’ means those processes designed to reduce the concentration of radionuclides in effluents to air or water that employ equipment permanently installed in the effluent duct or pipe. Effluent treatment does not include devices or procedures employed before the effluent enters the duct or pipe to reduce the concentration of radionuclide in the air or water entering the duct or pipe.

(26) ‘Emission’ means a release of material to air.

(27) ‘Environmental Conservation Law’ (or ECL) means Chapter 43-B of the Consolidated Laws of New York.

(28) ‘Exposure’ means the quotient of  $dQ$  divided 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 380-2.2 of this Subpart).

(29) ‘External dose’ means that portion of the dose equivalent received from radiation sources outside the body.

(30) ‘Extremities’ means hand, elbow, arm below the elbow, foot, knee, and leg below the knee.

(31) ‘Gray’ (see section 380-2.3 of this Subpart).

(32) ‘Incineration’ means thermally breaking down waste in an enclosed device using controlled flame combustion to an ash residue that contains little or no combustible material as a method of disposal.

(33) ‘Individual’ means any human being.

(34) ‘Inspection’ means an official examination or observation including, but not limited to, records, tests, surveys, and monitoring to determine compliance with rules, regulations, orders, requirements, and conditions of the Department.

(35) ‘Internal dose’ means that portion of the dose equivalent received from radioactive material taken into the body.

(36) ‘License’ means a radioactive material license issued by the New York State Department of Health, New York City Department of Health and Mental Hygiene, U.S. Nuclear Regulatory Commission, or licensing agency of an agreement state, authorizing the receipt, possession, use, transfer, or disposal of radioactive material.

(37) ‘Licensee’ means the holder of a license.

(38) ‘Licensing agency’ means the municipal, State, or Federal government agency authorized to issue radioactive material licenses.

(39) ‘Licensed material’ means radioactive material subject to general or specific licensing and regulatory control by the New York State Department of Health, New York City Department of Health and Mental Hygiene, U.S. Nuclear Regulatory Commission, or licensing agency of an agreement state.

(40) ‘Limits’ (dose limits) means the permissible upper bounds of radiation doses.

(41) ‘Loss of control of radioactive material’ means the loss of containment of radioactive material or radioactive material whose location is unknown which may result in the unauthorized disposal or release of radioactive material to the environment.

(42) ‘Member of the public’ means any individual except when that individual is receiving an occupational dose.

(43) ‘Monitoring’ (radiation monitoring, radiation protection monitoring) means the measurement of radiation levels, radioactive material concentrations, surface area concentrations, or quantities of radioactive material and the use of the results of these measurements to evaluate potential exposures and doses.

(44) ‘Nonstochastic effect’ (deterministic effect) means a health effect, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect.

(45) ‘NYCRR’ means the Codes, Rules and Regulations of the State of New York.

(46) ‘Occupational dose’ means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation and/or to radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include doses received from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.

(47) ‘Permit’ means a radiation control permit issued pursuant to this Part authorizing the disposal or release of radioactive material to the environment, the use of radioactive materials in the environment, or the maintenance of a former radioactive waste land burial site. The permit identifies the approved action, includes any variances, and contains standards and conditions of performance for the action.

(48) ‘Permittee’ means a person authorized to undertake an action regulated under a permit issued pursuant to this Part. Eligible permittees are owners, lessees, and operators at a site or facility.

(49) 'Person' means:

(i) Any individual, public, private, or government corporation, joint stock company, industry, partnership, co-partnership, firm, association, trust, estate, public or private institution, agency, department, or bureau of the State, or group, political subdivision of the State, any other State or political subdivision thereof, Federal government agencies other than the U.S. Nuclear Regulatory Commission or Department of Energy, any foreign government or nation or any political subdivision of any such government or nation; and

(ii) Any legal subsidiary, successor, representative, agent, or agency of the foregoing, or any other legal entity whatsoever.

(50) 'Public dose' means the dose received by a member of the public from exposure to radiation and/or radioactive material released into the environment by a person regulated under this Part, or to any other source of radiation under the control of a person regulated under this Part. It does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with a radioactive materials license, or from voluntary participation in medical research programs.

(51) 'Quality Factor' (Q) means the modifying factor (listed in Tables 1 and 2 of section 380-2.3(b) and (c) of this Subpart) that is used to derive dose equivalent from absorbed dose.

(52) 'Rad' (see section 380-2.3 of this Subpart).

(53) 'Radiation' (ionizing radiation) means alpha particles, beta particles, gamma rays, x-rays, neutrons, high-speed electrons, high-speed protons, and other particles capable of producing ions. Radiation, as used in this Part, does not include non-ionizing radiation, such as radiowaves or microwaves, or visible, infrared, or ultraviolet light.

(54) 'Radioactive material' means any material (solid, liquid, or gas) which emits radiation spontaneously.

(55) 'Radioactivity' means the transformation of unstable atomic nuclei by the emission of radiation.

(56) 'Reference man' means a hypothetical aggregation of human physical and physiological characteristics determined by international consensus. These characteristics may be used by researchers and public health workers to standardize results of experiments and to relate biological insult to a common base.

(57) 'Release' means the introduction of material to the environment. Release includes all discharges and emissions.

(58) 'Rem' (see section 380-2.3 of this Subpart).

(59) ‘Restricted area’ means an area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area.

(60) ‘Sanitary sewerage’ means a system of public sewers for carrying off waste water and refuse, but excluding on-site waste water treatment facilities, septic tanks, and leach fields owned or operated by the licensee.

(61) ‘SI’ is the abbreviation for the International System of Units.

(62) ‘Sievert’ (see section 380-2.3 of this Subpart).

(63) ‘Stochastic effect’ (probabilistic effect) means a health effect that occurs randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects.

(64) ‘Survey’ means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. When appropriate, such an evaluation includes a physical survey of the location of radioactive material, and measurements, monitoring, or calculations of levels of radiation, concentrations, or quantities of radioactive material present.

(65) ‘Total effective dose equivalent’ (TEDE) means the sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

(66) ‘Technologically enhanced naturally occurring radioactive material’ (TENORM) means naturally occurring radioactive material whose radionuclide concentrations are increased by or as a result of past or present human practices, such as manufacturing or water processing.

(67) ‘Uncontrolled release’ means a release of material to the environment that was unplanned, due to failure to secure radioactive material, equipment failure, human error, or a severe event such as fire, flood, or storm.

(68) ‘Unrestricted area’ means an area, access to which is neither limited nor controlled by the licensee.

(69) ‘Week’ means seven consecutive days.

(70) ‘Weighting factor ( $W_T$ )’ for an organ or tissue (T) is the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. For calculating the effective dose equivalent, the values of  $W_T$  are:

ORGAN DOSE WEIGHTING FACTORS	
Organ or Tissue	$W_T$
Gonads	0.25
Breast	0.15
Red bone marrow	0.12
Lung	0.12
Thyroid	0.03
<u>Bone surfaces</u>	<u>0.03</u>
Remainder	0.30 <sup>a</sup>
Whole Body	1.00 <sup>b</sup>

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

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

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

(72) ‘Year’ means the period of time beginning in January used to determine compliance with the provisions of this Part. The permittee may change the starting date of the year used to determine compliance by the permit provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years.

### Section 380-2.2 Units of Radioactivity.

For the purposes of this Part, activity is expressed in the special unit of curies (Ci) or in the SI unit of becquerels (Bq), or their multiples, or disintegrations (transformations) per unit of time.

- (a) One becquerel = one disintegration per second ( $S^{-1}$ ).
- (b) One curie =  $3.7 \times 10^{10}$  disintegrations per second  
 =  $3.7 \times 10^{10}$  becquerels  
 =  $2.22 \times 10^{12}$  disintegrations per minute.

Section 380-2.3 Units of radiation dose.

(a) Definitions. As used in this Part, the units of radiation doses are:

(1) ‘Gray’ (Gy) is the SI unit of absorbed dose. One gray is equal to an absorbed dose of one joule/kilogram (100 rads).

(2) ‘Rad’ is the special unit of absorbed dose. One rad is equal to an absorbed dose of 100 ergs/gram or 0.01 joule/kilogram (0.01 gray).

(3) ‘Rem’ is the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 sievert).

(4) ‘Sievert’ is the SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor (1 Sv = 100 rems).

(b) As used in this Part, the quality factors for converting absorbed dose to dose equivalent are shown in Table 1 of this subdivision.

TABLE 1		
QUALITY FACTORS AND ABSORBED DOSE EQUIVALENCIES		
Type of Radiation	Quality Factor (Q)	Absorbed Dose Equal to a Unit Dose Equivalent <sup>a</sup>
X-, gamma, or beta radiation	1	1
Alpha particles, multiple-charged particles, fission fragments and heavy particles of unknown charge	20	0.05
Neutrons of unknown energy	10	0.1
High-energy protons	10	0.1

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

(c) If it is more convenient to measure the neutron fluence rate than to determine the neutron dose equivalent rate in rems per hour or sieverts per hour, as provided in Table 1 in subdivision (b) of this section, one rem (0.01 Sv) of neutron radiation of unknown energies may, for purposes of the regulations in this Part, be assumed to result from a total fluence of 25 million neutrons per square centimeter incident upon the body. If sufficient information exists to estimate the approximate energy distribution of the neutrons, [the radiation installation may use] the fluence rate per unit dose equivalent or the appropriate Q value from Table 2 of this subdivision may be used to convert a measured tissue dose in rads to dose equivalent in rems.

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

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

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

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

## Subpart 380-3 Permits

### Section 380-3.1 Permit requirements

(a) Except as provided in section 380-3.5 of this Part, persons subject to this Part must obtain a permit before:

- (1) emitting radioactive material to the air;
- (2) discharging radioactive material to a water of the State as defined in ECL Article 17, Title 1;
- (3) incinerating radioactive material;
- (4) disposing of radioactive material in the environment; or
- (5) using radioactive material in the environment in a manner that results in the release of radioactive material to the environment.

(b) Persons who obtain a permit may only release, use, or dispose of the radioactive material as prescribed by that permit.

### Section 380-3.2 Permit applications.

(a) An application for a permit must satisfy the general requirements for complete applications contained in Part 621 of this Title.

(b) An application for a permit must satisfy the requirements of Part 617 of this Title, which include the submission of a properly completed environmental assessment form.

(c) A complete application for a permit must:

(1) contain information which thoroughly describes any proposed radioactive materials disposal, release, or site maintenance procedures in sufficient detail to:

- (i) demonstrate that the proposed action will comply with this Part;
- (ii) provide adequate justification for the proposed action; and
- (iii) enable the Department to assess the nature and extent of any potential environmental impact.

(2) Include the following:

- (i) procedures to ensure compliance with the requirements of this Part; and



(ii) any supplemental information which the Department notifies the applicant is necessary to review the application.

(d) In addition to the information required by subdivision (c) of this section, a complete application for a permit authorizing the emission of radioactive materials to the air, discharge of radioactive material to ground or surface water, or incineration of radioactive material, must also include the following:

(1) an identification of each emission or discharge point and the effluent flow rate through each;

(2) an identification of all radionuclides to be emitted or discharged, and an estimate of the total activity and average concentration of each radionuclide in the effluent through each emission or discharge point in one year;

(3) a description of the effluent treatment, if any, that will be used to minimize the radionuclides in the effluent, how such systems will be maintained, and how wastes produced during treatment will be disposed of; and

(4) if effluent treatment will be used, an estimate of the total annual activity and average annual concentration of each radionuclide in the effluent both before and after treatment.

(e) In addition to the information required by subdivision (c) of this section, a complete application for a permit authorizing the use of radioactive materials in the environment must also include the following:

(1) a list of all radionuclides to be used;

(2) the total activity of each radionuclide;

(3) a description of the method of use or application; and

(4) the objective of the use to be performed, and the location of use.

### Section 380-3.3 Terms of permits.

Permits issued pursuant to this Part must be issued for a term not to exceed five years from the date of issuance unless renewed, suspended, revoked, or discontinued by the Department.

### Section 380-3.4 Exemption.

Exhaust systems which release radioactive material to air that meet each of the following criteria are exempt from the permitting requirements of this Part:

(a) The annual average concentration of a single radionuclide in the effluent at the emission point is less than or equal to 10 percent of the radionuclide concentrations listed in Table II, Column 1 of section 380-11.7 of this Part without relying on effluent treatment.

(b) If more than one radionuclide is released at the emission point, the following conditions must be satisfied:

(1) the fraction of the values in Table II, Column 1 of section 380-11.7 of this Part represented by effluents to air must be determined by dividing the actual average annual concentration of each radionuclide released by the concentration of that radionuclide listed in Table II, Column 1 of section 380-11.7 of this Part; and

(2) the sum of the fractions for each radionuclide required by paragraph (b)(1) of this section does not exceed 10 percent of unity without relying on effluent treatment to reduce radionuclide concentrations.

#### Section 380-3.5 Variances.

(a) Unless otherwise precluded by law, the Department may, upon its own initiative or upon written application from any person who is subject to this Part, grant a variance from one or more specific provisions of this Part under the conditions set forth in this section.

(b) Every application for a variance must:

(1) be submitted to the Department in writing;

(2) be submitted in conjunction with an application for a permit, where a permit is also required pursuant to this Part;

(3) identify the specific provisions of this Part from which a variance is sought;

(4) demonstrate that compliance with the identified provisions would, on the basis of conditions unique to the person's particular situation, tend to impose an unreasonable economic, technological, or safety burden on the person or the public; and

(5) demonstrate that the proposed activity will have no significant adverse impact on the public health and safety and the environment, will be consistent with the provisions of the ECL, and will meet all other provisions of this Part.

(c) An application for a variance to approve proposed procedures to dispose of radioactive material not otherwise authorized by Subpart 380-4 of this Part must also include the following:

(1) a description of the waste containing radioactive material to be disposed of, including the physical and chemical properties relevant to risk evaluation, and the proposed manner and conditions of waste disposal;

(2) an analysis and evaluation of pertinent information on the nature of the environment;

(3) the nature and location of other potentially affected licensed and unlicensed facilities; and

(4) analyses and procedures to ensure that doses are maintained ALARA and within the dose limits in section 380-5.1 of this Part.

(d) In granting any variance under this section, the Department may impose specific conditions necessary to assure that the subject action will have no significant adverse impact on the public health and safety or the environment, including requiring a permit when needed. Failure to comply with such conditions is a violation of this Part.

#### Subpart 380-4 Waste Disposal

##### Section 380-4.1 Authorized disposal methods.

(a) Persons may dispose of radioactive material only by:

(1) transfer to a licensee pursuant to any applicable municipal, state, or federal law;

(2) decay in storage, where the storage is authorized by a license issued by the New York City Department of Health & Mental Hygiene, New York State Department of Health, U.S. Nuclear Regulatory Commission, or licensing agency of an agreement state;

(3) release to the environment within the limits established in section 380-5.1 of this Part and in accordance with Subpart 380-3 of this Part;

(4) transfer to a facility authorized by a license issued by the New York City Department of Health & Mental Hygiene, New York State Department of Health, U.S. Nuclear Regulatory Commission, or licensing agency of an agreement state to accept the radioactive material for storage, treatment or disposal, or operated by the U.S. Department of Energy;

(5) incineration as authorized by and in conformance with a permit issued pursuant to section 380-3.1 of this Part;

(6) a release into sanitary sewerage as authorized by and in conformance with section 380-4.2 of this Subpart; or

(7) disposal as authorized by section 380-4.3 of this Subpart.

##### Section 380-4.2 Disposal by release into sanitary sewerage.

(a) Licensed material may be released into sanitary sewerage if each of the following conditions is satisfied:

(1) the material is:

(i) readily soluble in water; or

(ii) biological material that is readily dispersible in water;

(2) the quantity of licensed or other radioactive material released into the sewer in one month divided by the average monthly volume of water released into the sewer does not exceed the concentration listed in Table III of section 380-11.7 of this Part;

(3) if more than one radionuclide is released, the following conditions must also be satisfied:

(i) the fraction of the limit in Table III of section 380-11.7 of this Part represented by releases into sanitary sewerage must be determined by dividing the actual monthly average concentration of each radionuclide released into the sewer by the concentration of that radionuclide listed in Table III of section 380-11.7 of this Part; and

(ii) the sum of the fractions for each radionuclide required by subparagraph (i) of this paragraph does not exceed unity; and

(4) the total quantity of licensed and other radioactive material released into the sanitary sewerage system in a year does not exceed five curies (185 GBq) of hydrogen-3, one curie (37 GBq) of carbon-14, and one curie (37 GBq) of all other radioactive materials combined.

(b) Excreta from individuals undergoing medical diagnosis or therapy with radioactive material is not subject to the limitations contained in subdivision (a) of this section.

(c) The Department may impose additional restrictions on the release of licensed material into sanitary sewerage in order to minimize or avoid adverse environmental impacts if:

(1) the material is, or has the potential to be, concentrated in the sewage treatment plant sludge;  
or

(2) the sludge is incinerated, and the material is, or has the potential to be, concentrated in the ash.

#### Section 380-4.3 Disposal of specific wastes.

(a) The following licensed material may be disposed of without regard to its radioactivity, but must be disposed of in accordance with any other applicable provisions of the ECL:

(1) 0.05 microcurie (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting;

(2) 0.05 microcurie (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of animal tissue, averaged over the weight of the entire animal; and

(3) 0.05 microcurie (1.85 kBq), or less, of hydrogen-3 or carbon-14 per gram of biodegradable animal bedding.

(b) Tissue disposed of under subdivision (a) of this section must not be disposed of in a manner that would permit its use either as food for humans or as animal feed.

(c) Records must be maintained in accordance with section 380-8.5 of this Part.

#### Section 380-4.4 Compliance with environmental and health protection regulations.

Nothing in this subpart relieves any person subject to this Part from complying with other applicable federal, state, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of under this Subpart.

#### Subpart 380-5 Radiation Dose Limits For Individual Members Of The Public

##### Section 380-5.1 Dose limits for individual members of the public.

(a) Each person subject to this Part must minimize the disposal and release of radioactive material to the environment so that:

(1) the total effective dose equivalent to individual members of the public from the disposal or release does not exceed 0.1 rem (1 mSv) in a year, exclusive of the dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material which have been released in accordance with a license, from voluntary participation in medical research programs, and from the licensee's disposal of material into sanitary sewerage in accordance with section 380-4.2 of this Part;

(2) the dose in any unrestricted area in the environment from external sources does not exceed 0.002 rem (0.02 mSv) in any one hour; and

(3) doses to individual members of the public are ALARA.

(b) Constraint on airborne emissions.

To implement the ALARA requirements of section 380-7.2 of this Part, and notwithstanding the requirements in this section, a constraint on airborne emissions of radioactive material to the environment, excluding radon-222 and its decay products, must be established by permittees such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 mSv) per year from these emissions. If a permittee subject to this requirement exceeds this dose constraint, the permittee must report the exceedance as provided in Subpart 380-9 of this Part and promptly take appropriate corrective action to ensure against recurrence.

(c) If a licensee allows members of the public to have access to restricted areas in the environment (i.e., outdoors), the limits for members of the public continue to apply to those individuals.

(d) The Department may impose additional restrictions on radiation levels in unrestricted areas in the environment and on the total quantity of radionuclides that may be disposed of or released in effluents in order to restrict collective dose.

Section 380-5.2 Compliance with dose limits for individual members of the public.

(a) Each person subject to this Part must make or cause to be made, as appropriate, surveys of radiation levels in unrestricted areas in the environment and radioactive materials in effluents released to unrestricted areas in the environment to demonstrate compliance with the dose limits for individual members of the public established in section 380-5.1 of this Subpart.

(b) Surveys must show compliance with the annual dose limit in section 380-5.1 of this Subpart by:

(1) demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the disposal or release does not exceed the annual dose limit; or

(2) demonstrating that:

(i) the annual average concentrations of radioactive material released in effluents to air or water at the emission point or point of discharge do not exceed the values specified in Table II of section 380-11.7 of this Part; and

(ii) if an individual were continually present in an unrestricted area, the dose from external sources would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year.

(c) Upon approval from the Department, a permittee may adjust the effluent concentration values in Table II of section 380-11.7 of this Part, for members of the public, to take into account the actual physical and chemical characteristics of the effluent (e.g., aerosol size distribution, solubility, density, radioactive decay equilibrium, chemical form). Nothing in this subdivision alters the requirements of section 380-5.1 of this subpart.

Subpart 380-6 Surveys and Calibrations

Section 380-6.1 Surveys required.

Each person subject to this Part must make or cause to be made, surveys that:

(a) are necessary to demonstrate compliance with this Part; and

(b) are reasonable, in scope and method, to evaluate:

(1) the magnitude and extent of radiation levels in the environment;

(2) concentrations or quantities of radioactive material in effluents, used in the environment, or disposed of in the environment; and

(3) the potential radiological hazards and environmental impacts.

## Section 380-6.2 Calibration of instruments.

Each person subject to this Part must ensure that instruments and equipment used for quantitative radiation measurements (e.g., dose rate and effluent monitoring) are calibrated at least annually for the radiation measured. Instruments used to measure effluent flow rates must also be calibrated annually.

## Subpart 380-7 Release Minimization Programs

### Section 380-7.1 Release minimization program required.

Each permittee must develop, document, and implement a release minimization program for maintaining releases of radioactive material to the environment ALARA. The release minimization program:

(a) may be part of the radiation protection (ALARA) program required as part of a license; and

(b) must be commensurate with the scope and extent of permitted activities and sufficient to ensure compliance with the provisions of this Part.

### Section 380-7.2 Procedures and engineering controls.

The permittee must use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve doses to members of the public that are ALARA.

### Section 380-7.3 Periodic reviews.

The permittee must, at intervals not to exceed 12 months, review the release minimization program content and implementation.

## Subpart 380-8 Records

### Section 380-8.1 General provisions.

(a) Each person subject to this Part must use the units of curie, rad, rem, [or the SI units of becquerel, gray, sievert,] including multiples and subdivisions thereof, and must clearly indicate the units of all quantities on records required by this Part.

(b) In the records required by this Part, the person may record quantities in SI units in parentheses following each of the units specified in paragraph (a) of this section. However, all quantities must be recorded as stated in paragraph (a) of this section.

(c) The person must make a clear distinction among the quantities entered on the records required by this Part (e.g., total effective dose equivalent, deep-dose equivalent, committed effective dose equivalent).

(d) The person must retain the records required by this Part for three years after the record is made, or until the licensing agency terminates each pertinent license requiring the record, whichever is longer.

## Section 380-8.2 Records of release minimization programs.

Each permittee must maintain records of the release minimization program, including:

- (a) the provisions of the program; and
- (b) audits and other reviews of program content and implementation.

## Section 380-8.3 Records of surveys and calibrations.

(a) Each person subject to this Part must maintain records showing the results of surveys and calibrations required by Subpart 380-6 of this Part.

(b) Each person subject to this Part must maintain records of the results of measurements, monitoring, and calculations used to evaluate the release of radioactive effluents to the environment, or the use of radioactive material in the environment, including protocols for sample collections and analysis.

## Section 380-8.4 Records of dose to individual members of the public.

Each person subject to this Part must maintain records sufficient to demonstrate compliance with the dose limit for individual members of the public specified in section 380-5.1 of this Part.

## Section 380-8.5 Records of waste disposal.

Each person subject to this Part must maintain records of the disposal of radioactive materials made under sections 380-3.5, 380-4.2, and 380-4.3 of this Part, including existing records of burials in soil authorized before April 1985.\*

## Section 380-8.6 Form of records.

(a) Each record required by this Part must be legible throughout the specified retention period. The record may be maintained in the following forms:

- (1) original;
- (2) a reproduced copy or a microform, provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period; or
- (3) in electronic media with the capability for producing legible, accurate, and complete records during the required retention period.

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\* A previous 6 NYCRR section 380.3 permitted burial of small quantities of licensed materials in soil before April 1985, without specific Department authorization.



(b) Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials, dates, and signatures. Persons subject to this Part must maintain adequate safeguards against tampering with and loss of records.

(c) Raw data pertaining to surveys of radioactive materials releases required by section 380-8.3 of this Subpart that are stored in an electronic form must also be made available in a printed copy form when requested by the Department.

#### Section 380-8.7 Transfer of Permit.

If a permit is transferred pursuant to Part 621 of this Title, the permittee must transfer all records required by this Subpart to the new permittee and the new permittee will be responsible for maintaining these records for the specified retention period.

#### Subpart 380-9 Reports

##### Section 380-9.1 Annual reports.

Each permittee must submit to the Department an annual report on its radioactive releases or disposals during the previous calendar year. The report must list the radionuclides released or disposed of, and the total quantity and the average annual concentrations of each. Permittees that have installed fixed environmental dosimeters in accordance with a permit must also report all dosimetry results. This report must be submitted by the end of each March as described in section 380-1.3 of this Part.

##### Section 380-9.2 Notification of incidents.

(a) Immediate report. Each person subject to this part must notify the Department by telephone as described in section 380-1.3 of this Part as soon as possible but not later than two hours after the discovery of an event that prevents immediate protective actions necessary to avoid an uncontrolled release of radioactive material to the environment from occurring.

(b) Report on next business day. Each person must notify the Department by telephone as described in section 380-1.3 of this Part no later than the next business day after the discovery of any of the following events involving radioactive material:

(1) an unplanned contamination event that occurs in the environment;

(2) an event in which equipment is disabled or fails to function as designed to prevent releases exceeding regulatory limits, to prevent exposures to radiation and radioactive materials exceeding regulatory limits;

(3) a fire or explosion damaging any radioactive material or any device, container, or equipment containing radioactive material when the event creates a potential for an uncontrolled release to the environment;

(4) any lost, stolen, or missing radioactive material under such circumstances that it appears the material may have been released to the environment or disposed of in a manner not authorized under Subpart 380-4 of this Part;

(5) an exceedance of the annual release limit established in a Department-issued permit;

(6) an exceedance of the constraint on air emissions established by subdivision 380-5.1(b) of this Part; or

(7) an exceedance of any regulatory limit specified in this Part.

### Section 380-9.3 Contents of Reports.

(a) Telephoned reports. To the extent that the information is available at the time of notification, the information provided in telephoned reports must include:

(1) the caller's name and call back telephone number;

(2) a description of the event, including date and time;

(3) the exact location of the event;

(4) the isotopes, quantities, and chemical and physical form of the radioactive material involved;

(5) any data available on environmental contamination levels; and

(6) a description of any corrective or mitigating actions taken.

(b) Written reports. Each person required to make a telephoned report under section 380-9.2 of this Subpart must, within 30 days after making the telephone report submit a written report as described in section 380-1.3 of this Part, setting forth the following information, unless otherwise directed by the Department. Written reports prepared pursuant to other regulations may be submitted to fulfill this requirement if the reports contain all of the necessary information.

(1) a description of the event, including the date and time, the probable cause, and the manufacturer and model number (if applicable) of any equipment that failed or malfunctioned;

(2) the exact location of the event;

(3) a description of the radioactive material involved, including the isotopes, quantity, and chemical and physical form;

(4) an assessment of any environmental contamination including the results of any surveys performed, samples analyzed, and pathway analyses;

(5) an assessment of the potential radiation dose to the public;

(6) remedial or mitigation measures undertaken or planned and the results of any evaluations or assessments of those measures; and

(7) corrective actions taken or planned to ensure against a recurrence, including the schedule for achieving conformance with applicable limits, and associated permit conditions.

(c) A report of the loss or theft of radioactive material must also contain the following information:

(1) the circumstances under which any loss or theft occurred;

(2) a statement of the disposition, or probable disposition, of the radioactive material involved;

(3) actions that have been taken, or will be taken, to recover the material; and

(4) procedures or measures that have been, or will be, adopted to prevent a recurrence of the loss or theft of radioactive material.

(d) Followup Reports. Subsequent to filing any written report, each person must also report to the Department in writing any additional substantive information on the event, loss, or theft within 30 days after the person learns of information not previously reported to the Department in writing.

#### Subpart 380-10 General Regulatory Requirements

##### Section 380-10.1 Additional requirements.

The Department may, by rule, regulation, or order, impose upon any person subject to this Part such requirements in addition to those established in this Part as it deems appropriate or necessary to protect public health and safety or the environment from the disposal or release of radioactive material to the environment.

##### Section 380-10.2 Enforcement and inspection and access to records.

(a) Enforcement.

(1) Every person who disposes of or releases radioactive material within the State, or whose loss of control of radioactive material results or may result in the disposal or uncontrolled release of such material to the environment is subject to every applicable requirement identified in this Part, unless the person demonstrates to the Department's satisfaction that the person is clearly exempt from regulation under, or from the requirement in question that is contained in, this Part.

(2) Without limitation to any other civil or criminal sanction that may be applicable, any person who violates any provision of, or fails to perform any duty imposed by this Part, or any term or condition of any permit issued pursuant to this Part, or any final determination or order of the Commissioner of the New York State Department of Environmental Conservation issued pursuant to any statutory authority under which this Part is promulgated, is subject to all applicable civil, administrative, and criminal sanctions set forth in ECL Article 71.

(b) Inspection and access to records.

(1) An authorized representative of the Department may enter any facility property or premises of any person where radioactive material is disposed of or released to the environment, during normal business hours or at any other time during which regulated actions are reasonably believed to be occurring, for the purpose of inspecting such facility, property or premises to determine compliance, subject to the limitations set forth in this subdivision. Such entry will be accomplished with the minimum disruption to operations at the facility.

(2) Inspections will be limited to areas or places where regulated actions are occurring or are reasonably believed to be occurring.

(3) All records required to be maintained under this Part must be furnished upon request, within a reasonable period of time specified by the Department. Inspections of records and documents required to be maintained under this Part will occur at the location where such records are maintained or at a reasonable time and place specified by the Department.

(4) Except as provided for in paragraph (5) of this subdivision, inspections will be limited in frequency, duration, and scope based on the following factors:

- (i) potential environmental harm of the regulated activity;
- (ii) complexity of the regulated activity and the time needed to determine compliance;
- (iii) specific federal or State inspection mandates;
- (iv) noncompliance history of the person or facility;
- (v) existence or need for permits;
- (vi) information received concerning noncompliance;
- (vii) self-reported violations or releases that require a response by the Department; and
- (viii) need to follow up previous inspections which uncovered noncompliance with additional inspections.

(5) Notwithstanding paragraph (4) of this subdivision, inspections by the Department may occur with greater frequency when:

- (i) a permit or order authorizes more frequent inspection; and
- (ii) the Department has a reasonable basis to determine inspection is warranted in order to make a compliance determination.

### Section 380-10.3 Tests.

Each person subject to this Part must perform upon instructions from the Department, or must allow the Department to perform, such reasonable tests as the Department deems appropriate or necessary including, but not limited to, tests of:

- (a) radioactive material;
- (b) facilities wherein radioactive material is used or stored;
- (c) radiation detection and monitoring instruments; and
- (d) other equipment and devices used in connection with utilization or storage of radioactive material.

### Section 380-10.4 Vacating premises.

Each permittee must, no less than 30 days before vacating or relinquishing possession or control of premises which may have been contaminated with radioactive material, notify the Department in writing of intent to vacate. The permittee must remediate any environmental contamination in such a manner as the Department may specify.

### Section 380-10.5 Safeguarding information.

Any requests for the release of information in the custody of the Department related to this Part will be handled according to the provisions of New York Public Officers Law section 87 and Part 616 of this Title, Public Access to Records of the Department.

### Section 380-10.6 Impounding.

The Department may impound sources of radiation when it determines such action is necessary to protect the public health and safety or the environment.

### Section 380-10.7 Completeness and accuracy of information.

(a) Information provided to the Department by an applicant for a permit, or by a permittee, or information required by statute or by the Department's regulations, orders, or permit conditions to be maintained by the applicant or the permittee, must be complete and accurate in all material respects.

(b) Each applicant or permittee must notify the Department of any material change in either the submitted application materials or permitted activities. Notification must be provided to the Department within two working days of identifying the information. This requirement is not applicable to information which is already required to be provided to the Department by other reporting or updating requirements.

Section 380-10.8 Deliberate misconduct.

(a) For the purposes of this section, deliberate misconduct means an intentional act or omission that the person knows:

(1) could cause, or would have caused if not detected, a permittee, applicant, contractor or subcontractor to be in violation of any rule, regulation, order, or permit issued under this Part; or

(2) constitutes a violation of a requirement, procedure, instruction, contract, purchase order, or policy of a permittee, applicant, contractor, or subcontractor.

(b) This section applies to the following persons and their employees:

(1) permittees;

(2) applicants for permits; and

(3) contractors (including suppliers and consultants) and subcontractors of any permittee or applicant for a permit who knowingly provide to the permittee, applicant, contractor, or subcontractor, any components, equipment, materials, or other goods or services that relate to a permittee's or applicant's actions under this Part.

(c) The persons listed in subdivision (b) of this section, must not:

(1) engage in deliberate misconduct; or

(2) deliberately submit to the Department, a permittee, an applicant, or a contractor or subcontractor of the permittee or applicant, information that the person submitting the information knows to be materially incomplete or inaccurate.

(d) A person who violates this section may be subject to enforcement action and penalties as authorized by the ECL.

Section 380-10.9 Prohibitions.

(a) The uncontrolled release, loss of control, transfer to an unauthorized person, or abandonment of radioactive material is prohibited.

(b) It is a violation of this Part to do any act prohibited by any provision of this Part; or to fail to perform any act required by any provision of this Part.

## Subpart 380-11 Annual Limits on Intake (ALI) and Derived Air Concentrations (DAC) Of Radionuclides For Occupational Exposure; Effluent Concentrations; Concentrations For Release To Sewerage

### Section 380-11.1 Introduction

For each radionuclide, Table I of section 380-11.7 of this Subpart indicates the chemical form which is to be used for selecting the appropriate ALI or DAC value. The ALIs and DACs for inhalation are given for an aerosol with an activity median aerodynamic diameter (AMAD) of 1  $\mu\text{m}$  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 halftimes for D of less than 10 days, for W from 10 to 100 days, and for Y greater than 100 days. The class (D, W, or Y) given in the columns headed "class" applies only to the inhalation ALIs and DACs given in Table I, Columns 2 and 3.

For each radionuclide, Table II of section 380-11.7 provides concentration values for airborne and liquid effluents released to the general environment. Table III of section 380-11.7 provides concentration limits for releases to sanitary sewer systems. The concentration values listed in Tables II and III of section 380-11.7 are used to control the release of radionuclides to the environment in such a manner that the total dose to an individual member of the public does not exceed the limits prescribed in Subpart 380-5 of this Part.

### Section 380-11.2 Notation

The values in Tables I, II, and III of section 380-11.7 of this Subpart are presented in the computer "E" notation. In this notation a value of 6E-02 represents a value of  $6 \times 10^{-2}$  or 0.06, 6E+2 represents  $6 \times 10^2$  or 600, and 6E+0 represents  $6 \times 10^0$  or 6.

### Section 380-11.3 Table I Occupational Values

(a) Note that the columns in Table I of section 380-11.7 of this subpart captioned "Oral Ingestion ALI," "Inhalation ALI," and "DAC," are applicable to occupational exposure to radioactive material.

(b) The ALIs in section 380-11.7 of this Subpart are the annual intakes of given radionuclide by "Reference Man" which would result in either

(1) a committed effective dose equivalent of five rems (stochastic ALI) or

(2) a committed dose equivalent of 50 rems to an organ or tissue (non-stochastic ALI). The stochastic ALIs 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 rems. 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 380-2.1 of this Part. The non-stochastic ALIs were derived to avoid non-stochastic effects, such as prompt damage to tissue or reduction in organ function.

(c) 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 parts of the GI tract -- stomach, small intestine, upper large intestine, and lower large intestine -- are to be treated as four separate organs.

(d) Note that the dose equivalents for extremities (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.

(e) When an ALI is defined by the stochastic dose limit, this value alone, is given. When an ALI is determined by the non-stochastic dose limit to an organ, the organ or tissue to which the limit applies is shown, and the ALI 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.)

(f) The use of the ALIs listed first, the more limiting of the stochastic and non-stochastic ALIs, 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 ALI is limiting, use of that non-stochastic ALI is considered unduly conservative, the licensee may use the stochastic ALI to determine the committed effective dose equivalent. However, the licensee shall also ensure that the 50-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 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 ALIs (ALIs) that contribute to the committed dose equivalent to the organ receiving the highest dose does not exceed unity (i.e.,  $\Sigma (\text{intake (in } \mu\text{Ci) of each radionuclide}/\text{ALI}_{\text{ins}}) < 1.0$ ). If there is an external deep dose equivalent contribution of  $H_d$  then this sum must be less than one -  $(H_d/50)$  instead of being  $< 1.0$ .

(g) The derived air concentration (DAC) values are derived limits intended to control chronic occupational exposures. The relationship between the DAC and the ALI 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  $2 \times 10^4$  ml per minute is the volume of air breathed per minute at work by reference man under working conditions of light work.

(h) The DAC 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.

(i) The ALI and DAC values relate to exposure to the single radionuclide named, but also include contributions from the ingrowth of any daughter radionuclide produced in the body by the decay of the parent. However, intakes that include both the parent and daughter radionuclides should be treated by the general method appropriate for mixtures.



(j) The value of ALI and DAC 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. When an individual is exposed to radioactive materials which fall under several of the translocation classifications (i.e., Class D, Class W, or Class Y) of the same radionuclide, the exposure may be evaluated as if it were a mixture of different radionuclides.

(k) 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 radioisotopes. For this reason, values are given for Class D, W, and Y compounds, even for very short-lived radionuclides.

#### Section 380-11.4 Table II Effluent Concentrations

(a) The columns in Table II of this Subpart captioned "Effluents," "Air," and "Water," are applicable to the assessment and control of dose to the public, particularly in the implementation of the provisions of section 380-5.2 of this Part. 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 0.05 rem (50 millirems or 0.5 millisieverts) to reference man, except for noble gasses. For noble gasses, the concentration values given in Column 1 of Table II are equivalent to the radionuclide concentration that would produce a total effective dose equivalent of 0.10 rem (100 millirems or 1 millisieverts) due to submersion.

(b) Consideration of non-stochastic limits has not been included in deriving the air and water effluent concentration values because non-stochastic effects are presumed not to occur at the dose levels established for individual members of the public. For radionuclides, where the non-stochastic limit was governing in deriving the occupational DAC, the stochastic ALI was used in deriving the corresponding airborne effluent limit in Table II. For this reason, the DAC and airborne effluent limits are not always proportional.

(c) 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 ALI was divided by  $2.4 \times 10^9$ , relating the inhalation ALI to the DAC, as explained above, and then divided by a factor of 300. The factor of 300 includes the following components: a factor of 50 to relate the 5-rem annual occupational dose limit to the 0.1-rem limit for members of the public; a factor of 3 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 2 to adjust the occupational values (derived for adults) so that they are applicable to other age groups.

(d) For those radionuclides for which submersion (external dose) is limiting, the occupational DAC in Table I, Column 3, was divided by 219. The factor of 219 is composed of a factor of 50, as described above, and a factor of 4.38 relating occupational exposure for 2,000 hours per year to full-time exposure (8,760 hours per year). Note that an additional factor of 2 for age considerations is not warranted in the submersion case.

(e) The water concentrations were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by  $7.3 \times 10^7$ . The factor of  $7.3 \times 10^7$  (ml) includes the following components: the factors of 50 and 2 described above and a factor of  $7.3 \times 10^5$  (ml) which is the annual water intake of Reference Man.

(f) Note 2 in section 380-11.7 of this Subpart provides groupings of radionuclides which are applicable to unknown mixtures of radionuclides. These groupings (including occupational inhalation ALIs and DACs, air and water effluent concentrations and sewerage) require demonstrating that the most limiting radionuclides in successive classes are absent. The limit for the unknown mixture is defined when the presence of the one of the listed radionuclides cannot be definitely excluded as being present either from knowledge of the radionuclide composition of the source or from actual measurements.

#### Section 380-11.5 Table III Releases to Sewer

The monthly average concentration limits for release to sanitary sewers are applicable to the provisions in section 380-4.2 of this Part. The concentration values were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by  $7.3 \times 10^6$ (ml). The factor of  $7.3 \times 10^6$ (ml) is composed of a factor of  $7.3 \times 10^5$ (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 0.5 rem.

Section 380-11.6 LIST OF ELEMENTS

Name	Atomic Symbol	Atomic Number	Name	Atomic 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	Nitrogen	N	7
Barium	Ba	56	Osmium	Os	76
Berkelium	Bk	97	Oxygen	O	8
Beryllium	Be	4	Palladium	Pd	46
Bismuth	Bi	83	Phosphorus	P	15
Bromine	Br	35	Platinum	Pt	78
Cadmium	Cd	48	Plutonium	Pu	94
Calcium	Ca	20	Polonium	Po	84
Californium	Cf	98	Potassium	K	19
Carbon	C	6	Praseodymium	Pr	59
Cerium	Ce	58	Promethium	Pm	61
Cesium	Cs	55	Protactinium	Pa	91
Chlorine	Cl	17	Radium	Ra	88
Chromium	Cr	24	Radon	Rn	86
Cobalt	Co	27	Rhenium	Re	75
Copper	Cu	29	Rhodium	Rh	45
Curium	Cm	96	Rubidium	Rb	37
Dysprosium	Dy	66	Ruthenium	Ru	44
Einsteinium	Es	99	Samarium	Sm	62
Erbium	Er	68	Scandium	Sc	21
Europium	Eu	63	Selenium	Se	34
Fermium	Fm	100	Silicon	Si	14
Fluorine	F	9	Silver	Ag	47
Francium	Fr	87	Sodium	Na	11
Gadolinium	Gd	64	Strontium	Sr	38
Gallium	Ga	31	Sulfur	S	16
Germanium	Ge	32	Tantalum	Ta	73
Gold	Au	79	Technetium	Tc	43
Hafnium	Hf	72	Tellurium	Te	52
Holmium	Ho	67	Terbium	Tb	65
Hydrogen	H	1	Thallium	Tl	81
Indium	In	49	Thorium	Th	90
Iodine	I	53	Thulium	Tm	69
Iridium	Ir	77	Tin	Sn	50
Iron	Fe	26	Titanium	Ti	22
Krypton	Kr	36	Tungsten	W	74
Lanthanum	La	57	Uranium	U	92
Lead	Pb	82	Vanadium	V	23
Lutetium	Lu	71	Xenon	Xe	54
Magnesium	Mg	12	Ytterbium	Yb	70
Manganese	Mn	25	Yttrium	Y	39
Mendelevium	Md	101	Zinc	Zn	30
			Zirconium	Zr	40

Section 380-11.7 Tables of Concentrations

Section 380-11.7 Tables of Concentrations		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
		Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
			Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )				
Atomic Radionuclide No.	Class							
1	Hydrogen-3	Water, DAC includes skin absorption	8E+4	8E+4	2E-5	1E-7	1E-3	1E-2
		Gas (HT or T <sub>2</sub> ) Submersion <sup>1</sup> : Use above values as HT and T <sub>2</sub> oxidize in air and in the body to HTO.						
4	Beryllium-7	W, all compounds except those given for Y	4E+4	2E+4	9E-6	3E-8	6E-4	6E-3
		Y, oxides, halides, and nitrates	-	-	2E+4	8E-6	3E-8	-
4	Beryllium-10	W, see <sup>7</sup> Be	1E+3	2E+2	6E-8	2E-10	-	-
		LLI wall (1E+3)	-	-	-	-	2E-5	2E-4
		Y, see <sup>7</sup> Be	-	1E+1	6E-9	2E-11	-	-
6	Carbon-11 <sup>2</sup>	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
7	Nitrogen-13	Submersion <sup>1</sup>	-	-	4E-6	2E-8	-	-
8	Oxygen-15	Submersion <sup>1</sup>	-	-	4E-6	2E-8	-	-
9	Fluorine-18 <sup>2</sup>	D, fluorides of H, Li, Na, K, Rb, Cs, and Fr	5E+4	7E+4	3E-5	1E-7	-	-
		St wall (5E+4)	-	-	-	-	7E-4	7E-3
		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	-	9E+4	4E-5	1E-7	-	-
		Y, lanthanum fluoride	-	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

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
12	Magnesium-28	D, all compounds except those given for W	7E+2	2E+3	7E-7	2E-9	9E-6	9E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	1E+3	5E-7	2E-9	-	-
13	Aluminum-26	D, all compounds except those given for W	4E+2	6E+1	3E-8	9E-11	6E-6	6E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	9E+1	4E-8	1E-10	-	-
14	Silicon-31	D, all compounds except those given for W and Y	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, oxides, hydroxides, carbides, and nitrates	-	3E+4	1E-5	5E-8	-	-
		Y, aluminosilicate glass	-	3E+4	1E-5	4E-8	-	-
14	Silicon-32	D, see $^{31}\text{Si}$	2E+3	2E+2	1E-7	3E-10	-	-
		LLI wall (3E+3)	-	-	-	-	4E-5	4E-4
		W, see $^{31}\text{Si}$	-	1E+2	5E-8	2E-10	-	-
		Y, see $^{31}\text{Si}$	-	5E+0	2E-9	7E-12	-	-
15	Phosphorus-32	D, all compounds except phosphates given for W	6E+2	9E+2	4E-7	1E-9	9E-6	9E-5
		W, phosphates of $\text{Zn}^{2+}$ , $\text{S}^{3+}$ , $\text{Mg}^{2+}$ , $\text{Fe}^{3+}$ , $\text{Bi}^{3+}$ , and lanthanides	-	4E+2	2E-7	5E-10	-	-
15	Phosphorus-33	D, see $^{32}\text{P}$	6E+3	8E+3	4E-6	1E-8	8E-5	8E-4
		W, see $^{32}\text{P}$	-	3E+3	1E-6	4E-9	-	-
16	Sulfur-35	Vapor	-	1E+4	6E-6	2E-8	-	-
		D, sulfides and sulfates except those given for W	1E+4	2E+4	7E-6	2E-8	-	-
		LLI wall (8E+3)	-	-	-	-	1E-4	1E-3
		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	2E+3	9E-7	3E-9	-	-



<u>Section 380-11.7 Tables of Concentrations</u>			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
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	3E+3	1E-6	4E-9	-	-
			LLI wall (3E+3)	-	-	-	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 <sup>2</sup>	Y, all compounds	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
22	Titanium-44	D, all compounds except those given for W and Y	3E+2	1E+1	5E-9	2E-11	4E-6	4E-5
		W, oxides, hydroxides, carbides, halides, and nitrates	-	3E+1	1E-8	4E-11	-	-
		Y, SrTiO <sub>3</sub>	-	6E+0	2E-9	8E-12	-	-
22	Titanium-45	D, see <sup>44</sup> Ti	9E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		W, see <sup>44</sup> Ti	-	4E+4	1E-5	5E-8	-	-
		Y, see <sup>44</sup> Ti	-	3E+4	1E-5	4E-8	-	-
23	Vanadium-47 <sup>2</sup>	D, all compounds except those given for W	3E+4	8E+4	3E-5	1E-7	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		W, oxides, hydroxides, carbides, and halides	-	1E+5	4E-5	1E-7	-	-
23	Vanadium-48	D, see <sup>47</sup> V	6E+2	1E+3	5E-7	2E-9	9E-6	9E-5
		W, see <sup>47</sup> V	-	6E+2	3E-7	9E-10	-	-
23	Vanadium-49	D, see <sup>47</sup> V	7E+4	3E+4	1E-5	-	-	-
			LLI wall (9E+4)	Bone surf (3E+4)	-	5E-8	1E-3	1E-2
		W, see <sup>47</sup> V	-	2E+4	8E-6	2E-8	-	-

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
24	Chromium-48	D, all compounds except those given for W and Y	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, halides and nitrates	-	7E+3	3E-6	1E-8	-	-
		Y, oxides and hydroxides	-	7E+3	3E-6	1E-8	-	-
24	Chromium-49 <sup>2</sup>	D, see <sup>48</sup> Cr	3E+4	8E+4	4E-5	1E-7	4E-4	4E-3
		W, see <sup>48</sup> Cr	-	1E+5	4E-5	1E-7	-	-
		Y, see <sup>48</sup> Cr	-	9E+4	4E-5	1E-7	-	-
24	Chromium-51	D, see <sup>48</sup> Cr	4E+4	5E+4	2E-5	6E-8	5E-4	5E-3
		W, see <sup>48</sup> Cr	-	2E+4	1E-5	3E-8	-	-
		Y, see <sup>48</sup> Cr	-	2E+4	8E-6	3E-8	-	-
25	Manganese-51 <sup>2</sup>	D, all compounds except those given for W	2E+4	5E+4	2E-5	7E-8	3E-4	3E-3
		W, oxides, hydroxides, halides, and nitrates	-	6E+4	3E-5	8E-8	-	-
25	Manganese-52m <sup>2</sup>	D, see <sup>51</sup> Mn	3E+4	9E+4	4E-5	1E-7	-	-
		St wall (4E+4)	-	-	-	-	5E-4	5E-3
		W, see <sup>51</sup> Mn	-	1E+5	4E-5	1E-7	-	-
25	Manganese-52	D, see <sup>51</sup> Mn	7E+2	1E+3	5E-7	2E-9	1E-5	1E-4
		W, see <sup>51</sup> Mn	-	9E+2	4E-7	1E-9	-	-
25	Manganese-53	D, see <sup>51</sup> Mn	5E+4	1E+4	5E-6	-	7E-4	7E-3
		Bone surf (2E+4)	-	(2E+4)	-	3E-8	-	-
		W, see <sup>51</sup> Mn	-	1E+4	5E-6	2E-8	-	-
25	Manganese-54	D, see <sup>51</sup> Mn	2E+3	9E+2	4E-7	1E-9	3E-5	3E-4
		W, see <sup>51</sup> Mn	-	8E+2	3E-7	1E-9	-	-
25	Manganese-56	D, see <sup>51</sup> Mn	5E+3	2E+4	6E-6	2E-8	7E-5	7E-4
		W, see <sup>51</sup> Mn	-	2E+4	9E-6	3E-8	-	-
26	Iron-52	D, all compounds except those given for W	9E+2	3E+3	1E-6	4E-9	1E-5	1E-4
		W, oxides, hydroxides, and halides	-	2E+3	1E-6	3E-9	-	-
26	Iron-55	D, see <sup>52</sup> Fe	9E+3	2E+3	8E-7	3E-9	1E-4	1E-3
		W, see <sup>52</sup> Fe	-	4E+3	2E-6	6E-9	-	-



<u>Section 380-11.7 Tables of Concentrations</u>			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
26	Iron-59	D, see $^{52}\text{Fe}$	8E+2	3E+2	1E-7	5E-10	1E-5	1E-4
		W, see $^{52}\text{Fe}$	-	5E+2	2E-7	7E-10	-	-
26	Iron-60	D, see $^{52}\text{Fe}$	3E+1	6E+0	3E-9	9E-12	4E-7	4E-6
		W, see $^{52}\text{Fe}$	-	2E+1	8E-9	3E-11	-	-
27	Cobalt-55	W, all compounds except those given for Y	1E+3	3E+3	1E-6	4E-9	2E-5	2E-4
		Y, oxides, hydroxides, halides, and nitrates	-	3E+3	1E-6	4E-9	-	-
27	Cobalt-56	W, see $^{55}\text{Co}$	5E+2	3E+2	1E-7	4E-10	6E-6	6E-5
		Y, see $^{55}\text{Co}$	4E+2	2E+2	8E-8	3E-10	-	-
27	Cobalt-57	W, see $^{55}\text{Co}$	8E+3	3E+3	1E-6	4E-9	6E-5	6E-4
		Y, see $^{55}\text{Co}$	4E+3	7E+2	3E-7	9E-10	-	-
27	Cobalt-58m	W, see $^{55}\text{Co}$	6E+4	9E+4	4E-5	1E-7	8E-4	8E-3
		Y, see $^{55}\text{Co}$	-	6E+4	3E-5	9E-8	-	-
27	Cobalt-58	W, see $^{55}\text{Co}$	2E+3	1E+3	5E-7	2E-9	2E-5	2E-4
		Y, see $^{55}\text{Co}$	1E+3	7E+2	3E-7	1E-9	-	-
27	Cobalt-60m <sup>2</sup>	W, see $^{55}\text{Co}$	1E+6	4E+6	2E-3	6E-6	-	-
		St wall (1E+6)	-	-	-	-	2E-2	2E-1
		Y, see $^{55}\text{Co}$	-	3E+6	1E-3	4E-6	-	-
27	Cobalt-60	W, see $^{55}\text{Co}$	5E+2	2E+2	7E-8	2E-10	3E-6	3E-5
		Y, see $^{55}\text{Co}$	2E+2	3E+1	1E-8	5E-11	-	-
27	Cobalt-61 <sup>2</sup>	W, see $^{55}\text{Co}$	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		Y, see $^{55}\text{Co}$	2E+4	6E+4	2E-5	8E-8	-	-
27	Cobalt-62m <sup>2</sup>	W, see $^{55}\text{Co}$	4E+4	2E+5	7E-5	2E-7	-	-
		St wall (5E+4)	-	-	-	-	7E-4	7E-3
		Y, see $^{55}\text{Co}$	-	2E+5	6E-5	2E-7	-	-

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci}/\text{ml}$ )	Water ( $\mu\text{Ci}/\text{ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
28	Nickel-56	D, all compounds except those given for W	1E+3	2E+3	8E-7	3E-9	2E-5	2E-4
		W, oxides, hydroxides, and carbides	-	1E+3	5E-7	2E-9	-	-
		Vapor	-	1E+3	5E-7	2E-9	-	-
28	Nickel-57	D, see $^{56}\text{Ni}$	2E+3	5E+3	2E-6	7E-9	2E-5	2E-4
		W, see $^{56}\text{Ni}$	-	3E+3	1E-6	4E-9	-	-
		Vapor	-	6E+3	3E-6	9E-9	-	-
28	Nickel-59	D, see $^{56}\text{Ni}$	2E+4	4E+3	2E-6	5E-9	3E-4	3E-3
		W, see $^{56}\text{Ni}$	-	7E+3	3E-6	1E-8	-	-
		Vapor	-	2E+3	8E-7	3E-9	-	-
28	Nickel-63	D, see $^{56}\text{Ni}$	9E+3	2E+3	7E-7	2E-9	1E-4	1E-3
		W, see $^{56}\text{Ni}$	-	3E+3	1E-6	4E-9	-	-
		Vapor	-	8E+2	3E-7	1E-9	-	-
28	Nickel-65	D, see $^{56}\text{Ni}$	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see $^{56}\text{Ni}$	-	3E+4	1E-5	4E-8	-	-
		Vapor	-	2E+4	7E-6	2E-8	-	-
28	Nickel-66	D, see $^{56}\text{Ni}$	4E+2	2E+3	7E-7	2E-9	-	-
		LLI wall (5E+2)	-	-	-	-	6E-6	6E-5
		W, see $^{56}\text{Ni}$	-	6E+2	3E-7	9E-10	-	-
		Vapor	-	3E+3	1E-6	4E-9	-	-
29	Copper-60 <sup>2</sup>	D, all compounds except those given for W and Y	3E+4	9E+4	4E-5	1E-7	-	-
		St wall (3E+4)	-	-	-	-	4E-4	4E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	4E-5	1E-7	-	-
29	Copper-61	D, see $^{60}\text{Cu}$	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see $^{60}\text{Cu}$	-	4E+4	2E-5	6E-8	-	-
		Y, see $^{60}\text{Cu}$	-	4E+4	1E-5	5E-8	-	-
29	Copper-64	D, see $^{60}\text{Cu}$	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see $^{60}\text{Cu}$	-	2E+4	1E-5	3E-8	-	-
		Y, see $^{60}\text{Cu}$	-	2E+4	9E-6	3E-8	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
29	Copper-67	D, see $^{60}\text{Cu}$ W, see $^{60}\text{Cu}$ Y, see $^{60}\text{Cu}$	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	D, all compounds except those given for W  W, oxides, hydroxides, carbides, halides, and nitrates	5E+4 St wall (6E+4)  -	2E+5 - 2E+5	7E-5 - 8E-5	2E-7 - 3E-7	- 9E-4 -	- 9E-3 -
31	Gallium-66	D, see $^{65}\text{Ga}$ W, see $^{65}\text{Ga}$	1E+3 -	4E+3 3E+3	1E-6 1E-6	5E-9 4E-9	1E-5 -	1E-4 -
31	Gallium-67	D, see $^{65}\text{Ga}$ W, see $^{65}\text{Ga}$	7E+3 -	1E+4 1E+4	6E-6 4E-6	2E-8 1E-8	1E-4 -	1E-3 -
31	Gallium-68 <sup>2</sup>	D, see $^{65}\text{Ga}$ W, see $^{65}\text{Ga}$	2E+4 -	4E+4 5E+4	2E-5 2E-5	6E-8 7E-8	2E-4 -	2E-3 -
31	Gallium-70 <sup>2</sup>	D, see $^{65}\text{Ga}$  W, see $^{65}\text{Ga}$	5E+4 St wall (7E+4) -	2E+5 - 2E+5	7E-5 - 8E-5	2E-7 - 3E-7	- 1E-3 -	- 1E-2 -
31	Gallium-72	D, see $^{65}\text{Ga}$ W, see $^{65}\text{Ga}$	1E+3 -	4E+3 3E+3	1E-6 1E-6	5E-9 4E-9	2E-5 -	2E-4 -

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
31	Gallium-73	D, see $^{65}\text{Ga}$	5E+3	2E+4	6E-6	2E-8	7E-5	7E-4
		W, see $^{65}\text{Ga}$	-	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 <sup>2</sup>	D, see $^{66}\text{Ge}$	3E+4	9E+4	4E-5	1E-7	-	-
		St wall (4E+4)	-	-	-	-	6E-4	6E-3
		W, see $^{66}\text{Ge}$	-	1E+5	4E-5	1E-7	-	-
32	Germanium-68	D, see $^{66}\text{Ge}$	5E+3	4E+3	2E-6	5E-9	6E-5	6E-4
		W, see $^{66}\text{Ge}$	-	1E+2	4E-8	1E-10	-	-
32	Germanium-69	D, see $^{66}\text{Ge}$	1E+4	2E+4	6E-6	2E-8	2E-4	2E-3
		W, see $^{66}\text{Ge}$	-	8E+3	3E-6	1E-8	-	-
32	Germanium-71	D, see $^{66}\text{Ge}$	5E+5	4E+5	2E-4	6E-7	7E-3	7E-2
		W, see $^{66}\text{Ge}$	-	4E+4	2E-5	6E-8	-	-
32	Germanium-75 <sup>2</sup>	D, see $^{66}\text{Ge}$	4E+4	8E+4	3E-5	1E-7	-	-
		St wall (7E+4)	-	-	-	-	9E-4	9E-3
		W, see $^{66}\text{Ge}$	-	8E+4	4E-5	1E-7	-	-
32	Germanium-77	D, see $^{66}\text{Ge}$	9E+3	1E+4	4E-6	1E-8	1E-4	1E-3
		W, see $^{66}\text{Ge}$	-	6E+3	2E-6	8E-9	-	-
32	Germanium-78 <sup>2</sup>	D, see $^{66}\text{Ge}$	2E+4	2E+4	9E-6	3E-8	-	-
		St wall (2E+4)	-	-	-	-	3E-4	3E-3
		W, see $^{66}\text{Ge}$	-	2E+4	9E-6	3E-8	-	-
33	Arsenic-69 <sup>2</sup>	W, all compounds	3E+4	1E+5	5E-5	2E-7	-	-
		St wall (4E+4)	-	-	-	-	6E-4	6E-3
33	Arsenic-70 <sup>2</sup>	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

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
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	5E+3	2E-6	7E-9	-	-
33	Arsenic-78 <sup>2</sup>	W, all compounds	8E+3 LLI wall (5E+3)	-	-	-	6E-5	6E-4
			8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
34	Selenium-70 <sup>2</sup>	D, all compounds except those given for W W, oxides, hydroxides, carbides, and elemental Se	2E+4	4E+4	2E-5	5E-8	1E-4	1E-3
			1E+4	4E+4	2E-5	6E-8	-	-
34	Selenium-73m <sup>2</sup>	D, see <sup>70</sup> Se W, see <sup>70</sup> Se	6E+4 3E+4	2E+5 1E+5	6E-5 6E-5	2E-7 2E-7	4E-4 -	4E-3 -
34	Selenium-73	D, see <sup>70</sup> Se W, see <sup>70</sup> Se	3E+3 -	1E+4 2E+4	5E-6 7E-6	2E-8 2E-8	4E-5 -	4E-4 -
34	Selenium-75	D, see <sup>70</sup> Se W, see <sup>70</sup> Se	5E+2 -	7E+2 6E+2	3E-7 3E-7	1E-9 8E-10	7E-6 -	7E-5 -
34	Selenium-79	D, see <sup>70</sup> Se W, see <sup>70</sup> Se	6E+2 -	8E+2 6E+2	3E-7 2E-7	1E-9 8E-10	8E-6 -	8E-5 -
34	Selenium-81m <sup>2</sup>	D, see <sup>70</sup> Se W, see <sup>70</sup> Se	4E+4 2E+4	7E+4 7E+4	3E-5 3E-5	9E-8 1E-7	3E-4 -	3E-3 -
34	Selenium-81 <sup>2</sup>	D, see <sup>70</sup> Se  W, see <sup>70</sup> Se	6E+4 St wall (8E+4) -	2E+5 -	9E-5 -	3E-7 -	- 1E-3 -	- 1E-2 -
34	Selenium-83 <sup>2</sup>	D, see <sup>70</sup> Se W, see <sup>70</sup> Se	4E+4 3E+4	1E+5 1E+5	5E-5 5E-5	2E-7 2E-7	4E-4 -	4E-3 -

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
35	Bromine-74m <sup>2</sup>	D, bromides of H, Li, Na, K, Rb, Cs, and Fr	1E+4 St wall (2E+4)	4E+4	2E-5	5E-8	-	-
		W, bromides 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, Ti, Zr, Hf, V, Nb, Ta, Mn, Tc, and Re	-	4E+4	2E-5	6E-8	-	3E-3
35	Bromine-74 <sup>2</sup>	D, see <sup>74m</sup> Br	2E+4 St wall (4E+4)	7E+4	3E-5	1E-7	-	-
		W, see <sup>74m</sup> Br	-	8E+4	4E-5	1E-7	5E-4	5E-3
35	Bromine-75 <sup>2</sup>	D, see <sup>74m</sup> Br	3E+4 St wall (4E+4)	5E+4	2E-5	7E-8	-	-
		W, see <sup>74m</sup> Br	-	5E+4	2E-5	7E-8	5E-4	5E-3
35	Bromine-76	D, see <sup>74m</sup> Br	4E+3	5E+3	2E-6	7E-9	5E-5	5E-4
		W, see <sup>74m</sup> Br	-	4E+3	2E-6	6E-9	-	-
35	Bromine-77	D, see <sup>74m</sup> Br	2E+4	2E+4	1E-5	3E-8	2E-4	2E-3
		W, see <sup>74m</sup> Br	-	2E+4	8E-6	3E-8	-	-
35	Bromine-80m	D, see <sup>74m</sup> Br	2E+4	2E+4	7E-6	2E-8	3E-4	3E-3
		W, see <sup>74m</sup> Br	-	1E+4	6E-6	2E-8	-	-
35	Bromine-80 <sup>2</sup>	D, see <sup>74m</sup> Br	5E+4 St wall (9E+4)	2E+5	8E-5	3E-7	-	-
		W, see <sup>74m</sup> Br	-	2E+5	9E-5	3E-7	1E-3	1E-2
35	Bromine-82	D, see <sup>74m</sup> Br	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W, see <sup>74m</sup> Br	-	4E+3	2E-6	5E-9	-	-
35	Bromine-83	D, see <sup>74m</sup> Br	5E+4 St wall (7E+4)	6E+4	3E-5	9E-8	-	-
		W, see <sup>74m</sup> Br	-	6E+4	3E-5	9E-8	9E-4	9E-3

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
35	Bromine-84 <sup>2</sup>	D, see <sup>74m</sup> Br	2E+4 St wall (3E+4)	6E+4	2E-5	8E-8	-	-
		W, see <sup>74m</sup> Br	-	6E+4	3E-5	-	4E-4	4E-3
36	Krypton-74 <sup>2</sup>	Submersion <sup>1</sup>	-	-	3E-6	1E-8	-	-
36	Krypton-76	Submersion <sup>1</sup>	-	-	9E-6	4E-8	-	-
36	Krypton-77 <sup>2</sup>	Submersion <sup>1</sup>	-	-	4E-6	2E-8	-	-
36	Krypton-79	Submersion <sup>1</sup>	-	-	2E-5	7E-8	-	-
36	Krypton-81	Submersion <sup>1</sup>	-	-	7E-4	3E-6	-	-
36	Krypton-83m <sup>2</sup>	Submersion <sup>1</sup>	-	-	1E-2	5E-5	-	-
36	Krypton-85m	Submersion <sup>1</sup>	-	-	2E-5	1E-7	-	-
36	Krypton-85	Submersion <sup>1</sup>	-	-	1E-4	7E-7	-	-
36	Krypton-87 <sup>2</sup>	Submersion <sup>1</sup>	-	-	5E-6	2E-8	-	-
36	Krypton-88	Submersion <sup>1</sup>	-	-	2E-6	9E-9	-	-
37	Rubidium-79 <sup>2</sup>	D, all compounds	4E+4 St wall (6E+4)	1E+5	5E-5	2E-7	-	-
				-	-	-	8E-4	8E-3
37	Rubidium-81m <sup>2</sup>	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

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
37	Rubidium-88 <sup>2</sup>	D, all compounds	2E+4 St wall (3E+4)	6E+4	3E-5	9E-8	- 4E-4	- 4E-3
37	Rubidium-89 <sup>2</sup>	D, all compounds	4E+4 St wall (6E+4)	1E+5	6E-5	2E-7	- 9E-4	- 9E-3
38	Strontium-80 <sup>2</sup>	D, all soluble compounds except SrTiO <sub>3</sub> Y, all insoluble com- pounds and SrTiO <sub>3</sub>	4E+3 -	1E+4	5E-6	2E-8	6E-5 -	6E-4 -
38	Strontium-81 <sup>2</sup>	D, see <sup>80</sup> Sr Y, see <sup>80</sup> Sr	3E+4 2E+4	8E+4	3E-5	1E-7	3E-4 -	3E-3 -
38	Strontium-82	D, see <sup>80</sup> Sr  Y, see <sup>80</sup> Sr	3E+2 LLI wall (2E+2) 2E+2	4E+2	2E-7	6E-10	- 3E-6 -	- 3E-5 -
38	Strontium-83	D, see <sup>80</sup> Sr Y, see <sup>80</sup> Sr	3E+3 2E+3	7E+3	3E-6	1E-8	3E-5 -	3E-4 -
38	Strontium-85m <sup>2</sup>	D, see <sup>80</sup> Sr Y, see <sup>80</sup> Sr	2E+5 -	6E+5	3E-4	9E-7	3E-3 -	3E-2 -
38	Strontium-85	D, see <sup>80</sup> Sr Y, see <sup>80</sup> Sr	3E+3 -	3E+3	1E-6	4E-9	4E-5 -	4E-4 -
38	Strontium-87m	D, see <sup>80</sup> Sr Y, see <sup>80</sup> Sr	5E+4 4E+4	1E+5	5E-5	2E-7	6E-4 -	6E-3 -
38	Strontium-89	D, see <sup>80</sup> Sr  Y, see <sup>80</sup> Sr	6E+2 LLI wall (6E+2) 5E+2	8E+2	4E-7	1E-9	- 8E-6 -	- 8E-5 -
38	Strontium-90	D, see <sup>80</sup> Sr  Y, see <sup>80</sup> Sr	3E+1 Bone surf (4E+1) -	2E+1 Bone surf (2E+1) 4E+0	8E-9	- 3E-11 6E-12	- 5E-7 -	- 5E-6 -
38	Strontium-91	D, see <sup>80</sup> Sr Y, see <sup>80</sup> Sr	2E+3 -	6E+3	2E-6	8E-9	2E-5 -	2E-4 -



## Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
38	Strontium-92	D, see $^{80}\text{Sr}$ Y, see $^{80}\text{Sr}$	3E+3 -	9E+3 7E+3	4E-6 3E-6	1E-8 9E-9	4E-5 -	4E-4 -
39	Yttrium-86m <sup>2</sup>	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 $^{86m}\text{Y}$ Y, see $^{86m}\text{Y}$	1E+3 -	3E+3 3E+3	1E-6 1E-6	5E-9 5E-9	2E-5 -	2E-4 -
39	Yttrium-87	W, see $^{86m}\text{Y}$ Y, see $^{86m}\text{Y}$	2E+3 -	3E+3 3E+3	1E-6 1E-6	5E-9 5E-9	3E-5 -	3E-4 -
39	Yttrium-88	W, see $^{86m}\text{Y}$ Y, see $^{86m}\text{Y}$	1E+3 3E+2	1E-7 2E+2	3E-10 3E-10	1E-5 1E-7	1E-4 3E-10	- -
39	Yttrium-90m	W, see $^{86m}\text{Y}$ Y, see $^{86m}\text{Y}$	8E+3 -	1E+4 1E+4	5E-6 5E-6	2E-8 2E-8	1E-4 -	1E-3 -
39	Yttrium-90	W, see $^{86m}\text{Y}$ LLI wall (5E+2) Y, see $^{86m}\text{Y}$	4E+2 - -	7E+2 - 6E+2	3E-7 - 3E-7	9E-10 - 9E-10	- 7E-6 -	- 7E-5 -
39	Yttrium-91m <sup>2</sup>	W, see $^{86m}\text{Y}$ Y, see $^{86m}\text{Y}$	1E+5 -	2E+5 2E+5	1E-4 7E-5	3E-7 2E-7	2E-3 -	2E-2 -
39	Yttrium-91	W, see $^{86m}\text{Y}$ LLI wall (6E+2) Y, see $^{86m}\text{Y}$	5E+2 - -	2E+2 - 1E+2	7E-8 - 5E-8	2E-10 - 2E-10	- 8E-6 -	- 8E-5 -
39	Yttrium-92	W, see $^{86m}\text{Y}$ Y, see $^{86m}\text{Y}$	3E+3 -	9E+3 8E+3	4E-6 3E-6	1E-8 1E-8	4E-5 -	4E-4 -
39	Yttrium-93	W, see $^{86m}\text{Y}$ Y, see $^{86m}\text{Y}$	1E+3 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	2E-5 -	2E-4 -
39	Yttrium-94 <sup>2</sup>	W, see $^{86m}\text{Y}$ St wall (3E+4) Y, see $^{86m}\text{Y}$	2E+4 - -	8E+4 - 8E+4	3E-5 - 3E-5	1E-7 - 1E-7	- 4E-4 -	- 4E-3 -
39	Yttrium-95 <sup>2</sup>	W, see $^{86m}\text{Y}$ St wall (5E+4) Y, see $^{86m}\text{Y}$	4E+4 - -	2E+5 - 1E+5	6E-5 - 6E-5	2E-7 - 2E-7	- 7E-4 -	- 7E-3 -

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
40	Zirconium-86	D, all compounds except those given for W and Y	1E+3	4E+3	2E-6	6E-9	2E-5	2E-4
		W, oxides, hydroxides, halides, and nitrates	-	3E+3	1E-6	4E-9	-	-
		Y, carbide	-	2E+3	1E-6	3E-9	-	-
40	Zirconium-88	D, see $^{86}\text{Zr}$	4E+3	2E+2	9E-8	3E-10	5E-5	5E-4
		W, see $^{86}\text{Zr}$	-	5E+2	2E-7	7E-10	-	-
		Y, see $^{86}\text{Zr}$	-	3E+2	1E-7	4E-10	-	-
40	Zirconium-89	D, see $^{86}\text{Zr}$	2E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see $^{86}\text{Zr}$	-	2E+3	1E-6	3E-9	-	-
		Y, see $^{86}\text{Zr}$	-	2E+3	1E-6	3E-9	-	-
40	Zirconium-93	D, see $^{86}\text{Zr}$	1E+3	6E+0	3E-9	-	-	-
		Bone surf (3E+3)	-	Bone surf (2E+1)	-	2E-11	4E-5	4E-4
		W, see $^{86}\text{Zr}$	-	2E+1	1E-8	-	-	-
		Bone surf (6E+1)	-	Bone surf (6E+1)	-	9E-11	-	-
		Y, see $^{86}\text{Zr}$	-	6E+1	2E-8	-	-	-
		Bone surf (7E+1)	-	Bone surf (7E+1)	-	9E-11	-	-
40	Zirconium-95	D, see $^{86}\text{Zr}$	1E+3	1E+2	5E-8	-	2E-5	2E-4
		Bone surf (3E+2)	-	Bone surf (3E+2)	-	4E-10	-	-
		W, see $^{86}\text{Zr}$	-	4E+2	2E-7	5E-10	-	-
		Y, see $^{86}\text{Zr}$	-	3E+2	1E-7	4E-10	-	-
40	Zirconium-97	D, see $^{86}\text{Zr}$	6E+2	2E+3	8E-7	3E-9	9E-6	9E-5
		W, see $^{86}\text{Zr}$	-	1E+3	6E-7	2E-9	-	-
		Y, see $^{86}\text{Zr}$	-	1E+3	5E-7	2E-9	-	-
41	Niobium-88 <sup>2</sup>	W, all compounds except those given for Y	5E+4	2E+5	9E-5	3E-7	-	-
		St wall (7E+4)	-	-	-	-	1E-3	1E-2
		Y, oxides and hydroxides	-	2E+5	9E-5	3E-7	-	-
41	Niobium-89 <sup>2</sup> (66 min)	W, see $^{88}\text{Nb}$	1E+4	4E+4	2E-5	6E-8	1E-4	1E-3
		Y, see $^{88}\text{Nb}$	-	4E+4	2E-5	5E-8	-	-
41	Niobium-89 (122 min)	W, see $^{88}\text{Nb}$	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y, see $^{88}\text{Nb}$	-	2E+4	6E-6	2E-8	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
41	Niobium-90	W, see $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	1E+3 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	1E-5 -	1E-4 -
41	Niobium-93m	W, see $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	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 $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	9E+2 -	2E+2 2E+1	8E-8 6E-9	3E-10 2E-11	1E-5 -	1E-4 -
41	Niobium-95m	W, see $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	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 $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	2E+3 -	1E+3 1E+3	5E-7 5E-7	2E-9 2E-9	3E-5 -	3E-4 -
41	Niobium-96	W, see $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	1E+3 -	3E+3 2E+3	1E-6 1E-6	4E-9 3E-9	2E-5 -	2E-4 -
41	Niobium-97 <sup>2</sup>	W, see $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	2E+4 -	8E+4 7E+4	3E-5 3E-5	1E-7 1E-7	3E-4 -	3E-3 -
41	Niobium-98 <sup>2</sup>	W, see $^{88}\text{Nb}$ Y, see $^{88}\text{Nb}$	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 $\text{MoS}_2$	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 $^{90}\text{Mo}$ Y, see $^{90}\text{Mo}$	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 $^{90}\text{Mo}$ Y, see $^{90}\text{Mo}$	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 $^{90}\text{Mo}$ Y, see $^{90}\text{Mo}$	2E+3 LLI wall (1E+3) 1E+3	3E+3 - 1E+3	1E-6 - 6E-7	4E-9 - 2E-9	- 2E-5 -	- 2E-4 -

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )			
42	Molybdenum-101 <sup>2</sup> D, see <sup>90</sup> Mo  Y, see <sup>90</sup> Mo	4E+4	1E+5	6E-5	2E-7	-	-
		St wall (5E+4)	-	-	-	7E-4	7E-3
		-	1E+5	6E-5	2E-7	-	-
43	Technetium-93m <sup>2</sup> D, all compounds except those given for W W, oxides, hydroxides, halides, and nitrates	7E+4	2E+5	6E-5	2E-7	1E-3	1E-2
		-	3E+5	1E-4	4E-7	-	-
43	Technetium-93 D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	3E+4	7E+4	3E-5	1E-7	4E-4	4E-3
		-	1E+5	4E-5	1E-7	-	-
43	Technetium-94m <sup>2</sup> D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	2E+4	4E+4	2E-5	6E-8	3E-4	3E-3
		-	6E+4	2E-5	8E-8	-	-
43	Technetium-94 D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	9E+3	2E+4	8E-6	3E-8	1E-4	1E-3
		-	2E+4	1E-5	3E-8	-	-
43	Technetium-95m D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	4E+3	5E+3	2E-6	8E-9	5E-5	5E-4
		-	2E+3	8E-7	3E-9	-	-
43	Technetium-95 D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	1E+4	2E+4	9E-6	3E-8	1E-4	1E-3
		-	2E+4	8E-6	3E-8	-	-
43	Technetium-96m <sup>2</sup> D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	2E+5	3E+5	1E-4	4E-7	2E-3	2E-2
		-	2E+5	1E-4	3E-7	-	-
43	Technetium-96 D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	2E+3	3E+3	1E-6	5E-9	3E-5	3E-4
		-	2E+3	9E-7	3E-9	-	-
43	Technetium-97m D, see <sup>93m</sup> Tc  W, see <sup>93m</sup> Tc	5E+3	7E+3	3E-6	-	6E-5	6E-4
		-	St wall (7E+3)	-	1E-8	-	-
		-	1E+3	5E-7	2E-9	-	-
43	Technetium-97 D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	4E+4	5E+4	2E-5	7E-8	5E-4	5E-3
		-	6E+3	2E-6	8E-9	-	-
43	Technetium-98 D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	1E+3	2E+3	7E-7	2E-9	1E-5	1E-4
		-	3E+2	1E-7	4E-10	-	-
43	Technetium-99m D, see <sup>93m</sup> Tc W, see <sup>93m</sup> Tc	8E+4	2E+5	6E-5	2E-7	1E-3	1E-2
		-	2E+5	1E-4	3E-7	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (µCi)	Col. 2		Col. 1 Air (µCi/ml)	Col. 2 Water (µCi/ml)	Monthly Average Concentration (µCi/ml)
				Col. 3	Col. 2			
				ALI (µCi)	DAC (µCi/ml)			
43	Technetium-99	D, see <sup>93m</sup> Tc	4E+3	5E+3	2E-6	-	6E-5	6E-4
				St wall (6E+3)	-	8E-9	-	-
		W, see <sup>93m</sup> Tc	-	7E+2	3E-7	9E-10	-	-
43	Technetium-101 <sup>2</sup>	D, see <sup>93m</sup> Tc	9E+4	3E+5	1E-4	5E-7	-	-
			St wall (1E+5)	-	-	-	2E-3	2E-2
		W, see <sup>93m</sup> Tc	-	4E+5	2E-4	5E-7	-	-
43	Technetium-104 <sup>2</sup>	D, see <sup>93m</sup> Tc	2E+4	7E+4	3E-5	1E-7	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		W, see <sup>93m</sup> Tc	-	9E+4	4E-5	1E-7	-	-
44	Ruthenium-94 <sup>2</sup>	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 <sup>94</sup> Ru	8E+3	2E+4	8E-6	3E-8	1E-4	1E-3
		W, see <sup>94</sup> Ru	-	1E+4	5E-6	2E-8	-	-
		Y, see <sup>94</sup> Ru	-	1E+4	5E-6	2E-8	-	-
44	Ruthenium-103	D, see <sup>94</sup> Ru	2E+3	2E+3	7E-7	2E-9	3E-5	3E-4
		W, see <sup>94</sup> Ru	-	1E+3	4E-7	1E-9	-	-
		Y, see <sup>94</sup> Ru	-	6E+2	3E-7	9E-10	-	-
44	Ruthenium-105	D, see <sup>94</sup> Ru	5E+3	1E+4	6E-6	2E-8	7E-5	7E-4
		W, see <sup>94</sup> Ru	-	1E+4	6E-6	2E-8	-	-
		Y, see <sup>94</sup> Ru	-	1E+4	5E-6	2E-8	-	-
44	Ruthenium-106	D, see <sup>94</sup> Ru	2E+2	9E+1	4E-8	1E-10	-	-
			LLI wall (2E+2)	-	-	-	3E-6	3E-5
		W, see <sup>94</sup> Ru	-	5E+1	2E-8	8E-11	-	-
		Y, see <sup>94</sup> 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 <sup>99m</sup> Rh	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see <sup>99m</sup> Rh	-	2E+3	9E-7	3E-9	-	-
		Y, see <sup>99m</sup> Rh	-	2E+3	8E-7	3E-9	-	-

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci}/\text{ml}$ )	Water ( $\mu\text{Ci}/\text{ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
45	Rhodium-100	D, see $^{99\text{m}}\text{Rh}$	2E+3	5E+3	2E-6	7E-9	2E-5	2E-4
		W, see $^{99\text{m}}\text{Rh}$	-	4E+3	2E-6	6E-9	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	4E+3	2E-6	5E-9	-	-
45	Rhodium-101m	D, see $^{99\text{m}}\text{Rh}$	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, see $^{99\text{m}}\text{Rh}$	-	8E+3	4E-6	1E-8	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	8E+3	3E-6	1E-8	-	-
45	Rhodium-101	D, see $^{99\text{m}}\text{Rh}$	2E+3	5E+2	2E-7	7E-10	3E-5	3E-4
		W, see $^{99\text{m}}\text{Rh}$	-	8E+2	3E-7	1E-9	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	2E+2	6E-8	2E-10	-	-
45	Rhodium-102m	D, see $^{99\text{m}}\text{Rh}$	1E+3	5E+2	2E-7	7E-10	-	-
		LLI wall (1E+3)	-	-	-	-	2E-5	2E-4
		W, see $^{99\text{m}}\text{Rh}$	-	4E+2	2E-7	5E-10	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	1E+2	5E-8	2E-10	-	-
45	Rhodium-102	D, see $^{99\text{m}}\text{Rh}$	6E+2	9E+1	4E-8	1E-10	8E-6	8E-5
		W, see $^{99\text{m}}\text{Rh}$	-	2E+2	7E-8	2E-10	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	6E+1	2E-8	8E-11	-	-
45	Rhodium-103m <sup>2</sup>	D, see $^{99\text{m}}\text{Rh}$	4E+5	1E+6	5E-4	2E-6	6E-3	6E-2
		W, see $^{99\text{m}}\text{Rh}$	-	1E+6	5E-4	2E-6	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	1E+6	5E-4	2E-6	-	-
45	Rhodium-105	D, see $^{99\text{m}}\text{Rh}$	4E+3	1E+4	5E-6	2E-8	-	-
		LLI wall (4E+3)	-	-	-	-	5E-5	5E-4
		W, see $^{99\text{m}}\text{Rh}$	-	6E+3	3E-6	9E-9	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	6E+3	2E-6	8E-9	-	-
45	Rhodium-106m	D, see $^{99\text{m}}\text{Rh}$	8E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, see $^{99\text{m}}\text{Rh}$	-	4E+4	2E-5	5E-8	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	4E+4	1E-5	5E-8	-	-
45	Rhodium-107 <sup>2</sup>	D, see $^{99\text{m}}\text{Rh}$	7E+4	2E+5	1E-4	3E-7	-	-
		St wall (9E+4)	-	-	-	-	1E-3	1E-2
		W, see $^{99\text{m}}\text{Rh}$	-	3E+5	1E-4	4E-7	-	-
		Y, see $^{99\text{m}}\text{Rh}$	-	3E+5	1E-4	3E-7	-	-
46	Palladium-100	D, all compounds except those given for W and Y	1E+3	1E+3	6E-7	2E-9	2E-5	2E-4
		W, nitrates	-	1E+3	5E-7	2E-9	-	-
		Y, oxides and hydroxides	-	1E+3	6E-7	2E-9	-	-

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci}/\text{ml}$ )	Water ( $\mu\text{Ci}/\text{ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
46	Palladium-101	D, see $^{100}\text{Pd}$	1E+4	3E+4	1E-5	5E-8	2E-4	2E-3
		W, see $^{100}\text{Pd}$	-	3E+4	1E-5	5E-8	-	-
		Y, see $^{100}\text{Pd}$	-	3E+4	1E-5	4E-8	-	-
46	Palladium-103	D, see $^{100}\text{Pd}$	6E+3	6E+3	3E-6	9E-9	-	-
			LLI wall (7E+3)	-	-	-	1E-4	1E-3
		W, see $^{100}\text{Pd}$	-	4E+3	2E-6	6E-9	-	-
	Y, see $^{100}\text{Pd}$	-	4E+3	1E-6	5E-9	-	-	
46	Palladium-107	D, see $^{100}\text{Pd}$	3E+4	2E+4	9E-6	-	-	-
			LLI wall (4E+4)	Kidneys (2E+4)	-	3E-8	5E-4	5E-3
		W, see $^{100}\text{Pd}$	-	7E+3	3E-6	1E-8	-	-
	Y, see $^{100}\text{Pd}$	-	4E+2	2E-7	6E-10	-	-	
46	Palladium-109	D, see $^{100}\text{Pd}$	2E+3	6E+3	3E-6	9E-9	3E-5	3E-4
		W, see $^{100}\text{Pd}$	-	5E+3	2E-6	8E-9	-	-
		Y, see $^{100}\text{Pd}$	-	5E+3	2E-6	6E-9	-	-
47	Silver-102 <sup>2</sup>	D, all compounds except those given for W and Y	5E+4	2E+5	8E-5	2E-7	-	-
			St wall (6E+4)	-	-	-	9E-4	9E-3
		W, nitrates and sulfides	-	2E+5	9E-5	3E-7	-	-
	Y, oxides and hydroxides	-	2E+5	8E-5	3E-7	-	-	
47	Silver-103 <sup>2</sup>	D, see $^{102}\text{Ag}$	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
		W, see $^{102}\text{Ag}$	-	1E+5	5E-5	2E-7	-	-
		Y, see $^{102}\text{Ag}$	-	1E+5	5E-5	2E-7	-	-
47	Silver-104m <sup>2</sup>	D, see $^{102}\text{Ag}$	3E+4	9E+4	4E-5	1E-7	4E-4	4E-3
		W, see $^{102}\text{Ag}$	-	1E+5	5E-5	2E-7	-	-
		Y, see $^{102}\text{Ag}$	-	1E+5	5E-5	2E-7	-	-
47	Silver-104 <sup>2</sup>	D, see $^{102}\text{Ag}$	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
		W, see $^{102}\text{Ag}$	-	1E+5	6E-5	2E-7	-	-
		Y, see $^{102}\text{Ag}$	-	1E+5	6E-5	2E-7	-	-
47	Silver-105	D, see $^{102}\text{Ag}$	3E+3	1E+3	4E-7	1E-9	4E-5	4E-4
		W, see $^{102}\text{Ag}$	-	2E+3	7E-7	2E-9	-	-
		Y, see $^{102}\text{Ag}$	-	2E+3	7E-7	2E-9	-	-
47	Silver-106m	D, see $^{102}\text{Ag}$	8E+2	7E+2	3E-7	1E-9	1E-5	1E-4
		W, see $^{102}\text{Ag}$	-	9E+2	4E-7	1E-9	-	-
		Y, see $^{102}\text{Ag}$	-	9E+2	4E-7	1E-9	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci/ml}$ )	Col. 2 Water ( $\mu\text{Ci/ml}$ )	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci/ml}$ )			
47	Silver-106 <sup>2</sup>	D, see <sup>102</sup> Ag	6E+4 St. wall (6E+4)	2E+5	8E-5	3E-7	-	-
		W, see <sup>102</sup> Ag	-	2E+5	9E-5	3E-7	-	9E-3
		Y, see <sup>102</sup> Ag	-	2E+5	8E-5	3E-7	-	-
47	Silver-108m	D, see <sup>102</sup> Ag	6E+2	2E+2	8E-8	3E-10	9E-6	9E-5
		W, see <sup>102</sup> Ag	-	3E+2	1E-7	4E-10	-	-
		Y, see <sup>102</sup> Ag	-	2E+1	1E-8	3E-11	-	-
47	Silver-110m	D, see <sup>102</sup> Ag	5E+2	1E+2	5E-8	2E-10	6E-6	6E-5
		W, see <sup>102</sup> Ag	-	2E+2	8E-8	3E-10	-	-
		Y, see <sup>102</sup> Ag	-	9E+1	4E-8	1E-10	-	-
47	Silver-111	D, see <sup>102</sup> Ag	9E+2 LLI wall (1E+3)	2E+3 Liver (2E+3)	6E-7	-	-	-
		W, see <sup>102</sup> Ag	-	9E+2	4E-7	2E-9	2E-5	2E-4
		Y, see <sup>102</sup> Ag	-	9E+2	4E-7	1E-9	-	-
47	Silver-112	D, see <sup>102</sup> Ag	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see <sup>102</sup> Ag	-	1E+4	4E-6	1E-8	-	-
		Y, see <sup>102</sup> Ag	-	9E+3	4E-6	1E-8	-	-
47	Silver-115 <sup>2</sup>	D, see <sup>102</sup> Ag	3E+4 St wall (3E+4)	9E+4	4E-5	1E-7	-	-
		W, see <sup>102</sup> Ag	-	9E+4	4E-5	-	4E-4	4E-3
		Y, see <sup>102</sup> Ag	-	8E+4	3E-5	1E-7	-	-
48	Cadmium-104 <sup>2</sup>	D, all compounds except those given for W and Y	2E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		W, sulfides, halides, and nitrates	-	1E+5	5E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	5E-5	2E-7	-	-
48	Cadmium-107	D, see <sup>104</sup> Cd	2E+4	5E+4	2E-5	8E-8	3E-4	3E-3
		W, see <sup>104</sup> Cd	-	6E+4	2E-5	8E-8	-	-
		Y, see <sup>104</sup> Cd	-	5E+4	2E-5	7E-8	-	-
48	Cadmium-109	D, see <sup>104</sup> Cd	3E+2 Kidneys (4E+2)	4E+1 Kidneys (5E+1)	1E-8	-	-	-
		W, see <sup>104</sup> Cd	-	1E+2 Kidneys (1E+2)	5E-8	7E-11	6E-6	6E-5
		Y, see <sup>104</sup> Cd	-	1E+2	5E-8	2E-10	-	-



<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation					Air ( $\mu\text{Ci/ml}$ )
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
48	Cadmium-113m	D, see $^{104}\text{Cd}$	2E+1 Kidneys (4E+1)	2E+0 Kidneys (4E+0)	1E-9 - 4E-9	- 5E-12 -	- 5E-7 -	- 5E-6 -
		W, see $^{104}\text{Cd}$	-	8E+0 Kidneys (1E+1)	-	2E-11	-	-
		Y, see $^{104}\text{Cd}$	-	1E+1	5E-9	2E-11	-	-
48	Cadmium-113	D, see $^{104}\text{Cd}$	2E+1 Kidneys (3E+1)	2E+0 Kidneys (3E+0)	9E-10 - 3E-9	- 5E-12 -	- 4E-7 -	- 4E-6 -
		W, see $^{104}\text{Cd}$	-	8E+0 Kidneys (1E+1)	-	2E-11	-	-
		Y, see $^{104}\text{Cd}$	-	1E+1	6E-9	2E-11	-	-
48	Cadmium-115m	D, see $^{104}\text{Cd}$	3E+2	5E+1 Kidneys (8E+1)	2E-8 - -	- 1E-10 2E-10	4E-6 - -	4E-5 - -
		W, see $^{104}\text{Cd}$	-	1E+2	5E-8	2E-10	-	-
		Y, see $^{104}\text{Cd}$	-	1E+2	6E-8	2E-10	-	-
48	Cadmium-115	D, see $^{104}\text{Cd}$	9E+2 LLI wall (1E+3)	1E+3 -	6E-7 - -	2E-9 - -	- 1E-5	- 1E-4
		W, see $^{104}\text{Cd}$	-	1E+3	5E-7	2E-9	-	-
		Y, see $^{104}\text{Cd}$	-	1E+3	6E-7	2E-9	-	-
48	Cadmium-117m	D, see $^{104}\text{Cd}$	5E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		W, see $^{104}\text{Cd}$	-	2E+4	7E-6	2E-8	-	-
		Y, see $^{104}\text{Cd}$	-	1E+4	6E-6	2E-8	-	-
48	Cadmium-117	D, see $^{104}\text{Cd}$	5E+3	1E+4	5E-6	2E-8	6E-5	6E-4
		W, see $^{104}\text{Cd}$	-	2E+4	7E-6	2E-8	-	-
		Y, see $^{104}\text{Cd}$	-	1E+4	6E-6	2E-8	-	-
49	Indium-109	D, all compounds except those given for W	2E+4	4E+4	2E-5	6E-8	3E-4	3E-3
		W, oxides, hydroxides, halides, and nitrates	-	6E+4	3E-5	9E-8	-	-
49	Indium-110 <sup>2</sup> (69.1 min)	D, see $^{109}\text{In}$	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see $^{109}\text{In}$	-	6E+4	2E-5	8E-8	-	-
49	Indium-110 (4.9 h)	D, see $^{109}\text{In}$	5E+3	2E+4	7E-6	2E-8	7E-5	7E-4
		W, see $^{109}\text{In}$	-	2E+4	8E-6	3E-8	-	-

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
49	Indium-111	D, see $^{109}\text{In}$	4E+3	6E+3	3E-6	9E-9	6E-5	6E-4
		W, see $^{109}\text{In}$	-	6E+3	3E-6	9E-9	-	-
49	Indium-112 <sup>2</sup>	D, see $^{109}\text{In}$	2E+5	6E+5	3E-4	9E-7	2E-3	2E-2
		W, see $^{109}\text{In}$	-	7E+5	3E-4	1E-6	-	-
49	Indium-113m <sup>2</sup>	D, see $^{109}\text{In}$	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
		W, see $^{109}\text{In}$	-	2E+5	8E-5	3E-7	-	-
49	Indium-114m	D, see $^{109}\text{In}$	3E+2	6E+1	3E-8	9E-11	-	-
		LLI wall (4E+2)	-	-	-	-	5E-6	5E-5
	W, see $^{109}\text{In}$	-	1E+2	4E-8	1E-10	-	-	
49	Indium-115m	D, see $^{109}\text{In}$	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see $^{109}\text{In}$	-	5E+4	2E-5	7E-8	-	-
49	Indium-115	D, see $^{109}\text{In}$	4E+1	1E+0	6E-10	2E-12	5E-7	5E-6
		W, see $^{109}\text{In}$	-	5E+0	2E-9	8E-12	-	-
49	Indium-116m <sup>2</sup>	D, see $^{109}\text{In}$	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
		W, see $^{109}\text{In}$	-	1E+5	5E-5	2E-7	-	-
49	Indium-117m <sup>2</sup>	D, see $^{109}\text{In}$	1E+4	3E+4	1E-5	5E-8	2E-4	2E-3
		W, see $^{109}\text{In}$	-	4E+4	2E-5	6E-8	-	-
49	Indium-117 <sup>2</sup>	D, see $^{109}\text{In}$	6E+4	2E+5	7E-5	2E-7	8E-4	8E-3
		W, see $^{109}\text{In}$	-	2E+5	9E-5	3E-7	-	-
49	Indium-119m <sup>2</sup>	D, see $^{109}\text{In}$	4E+4	1E+5	5E-5	2E-7	-	-
		St wall (5E+4)	-	-	-	-	7E-4	7E-3
	W, see $^{109}\text{In}$	-	1E+5	6E-5	2E-7	-	-	
50	Tin-110	D, all compounds except those given for W	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
		W, sulfides, oxides, hydroxides, halides, nitrates, and stannic phosphate	-	1E+4	5E-6	2E-8	-	-
50	Tin-111 <sup>2</sup>	D, see $^{110}\text{Sn}$	7E+4	2E+5	9E-5	3E-7	1E-3	1E-2
		W, see $^{110}\text{Sn}$	-	3E+5	1E-4	4E-7	-	-
50	Tin-113	D, see $^{110}\text{Sn}$	2E+3	1E+3	5E-7	2E-9	-	-
		LLI wall (2E+3)	-	-	-	-	3E-5	3E-4
	W, see $^{110}\text{Sn}$	-	5E+2	2E-7	8E-10	-	-	

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation					Air ( $\mu\text{Ci/ml}$ )
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
50	Tin-117m	D, see $^{110}\text{Sn}$	2E+3 LLI wall (2E+3)	1E+3 Bone surf (2E+3)	5E-7 -	- 3E-9	- 3E-5	- 3E-4
		W, see $^{110}\text{Sn}$	-	1E+3	6E-7	2E-9	-	-
50	Tin-119m	D, see $^{110}\text{Sn}$	3E+3 LLI wall (4E+3)	2E+3 -	1E-6 -	3E-9 -	- 6E-5	- 6E-4
		W, see $^{110}\text{Sn}$	-	1E+3	4E-7	1E-9	-	-
50	Tin-121m	D, see $^{110}\text{Sn}$	3E+3 LLI wall (4E+3)	9E+2 -	4E-7 -	1E-9 -	- 5E-5	- 5E-4
		W, see $^{110}\text{Sn}$	-	5E+2	2E-7	8E-10	-	-
50	Tin-121	D, see $^{110}\text{Sn}$	6E+3 LLI wall (6E+3)	2E+4 -	6E-6 -	2E-8 -	- 8E-5	- 8E-4
		W, see $^{110}\text{Sn}$	-	1E+4	5E-6	2E-8	-	-
50	Tin-123m <sup>2</sup>	D, see $^{110}\text{Sn}$	5E+4	1E+5	5E-5	2E-7	7E-4	7E-3
		W, see $^{110}\text{Sn}$	-	1E+5	6E-5	2E-7	-	-
50	Tin-123	D, see $^{110}\text{Sn}$	5E+2 LLI wall (6E+2)	6E+2 -	3E-7 -	9E-10 -	- 9E-6	- 9E-5
		W, see $^{110}\text{Sn}$	-	2E+2	7E-8	2E-10	-	-
50	Tin-125	D, see $^{110}\text{Sn}$	4E+2 LLI wall (5E+2)	9E+2 -	4E-7 -	1E-9 -	- 6E-6	- 6E-5
		W, see $^{110}\text{Sn}$	-	4E+2	1E-7	5E-10	-	-
50	Tin-126	D, see $^{110}\text{Sn}$	3E+2	6E+1	2E-8	8E-11	4E-6	4E-5
		W, see $^{110}\text{Sn}$	-	7E+1	3E-8	9E-11	-	-
50	Tin-127	D, see $^{110}\text{Sn}$	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		W, see $^{110}\text{Sn}$	-	2E+4	8E-6	3E-8	-	-
50	Tin-128 <sup>2</sup>	D, see $^{110}\text{Sn}$	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, see $^{110}\text{Sn}$	-	4E+4	1E-5	5E-8	-	-
51	Antimony-115 <sup>2</sup>	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	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
51	Antimony-116m <sup>2</sup>	D, see <sup>115</sup> Sb W, see <sup>115</sup> Sb	2E+4 -	7E+4 1E+5	3E-5 6E-5	1E-7 2E-7	3E-4 -	3E-3 -
51	Antimony-116 <sup>2</sup>	D, see <sup>115</sup> Sb  W, see <sup>115</sup> Sb	7E+4 St wall (9E+4) -	3E+5 - 3E+5	1E-4 - 1E-4	4E-7 - 5E-7	- 1E-3 -	- 1E-2 -
51	Antimony-117	D, see <sup>115</sup> Sb W, see <sup>115</sup> Sb	7E+4 -	2E+5 3E+5	9E-5 1E-4	3E-7 4E-7	9E-4 -	9E-3 -
51	Antimony-118m	D, see <sup>115</sup> Sb W, see <sup>115</sup> Sb	6E+3 5E+3	2E+4 2E+4	8E-6 9E-6	3E-8 3E-8	7E-5 -	7E-4 -
51	Antimony-119	D, see <sup>115</sup> Sb W, see <sup>115</sup> Sb	2E+4 2E+4	5E+4 3E+4	2E-5 1E-5	6E-8 4E-8	2E-4 -	2E-3 -
51	Antimony-120 <sup>2</sup> (16 min)	D, see <sup>115</sup> Sb  W, see <sup>115</sup> 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 <sup>115</sup> Sb W, see <sup>115</sup> 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 <sup>115</sup> Sb  W, see <sup>115</sup> Sb	8E+2 LLI wall (8E+2) 7E+2	2E+3 - 1E+3	1E-6 - 4E-7	3E-9 - 2E-9	- 1E-5 -	- 1E-4 -
51	Antimony-124m <sup>2</sup>	D, see <sup>115</sup> Sb W, see <sup>115</sup> 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 <sup>115</sup> Sb W, see <sup>115</sup> 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 <sup>115</sup> Sb W, see <sup>115</sup> Sb	2E+3 -	2E+3 5E+2	1E-6 2E-7	3E-9 7E-10	3E-5 -	3E-4 -
51	Antimony-126m <sup>2</sup>	D, see <sup>115</sup> Sb  W, see <sup>115</sup> 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 <sup>115</sup> Sb W, see <sup>115</sup> Sb	6E+2 5E+2	1E+3 5E+2	5E-7 2E-7	2E-9 7E-10	7E-6 -	7E-5 -

<u>Section 380-11.7 Tables of Concentrations</u>			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
			Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )				
51	Antimony-127	D, see $^{115}\text{Sb}$	8E+2	2E+3	9E-7	3E-9	-	-
		W, see $^{115}\text{Sb}$	LLI wall (8E+2) 7E+2	-	-	-	1E-5	1E-4
51	Antimony-128 <sup>2</sup> (10.4 min)	D, see $^{115}\text{Sb}$	8E+4	4E+5	2E-4	5E-7	-	-
		W, see $^{115}\text{Sb}$	St wall (1E+5) -	-	-	-	1E-3	1E-2
51	Antimony-128 (9.01 h)	D, see $^{115}\text{Sb}$	1E+3	4E+3	2E-6	6E-9	2E-5	2E-4
		W, see $^{115}\text{Sb}$	-	3E+3	1E-6	5E-9	-	-
51	Antimony-129	D, see $^{115}\text{Sb}$	3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		W, see $^{115}\text{Sb}$	-	9E+3	4E-6	1E-8	-	-
51	Antimony-130 <sup>2</sup>	D, see $^{115}\text{Sb}$	2E+4	6E+4	3E-5	9E-8	3E-4	3E-3
		W, see $^{115}\text{Sb}$	-	8E+4	3E-5	1E-7	-	-
51	Antimony-131 <sup>2</sup>	D, see $^{115}\text{Sb}$	1E+4	2E+4	1E-5	-	-	-
			Thyroid (2E+4)	Thyroid (4E+4)	-	6E-8	2E-4	2E-3
		W, see $^{115}\text{Sb}$	-	2E+4	1E-5	-	-	-
52	Tellurium-116	D, all compounds except those given for W	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, oxides, hydroxides, and nitrates	-	3E+4	1E-5	4E-8	-	-
52	Tellurium-121m	D, see $^{116}\text{Te}$	5E+2	2E+2	8E-8	-	-	-
		W, see $^{116}\text{Te}$	Bone surf (7E+2) -	Bone surf (4E+2)	-	5E-10	1E-5	1E-4
52	Tellurium-121	D, see $^{116}\text{Te}$	3E+3	4E+3	2E-6	6E-9	4E-5	4E-4
		W, see $^{116}\text{Te}$	-	3E+3	1E-6	4E-9	-	-
52	Tellurium-123m	D, see $^{116}\text{Te}$	6E+2	2E+2	9E-8	-	-	-
		W, see $^{116}\text{Te}$	Bone surf (1E+3) -	Bone surf (5E+2)	-	8E-10	1E-5	1E-4
			-	5E+2	2E-7	8E-10	-	-

<u>Section 380-11.7 Tables of Concentrations</u>			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu$ Ci/ml)	
		Oral Ingestion ALI ( $\mu$ Ci)	Inhalation					Air ( $\mu$ Ci/ml)
			ALI ( $\mu$ Ci)	DAC ( $\mu$ Ci/ml)				
52	Tellurium-123	D, see <sup>116</sup> Te	5E+2 Bone surf (1E+3)	2E+2 Bone surf (5E+2)	8E-8 -	- 7E-10	- 2E-5	- 2E-4
		W, see <sup>116</sup> Te	-	4E+2 Bone surf (1E+3)	2E-7 -	- 2E-9	-	-
52	Tellurium-125m	D, see <sup>116</sup> Te	1E+3 Bone surf (1E+3)	4E+2 Bone surf (1E+3)	2E-7 -	- 1E-9	- 2E-5	- 2E-4
		W, see <sup>116</sup> Te	-	7E+2	3E-7	1E-9	-	-
52	Tellurium-127m	D, see <sup>116</sup> Te	6E+2	3E+2 Bone surf (4E+2)	1E-7 -	- 6E-10	9E-6 -	9E-5 -
		W, see <sup>116</sup> Te	-	3E+2	1E-7	4E-10	-	-
52	Tellurium-127	D, see <sup>116</sup> Te	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see <sup>116</sup> Te	-	2E+4	7E-6	2E-8	-	-
52	Tellurium-129m	D, see <sup>116</sup> Te	5E+2	6E+2	3E-7	9E-10	7E-6	7E-5
		W, see <sup>116</sup> Te	-	2E+2	1E-7	3E-10	-	-
52	Tellurium-129 <sup>2</sup>	D, see <sup>116</sup> Te	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
		W, see <sup>116</sup> Te	-	7E+4	3E-5	1E-7	-	-
52	Tellurium-131m	D, see <sup>116</sup> Te	3E+2 Thyroid (6E+2)	4E+2 Thyroid (1E+3)	2E-7 -	- 2E-9	- 8E-6	- 8E-5
		W, see <sup>116</sup> Te	-	4E+2 Thyroid (9E+2)	2E-7 -	- 1E-9	-	-
			D, see <sup>116</sup> Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- 8E-5
52	Tellurium-131 <sup>2</sup>	W, see <sup>116</sup> Te	-	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	-	-
			D, see <sup>116</sup> Te	2E+2 Thyroid (7E+2)	2E+2 Thyroid (8E+2)	9E-8 -	- 1E-9	- 9E-6
		W, see <sup>116</sup> Te	-	2E+2 Thyroid (6E+2)	9E-8 -	- 9E-10	-	-

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation					
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
52	Tellurium-133m <sup>2</sup>	D, see <sup>116</sup> Te	3E+3 Thyroid (6E+3)	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	- 9E-5	- 9E-4
		W, see <sup>116</sup> Te	-	5E+3 Thyroid (1E+4)	2E-6 -	- 2E-8	-	-
52	Tellurium-133 <sup>2</sup>	D, see <sup>116</sup> Te	1E+4 Thyroid (3E+4)	2E+4 Thyroid (6E+4)	9E-6 -	- 8E-8	- 4E-4	- 4E-3
		W, see <sup>116</sup> Te	-	2E+4 Thyroid (6E+4)	9E-6 -	- 8E-8	-	-
52	Tellurium-134 <sup>2</sup>	D, see <sup>116</sup> Te	2E+4 Thyroid (2E+4)	2E+4 Thyroid (5E+4)	1E-5 -	- 7E-8	- 3E-4	- 3E-3
		W, see <sup>116</sup> Te	-	2E+4 Thyroid (5E+4)	1E-5 -	- 7E-8	-	-
53	Iodine-120m <sup>2</sup>	D, all compounds	1E+4 Thyroid (1E+4)	2E+4 -	9E-6 -	3E-8 -	- 2E-4	- 2E-3
53	Iodine-120 <sup>2</sup>	D, all compounds	4E+3 Thyroid (8E+3)	9E+3 Thyroid (1E+4)	4E-6 -	- 2E-8	- 1E-4	- 1E-3
53	Iodine-121	D, all compounds	1E+4 Thyroid (3E+4)	2E+4 Thyroid (5E+4)	8E-6 -	- 7E-8	- 4E-4	- 4E-3
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

## Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
53	Iodine-128 <sup>2</sup>	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 <sup>2</sup>	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
53	Iodine-133	D, all compounds	1E+2 Thyroid (5E+2)	3E+2 Thyroid (9E+2)	1E-7 -	- 1E-9	- 7E-6	- 7E-5
53	Iodine-134 <sup>2</sup>	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 <sup>2</sup>	Submersion <sup>1</sup>	-	-	1E-5	4E-8	-	-
54	Xenon-121 <sup>2</sup>	Submersion <sup>1</sup>	-	-	2E-6	1E-8	-	-
54	Xenon-122	Submersion <sup>1</sup>	-	-	7E-5	3E-7	-	-
54	Xenon-123	Submersion <sup>1</sup>	-	-	6E-6	3E-8	-	-
54	Xenon-125	Submersion <sup>1</sup>	-	-	2E-5	7E-8	-	-
54	Xenon-127	Submersion <sup>1</sup>	-	-	1E-5	6E-8	-	-



Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
54	Xenon-129m	Submersion <sup>1</sup>	-	-	2E-4	9E-7	-	-
54	Xenon-131m	Submersion <sup>1</sup>	-	-	4E-4	2E-6	-	-
54	Xenon-133m	Submersion <sup>1</sup>	-	-	1E-4	6E-7	-	-
54	Xenon-133	Submersion <sup>1</sup>	-	-	1E-4	5E-7	-	-
54	Xenon-135m <sup>2</sup>	Submersion <sup>1</sup>	-	-	9E-6	4E-8	-	-
54	Xenon-135	Submersion <sup>1</sup>	-	-	1E-5	7E-8	-	-
54	Xenon-138 <sup>2</sup>	Submersion <sup>1</sup>	-	-	4E-6	2E-8	-	-
55	Cesium-125 <sup>2</sup>	D, all compounds	5E+4 St wall (9E+4)	1E+5	6E-5	2E-7	-	-
			-	-	-	-	1E-3	1E-2
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 <sup>2</sup>	D, all compounds	6E+4 St wall (1E+5)	2E+5	8E-5	3E-7	-	-
			-	-	-	-	1E-3	1E-2
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	-	-
			-	-	-	-	2E-3	2E-2
55	Cesium-134	D, all compounds	7E+1	1E+2	4E-8	2E-10	9E-7	9E-6
55	Cesium-135m <sup>2</sup>	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 <sup>2</sup>	D, all compounds	2E+4 St wall (3E+4)	6E+4	2E-5	8E-8	-	-
			-	-	-	-	4E-4	4E-3

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
56	Barium-126 <sup>2</sup>	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
56	Barium-131m <sup>2</sup>	D, all compounds	4E+5	1E+6	6E-4	2E-6	-	-
		St wall (5E+5)	-	-	-	-	7E-3	7E-2
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	9E+3	4E-6	1E-8	-	-
		LLI wall (3E+3)	-	-	-	-	4E-5	4E-4
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 <sup>2</sup>	D, all compounds	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
56	Barium-140	D, all compounds	5E+2	1E+3	6E-7	2E-9	-	-
		LLI wall (6E+2)	-	-	-	-	8E-6	8E-5
56	Barium-141 <sup>2</sup>	D, all compounds	2E+4	7E+4	3E-5	1E-7	3E-4	3E-3
56	Barium-142 <sup>2</sup>	D, all compounds	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
57	Lanthanum-131 <sup>2</sup>	D, all compounds except those given for W	5E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		W, oxides and hydroxides	-	2E+5	7E-5	2E-7	-	-
57	Lanthanum-132	D, see <sup>131</sup> La	3E+3	1E+4	4E-6	1E-8	4E-5	4E-4
		W, see <sup>131</sup> La	-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-135	D, see <sup>131</sup> La	4E+4	1E+5	4E-5	1E-7	5E-4	5E-3
		W, see <sup>131</sup> La	-	9E+4	4E-5	1E-7	-	-
57	Lanthanum-137	D, see <sup>131</sup> La	1E+4	6E+1	3E-8	-	2E-4	2E-3
			-	Liver (7E+1)	-	1E-10	-	-
		W, see <sup>131</sup> La	-	3E+2	1E-7	-	-	-
			-	Liver (3E+2)	-	4E-10	-	-
57	Lanthanum-138	D, see <sup>131</sup> La	9E+2	4E+0	1E-9	5E-12	1E-5	1E-4
		W, see <sup>131</sup> La	-	1E+1	6E-9	2E-11	-	-

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci}/\text{ml}$ )	Water ( $\mu\text{Ci}/\text{ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
57	Lanthanum-140	D, see $^{131}\text{La}$	6E+2	1E+3	6E-7	2E-9	9E-6	9E-5
		W, see $^{131}\text{La}$	-	1E+3	5E-7	2E-9	-	-
57	Lanthanum-141	D, see $^{131}\text{La}$	4E+3	9E+3	4E-6	1E-8	5E-5	5E-4
		W, see $^{131}\text{La}$	-	1E+4	5E-6	2E-8	-	-
57	Lanthanum-142 <sup>2</sup>	D, see $^{131}\text{La}$	8E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see $^{131}\text{La}$	-	3E+4	1E-5	5E-8	-	-
57	Lanthanum-143 <sup>2</sup>	D, see $^{131}\text{La}$	4E+4	1E+5	4E-5	1E-7	-	-
		St wall (4E+4)	-	-	-	-	5E-4	5E-3
	W, see $^{131}\text{La}$	-	9E+4	4E-5	1E-7	-	-	
58	Cerium-134	W, all compounds except those given for Y	5E+2	7E+2	3E-7	1E-9	-	-
		LLI wall (6E+2)	-	-	-	-	8E-6	8E-5
	Y, oxides, hydroxides, and fluorides	-	7E+2	3E-7	9E-10	-	-	
58	Cerium-135	W, see $^{134}\text{Ce}$	2E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		Y, see $^{134}\text{Ce}$	-	4E+3	1E-6	5E-9	-	-
58	Cerium-137m	W, see $^{134}\text{Ce}$	2E+3	4E+3	2E-6	6E-9	-	-
		LLI wall (2E+3)	-	-	-	-	3E-5	3E-4
	Y, see $^{134}\text{Ce}$	-	4E+3	2E-6	5E-9	-	-	
58	Cerium-137	W, see $^{134}\text{Ce}$	5E+4	1E+5	6E-5	2E-7	7E-4	7E-3
		Y, see $^{134}\text{Ce}$	-	1E+5	5E-5	2E-7	-	-
58	Cerium-139	W, see $^{134}\text{Ce}$	5E+3	8E+2	3E-7	1E-9	7E-5	7E-4
		Y, see $^{134}\text{Ce}$	-	7E+2	3E-7	9E-10	-	-
58	Cerium-141	W, see $^{134}\text{Ce}$	2E+3	7E+2	3E-7	1E-9	-	-
		LLI wall (2E+3)	-	-	-	-	3E-5	3E-4
	Y, see $^{134}\text{Ce}$	-	6E+2	2E-7	8E-10	-	-	
58	Cerium-143	W, see $^{134}\text{Ce}$	1E+3	2E+3	8E-7	3E-9	-	-
		LLI wall (1E+3)	-	-	-	-	2E-5	2E-4
	Y, see $^{134}\text{Ce}$	-	2E+3	7E-7	2E-9	-	-	

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
58	Cerium-144	W, see $^{134}\text{Ce}$	2E+2	3E+1	1E-8	4E-11	-	-
			LLI wall (3E+2)	-	-	-	3E-6	3E-5
		Y, see $^{134}\text{Ce}$	-	1E+1	6E-9	2E-11	-	-
59	Praseodymium-136 <sup>2</sup> W, all compounds except those given for Y		5E+4	2E+5	1E-4	3E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
		Y, oxides, hydroxides, carbides, and fluorides	-	2E+5	9E-5	3E-7	-	-
59	Praseodymium-137 <sup>2</sup> W, see $^{136}\text{Pr}$		4E+4	2E+5	6E-5	2E-7	5E-4	5E-3
		Y, see $^{136}\text{Pr}$	-	1E+5	6E-5	2E-7	-	-
59	Praseodymium-138m W, see $^{136}\text{Pr}$		1E+4	5E+4	2E-5	8E-8	1E-4	1E-3
		Y, see $^{136}\text{Pr}$	-	4E+4	2E-5	6E-8	-	-
59	Praseodymium-139 W, see $^{136}\text{Pr}$		4E+4	1E+5	5E-5	2E-7	6E-4	6E-3
		Y, see $^{136}\text{Pr}$	-	1E+5	5E-5	2E-7	-	-
59	Praseodymium-142m <sup>2</sup> W, see $^{136}\text{Pr}$		8E+4	2E+5	7E-5	2E-7	1E-3	1E-2
		Y, see $^{136}\text{Pr}$	-	1E+5	6E-5	2E-7	-	-
59	Praseodymium-142 W, see $^{136}\text{Pr}$		1E+3	2E+3	9E-7	3E-9	1E-5	1E-4
		Y, see $^{136}\text{Pr}$	-	2E+3	8E-7	3E-9	-	-
59	Praseodymium-143 W, see $^{136}\text{Pr}$		9E+2	8E+2	3E-7	1E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
		Y, see $^{136}\text{Pr}$	-	7E+2	3E-7	9E-10	-	-
59	Praseodymium-144 <sup>2</sup> W, see $^{136}\text{Pr}$		3E+4	1E+5	5E-5	2E-7	-	-
			St wall (4E+4)	-	-	-	6E-4	6E-3
		Y, see $^{136}\text{Pr}$	-	1E+5	5E-5	2E-7	-	-
59	Praseodymium-145 W, see $^{136}\text{Pr}$		3E+3	9E+3	4E-6	1E-8	4E-5	4E-4
		Y, see $^{136}\text{Pr}$	-	8E+3	3E-6	1E-8	-	-
59	Praseodymium-147 <sup>2</sup> W, see $^{136}\text{Pr}$		5E+4	2E+5	8E-5	3E-7	-	-
			St wall (8E+4)	-	-	-	1E-3	1E-2
		Y, see $^{136}\text{Pr}$	-	2E+5	8E-5	3E-7	-	-

Section 380-11.7 Tables of Concentrations		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci}/\text{ml}$ )	Water ( $\mu\text{Ci}/\text{ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
60	Neodymium-136 <sup>2</sup>	W, all compounds except those given for Y	1E+4	6E+4	2E-5	8E-8	2E-4	2E-3
		Y, oxides, hydroxides, carbides, and fluorides	-	5E+4	2E-5	8E-8	-	-
60	Neodymium-138	W, see <sup>136</sup> Nd	2E+3	6E+3	3E-6	9E-9	3E-5	3E-4
		Y, see <sup>136</sup> Nd	-	5E+3	2E-6	7E-9	-	-
60	Neodymium-139m	W, see <sup>136</sup> Nd	5E+3	2E+4	7E-6	2E-8	7E-5	7E-4
		Y, see <sup>136</sup> Nd	-	1E+4	6E-6	2E-8	-	-
60	Neodymium-139 <sup>2</sup>	W, see <sup>136</sup> Nd	9E+4	3E+5	1E-4	5E-7	1E-3	1E-2
		Y, see <sup>136</sup> Nd	-	3E+5	1E-4	4E-7	-	-
60	Neodymium-141	W, see <sup>136</sup> Nd	2E+5	7E+5	3E-4	1E-6	2E-3	2E-2
		Y, see <sup>136</sup> Nd	-	6E+5	3E-4	9E-7	-	-
60	Neodymium-147	W, see <sup>136</sup> Nd	1E+3	9E+2	4E-7	1E-9	-	-
		Y, see <sup>136</sup> Nd	LLI wall (1E+3)	-	-	-	2E-5	2E-4
			-	8E+2	4E-7	1E-9	-	-
60	Neodymium-149 <sup>2</sup>	W, see <sup>136</sup> Nd	1E+4	3E+4	1E-5	4E-8	1E-4	1E-3
		Y, see <sup>136</sup> Nd	-	2E+4	1E-5	3E-8	-	-
60	Neodymium-151 <sup>2</sup>	W, see <sup>136</sup> Nd	7E+4	2E+5	8E-5	3E-7	9E-4	9E-3
		Y, see <sup>136</sup> Nd	-	2E+5	8E-5	3E-7	-	-
61	Promethium-141 <sup>2</sup>	W, all compounds except those given for Y	5E+4	2E+5	8E-5	3E-7	-	-
		Y, oxides, hydroxides, carbides, and fluorides	St wall (6E+4)	-	-	-	8E-4	8E-3
			-	2E+5	7E-5	2E-7	-	-
61	Promethium-143	W, see <sup>141</sup> Pm	5E+3	6E+2	2E-7	8E-10	7E-5	7E-4
		Y, see <sup>141</sup> Pm	-	7E+2	3E-7	1E-9	-	-
61	Promethium-144	W, see <sup>141</sup> Pm	1E+3	1E+2	5E-8	2E-10	2E-5	2E-4
		Y, see <sup>141</sup> Pm	-	1E+2	5E-8	2E-10	-	-
61	Promethium-145	W, see <sup>141</sup> Pm	1E+4	2E+2	7E-8	-	1E-4	1E-3
		Y, see <sup>141</sup> Pm	-	Bone surf (2E+2)	-	3E-10	-	-
			-	2E+2	8E-8	3E-10	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2  Inhalation ALI ( $\mu\text{Ci}$ )	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 ( $\mu\text{Ci}/\text{ml}$ )
61	Promethium-146	W, see $^{141}\text{Pm}$ Y, see $^{141}\text{Pm}$	2E+3 -	5E+1 4E+1	2E-8 2E-8	7E-11 6E-11	2E-5 -	2E-4 -
61	Promethium-147	W, see $^{141}\text{Pm}$  Y, see $^{141}\text{Pm}$	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 $^{141}\text{Pm}$ Y, see $^{141}\text{Pm}$	7E+2 -	3E+2 3E+2	1E-7 1E-7	4E-10 5E-10	1E-5 -	1E-4 -
61	Promethium-148	W, see $^{141}\text{Pm}$  Y, see $^{141}\text{Pm}$	4E+2 LLI wall (5E+2) -	5E+2 - 5E+2	2E-7 - 2E-7	8E-10 - 7E-10	- 7E-6 -	- 7E-5 -
61	Promethium-149	W, see $^{141}\text{Pm}$  Y, see $^{141}\text{Pm}$	1E+3 LLI wall (1E+3) -	2E+3 - 2E+3	8E-7 - 8E-7	3E-9 - 2E-9	- 2E-5 -	- 2E-4 -
61	Promethium-150	W, see $^{141}\text{Pm}$ Y, see $^{141}\text{Pm}$	5E+3 -	2E+4 2E+4	8E-6 7E-6	3E-8 2E-8	7E-5 -	7E-4 -
61	Promethium-151	W, see $^{141}\text{Pm}$ Y, see $^{141}\text{Pm}$	2E+3 -	4E+3 3E+3	1E-6 1E-6	5E-9 4E-9	2E-5 -	2E-4 -
62	Samarium-141m <sup>2</sup>	W, all compounds	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
62	Samarium-141 <sup>2</sup>	W, all compounds	5E+4 St wall (6E+4)	2E+5 - -	8E-5 - -	2E-7 - -	- 8E-4	- 8E-3
62	Samarium-142 <sup>2</sup>	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

## Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
62	Samarium-151	W, all compounds	1E+4 LLI wall (1E+4)	1E+2 Bone surf (2E+2)	4E-8 -	-	-	2E-3
62	Samarium-153	W, all compounds	2E+3 LLI wall (2E+3)	3E+3 -	1E-6 -	4E-9 -	- 3E-5	- 3E-4
62	Samarium-155 <sup>2</sup>	W, all compounds	6E+4 St wall (8E+4)	2E+5 -	9E-5 -	3E-7 -	- 1E-3	- 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 -	- 2E-10	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
63	Europium-158 <sup>2</sup>	W, all compounds	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (µCi)	Inhalation		Col. 1 Air (µCi/ml)	Col. 2 Water (µCi/ml)	Monthly Average Concentration (µCi/ml)
				Col. 2 ALI (µCi)	Col. 3 DAC (µCi/ml)			
64	Gadolinium-145 <sup>2</sup>	D, all compounds except those given for W	5E+4	2E+5	6E-5	2E-7	-	-
		St wall (5E+4)	-	-	-	-	6E-4	6E-3
		W, oxides, hydroxides, and fluorides	-	2E+5	7E-5	2E-7	-	-
64	Gadolinium-146	D, see <sup>145</sup> Gd	1E+3	1E+2	5E-8	2E-10	2E-5	2E-4
		W, see <sup>145</sup> Gd	-	3E+2	1E-7	4E-10	-	-
64	Gadolinium-147	D, see <sup>145</sup> Gd	2E+3	4E+3	2E-6	6E-9	3E-5	3E-4
		W, see <sup>145</sup> Gd	-	4E+3	1E-6	5E-9	-	-
64	Gadolinium-148	D, see <sup>145</sup> Gd	1E+1	8E+3	3E-12	-	-	-
		Bone surf (2E+1)	-	Bone surf (2E-2)	-	2E-14	3E-7	3E-6
		W, see <sup>145</sup> Gd	-	3E-2	1E-11	-	-	-
			-	Bone surf (6E-2)	-	8E-14	-	-
64	Gadolinium-149	D, see <sup>145</sup> Gd	3E+3	2E+3	9E-7	3E-9	4E-5	4E-4
		W, see <sup>145</sup> Gd	-	2E+3	1E-6	3E-9	-	-
64	Gadolinium-151	D, see <sup>145</sup> Gd	6E+3	4E+2	2E-7	-	9E-5	9E-4
		Bone surf (6E+2)	-	-	-	9E-10	-	-
		W, see <sup>145</sup> Gd	-	1E+3	5E-7	2E-9	-	-
64	Gadolinium-152	D, see <sup>145</sup> Gd	2E+1	1E-2	4E-12	-	-	-
		Bone surf (3E+1)	-	Bone surf (2E-2)	-	3E-14	4E-7	4E-6
		W, see <sup>145</sup> Gd	-	4E-2	2E-11	-	-	-
			-	Bone surf (8E-2)	-	1E-13	-	-
64	Gadolinium-153	D, see <sup>145</sup> Gd	5E+3	1E+2	6E-8	-	6E-5	6E-4
		Bone surf (2E+2)	-	-	-	3E-10	-	-
		W, see <sup>145</sup> Gd	-	6E+2	2E-7	8E-10	-	-
64	Gadolinium-159	D, see <sup>145</sup> Gd	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see <sup>145</sup> Gd	-	6E+3	2E-6	8E-9	-	-
65	Terbium-147 <sup>2</sup>	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



Section 380-11.7 Tables of Concentrations

Section 380-11.7 Tables of Concentrations		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
		Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
			Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )				
Atomic Radionuclide No.	Class							
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 LLI 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
65	Terbium-161	W, all compounds	2E+3 LLI wall (2E+3)	2E+3 -	7E-7 -	2E-9 -	- 3E-5	- 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-5	- 1E-4
67	Holmium-155 <sup>2</sup>	W, all compounds	4E+4	2E+5	6E-5	2E-7	6E-4	6E-3
67	Holmium-157 <sup>2</sup>	W, all compounds	3E+5	1E+6	6E-4	2E-6	4E-3	4E-2
67	Holmium-159 <sup>2</sup>	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

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
67	Holmium-162m <sup>2</sup>	W, all compounds	5E+4	3E+5	1E-4	4E-7	7E-4	7E-3
67	Holmium-162 <sup>2</sup>	W, all compounds	5E+5	2E+6	1E-3	3E-6	-	-
			St wall (8E+5)	-	-	-	1E-2	1E-1
67	Holmium-164m <sup>2</sup>	W, all compounds	1E+5	3E+5	1E-4	4E-7	1E-3	1E-2
67	Holmium-164 <sup>2</sup>	W, all compounds	2E+5	6E+5	3E-4	9E-7	-	-
			St wall (2E+5)	-	-	-	3E-3	3E-2
67	Holmium-166m	W, all compounds	6E+2	7E+0	3E-9	9E-12	9E-6	9E-5
67	Holmium-166	W, all compounds	9E+2	2E+3	7E-7	2E-9	-	-
			LLI wall (9E+2)	-	-	-	1E-5	1E-4
67	Holmium-167	W, all compounds	2E+4	6E+4	2E-5	8E-8	2E-4	2E-3
68	Erbium-161	W, all compounds	2E+4	6E+4	3E-5	9E-8	2E-4	2E-3
68	Erbium-165	W, all compounds	6E+4	2E+5	8E-5	3E-7	9E-4	9E-3
68	Erbium-169	W, all compounds	3E+3	3E+3	1E-6	4E-9	-	-
			LLI wall (4E+3)	-	-	-	5E-5	5E-4
68	Erbium-171	W, all compounds	4E+3	1E+4	4E-6	1E-8	5E-5	5E-4
68	Erbium-172	W, all compounds	1E+3	1E+3	6E-7	2E-9	-	-
			LLI wall (1E+3)	-	-	-	2E-5	2E-4
69	Thulium-162 <sup>2</sup>	W, all compounds	7E+4	3E+5	1E-4	4E-7	-	-
			St wall (7E+4)	-	-	-	1E-3	1E-2
69	Thulium-166	W, all compounds	4E+3	1E+4	6E-6	2E-8	6E-5	6E-4
69	Thulium-167	W, all compounds	2E+3	2E+3	8E-7	3E-9	-	-
			LLI wall (2E+3)	-	-	-	3E-5	3E-4

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2	Col. 3	Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Inhalation				
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
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
69	Thulium-172	W, all compounds	7E+2 LLI wall (8E+2)	1E+3 -	5E-7 -	2E-9 -	- 1E-5	- 1E-4
69	Thulium-173	W, all compounds	4E+3	1E+4	5E-6	2E-8	6E-5	6E-4
69	Thulium-175 <sup>2</sup>	W, all compounds	7E+4 St wall (9E+4)	3E+5 -	1E-4 -	4E-7 -	- 1E-3	- 1E-2
70	Ytterbium-162 <sup>2</sup>	W, all compounds except those given for Y Y, oxides, hydroxides, and fluorides	7E+4 -	3E+5 3E+5	1E-4 1E-4	4E-7 4E-7	1E-3 -	1E-2 -
70	Ytterbium-166	W, see <sup>162</sup> Yb Y, see <sup>162</sup> Yb	1E+3 -	2E+3 2E+3	8E-7 8E-7	3E-9 3E-9	2E-5 -	2E-4 -
70	Ytterbium-167 <sup>2</sup>	W, see <sup>162</sup> Yb Y, see <sup>162</sup> Yb	3E+5 -	8E+5 7E+5	3E-4 3E-4	1E-6 1E-6	4E-3 -	4E-2 -
70	Ytterbium-169	W, see <sup>162</sup> Yb Y, see <sup>162</sup> Yb	2E+3 -	8E+2 7E+2	4E-7 3E-7	1E-9 1E-9	2E-5 -	2E-4 -
70	Ytterbium-175	W, see <sup>162</sup> Yb LLI wall (3E+3) Y, see <sup>162</sup> Yb	3E+3 -	4E+3 3E+3	1E-6 1E-6	5E-9 5E-9	- 4E-5 -	- 4E-4 -
70	Ytterbium-177 <sup>2</sup>	W, see <sup>162</sup> Yb Y, see <sup>162</sup> Yb	2E+4 -	5E+4 5E+4	2E-5 2E-5	7E-8 6E-8	2E-4 -	2E-3 -
70	Ytterbium-178 <sup>2</sup>	W, see <sup>162</sup> Yb Y, see <sup>162</sup> Yb	1E+4 -	4E+4 4E+4	2E-5 2E-5	6E-8 5E-8	2E-4 -	2E-3 -
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 -

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2	Col. 3	Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Inhalation				
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
71	Lutetium-170	W, see $^{169}\text{Lu}$	1E+3	2E+3	9E-7	3E-9	2E-5	2E-4
		Y, see $^{169}\text{Lu}$	-	2E+3	8E-7	3E-9	-	-
71	Lutetium-171	W, see $^{169}\text{Lu}$	2E+3	2E+3	8E-7	3E-9	3E-5	3E-4
		Y, see $^{169}\text{Lu}$	-	2E+3	8E-7	3E-9	-	-
71	Lutetium-172	W, see $^{169}\text{Lu}$	1E+3	1E+3	5E-7	2E-9	1E-5	1E-4
		Y, see $^{169}\text{Lu}$	-	1E+3	5E-7	2E-9	-	-
71	Lutetium-173	W, see $^{169}\text{Lu}$	5E+3	3E+2	1E-7	-	7E-5	7E-4
		Y, see $^{169}\text{Lu}$	-	Bone surf (5E+2)	-	6E-10	-	-
71	Lutetium-174m	W, see $^{169}\text{Lu}$	2E+3	2E+2	1E-7	-	-	-
		Y, see $^{169}\text{Lu}$	LLI wall (3E+3)	Bone surf (3E+2)	-	5E-10	4E-5	4E-4
71	Lutetium-174	W, see $^{169}\text{Lu}$	5E+3	1E+2	5E-8	-	7E-5	7E-4
		Y, see $^{169}\text{Lu}$	-	Bone surf (2E+2)	-	3E-10	-	-
71	Lutetium-176m	W, see $^{169}\text{Lu}$	8E+3	3E+4	1E-5	3E-8	1E-4	1E-3
		Y, see $^{169}\text{Lu}$	-	2E+4	9E-6	3E-8	-	-
71	Lutetium-176	W, see $^{169}\text{Lu}$	7E+2	5E+0	2E-9	-	1E-5	1E-4
		Y, see $^{169}\text{Lu}$	-	Bone surf (1E+1)	-	2E-11	-	-
71	Lutetium-177m	W, see $^{169}\text{Lu}$	7E+2	1E+2	5E-8	-	1E-5	1E-4
		Y, see $^{169}\text{Lu}$	-	Bone surf (1E+2)	-	2E-10	-	-
71	Lutetium-177	W, see $^{169}\text{Lu}$	2E+3	2E+3	9E-7	3E-9	-	-
		Y, see $^{169}\text{Lu}$	LLI wall (3E+3)	-	-	-	4E-5	4E-4
71	Lutetium-178m <sup>2</sup>	W, see $^{169}\text{Lu}$	5E+4	2E+5	8E-5	3E-7	-	-
		Y, see $^{169}\text{Lu}$	St. wall (6E+4)	-	-	-	8E-4	8E-3
			-	2E+5	7E-5	2E-7	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2  Inhalation ALI ( $\mu\text{Ci}$ )	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 ( $\mu\text{Ci}/\text{ml}$ )
71	Lutetium-178 <sup>2</sup>	W, see <sup>169</sup> Lu	4E+4 St wall (4E+4)	1E+5	5E-5	2E-7	-	-
		Y, see <sup>169</sup> Lu	-	1E+5	5E-5	2E-7	6E-4	6E-3
71	Lutetium-179	W, see <sup>169</sup> Lu	6E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		Y, see <sup>169</sup> Lu	-	2E+4	6E-6	3E-8	-	-
72	Hafnium-170	D, all compounds except those given for W	3E+3	6E+3	2E-6	8E-9	4E-5	4E-4
		W, oxides, hydroxides, carbides, and nitrates	-	5E+3	2E-6	6E-9	-	-
72	Hafnium-172	D, see <sup>170</sup> Hf	1E+3	9E+0	4E-9	-	2E-5	2E-4
		W, see <sup>170</sup> Hf	-	Bone surf (2E+1)	-	3E-11	-	-
			-	4E+1	2E-8	-	-	-
			-	Bone surf (6E+1)	-	8E-11	-	-
72	Hafnium-173	D, see <sup>170</sup> Hf	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see <sup>170</sup> Hf	-	1E+4	5E-6	2E-8	-	-
72	Hafnium-175	D, see <sup>170</sup> Hf	3E+3	9E+2	4E-7	-	4E-5	4E-4
		W, see <sup>170</sup> Hf	-	Bone surf (1E+3)	-	1E-9	-	-
			-	1E+3	5E-7	2E-9	-	-
72	Hafnium-177m <sup>2</sup>	D, see <sup>170</sup> Hf	2E+4	6E+4	2E-5	8E-8	3E-4	3E-3
		W, see <sup>170</sup> Hf	-	9E+4	4E-5	1E-7	-	-
72	Hafnium-178m	D, see <sup>170</sup> Hf	3E+2	1E+0	5E-10	-	3E-6	3E-5
		W, see <sup>170</sup> Hf	-	Bone surf (2E+0)	-	3E-12	-	-
			-	5E+0	2E-9	-	-	-
			-	Bone surf (9E+0)	-	1E-11	-	-
72	Hafnium-179m	D, see <sup>170</sup> Hf	1E+3	3E+2	1E-7	-	1E-5	1E-4
		W, see <sup>170</sup> Hf	-	Bone surf (6E+2)	-	8E-10	-	-
			-	6E+2	3E-7	8E-10	-	-
72	Hafnium-180m	D, see <sup>170</sup> Hf	7E+3	2E+4	9E-6	3E-8	1E-4	1E-3
		W, see <sup>170</sup> Hf	-	3E+4	1E-5	4E-8	-	-

## Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
72	Hafnium-181	D, see $^{170}\text{Hf}$	1E+3	2E+2	7E-8	-	2E-5	2E-4
				Bone surf				
			-	(4E+2)	-	6E-10	-	-
		W, see $^{170}\text{Hf}$	-	4E+2	2E-7	6E-10	-	-
72	Hafnium-182m <sup>2</sup>	D, see $^{170}\text{Hf}$	4E+4	9E+4	4E-5	1E-7	5E-4	5E-3
		W, see $^{170}\text{Hf}$	-	1E+5	6E-5	2E-7	-	-
72	Hafnium-182	D, see $^{170}\text{Hf}$	2E+2	8E-1	3E-10	-	-	-
			Bone surf	Bone surf				
			(4E+2)	(2E+0)	-	2E-12	5E-6	5E-5
		W, see $^{170}\text{Hf}$	-	3E+0	1E-9	-	-	-
			-	Bone surf	-	1E-11	-	-
				(7E+0)				
72	Hafnium-183 <sup>2</sup>	D, see $^{170}\text{Hf}$	2E+4	5E+4	2E-5	6E-8	3E-4	3E-3
		W, see $^{170}\text{Hf}$	-	6E+4	2E-5	8E-8	-	-
72	Hafnium-184	D, see $^{170}\text{Hf}$	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		W, see $^{170}\text{Hf}$	-	6E+3	3E-6	9E-9	-	-
73	Tantalum-172 <sup>2</sup>	W, all compounds except those given for Y	4E+4	1E+5	5E-5	2E-7	5E-4	5E-3
		Y, elemental Ta, oxides, hydroxides, halides, carbides, nitrates, and nitrides	-	1E+5	4E-5	1E-7	-	-
73	Tantalum-173	W, see $^{172}\text{Ta}$	7E+3	2E+4	8E-6	3E-8	9E-5	9E-4
		Y, see $^{172}\text{Ta}$	-	2E+4	7E-6	2E-8	-	-
73	Tantalum-174 <sup>2</sup>	W, see $^{172}\text{Ta}$	3E+4	1E+5	4E-5	1E-7	4E-4	4E-3
		Y, see $^{172}\text{Ta}$	-	9E+4	4E-5	1E-7	-	-
73	Tantalum-175	W, see $^{172}\text{Ta}$	6E+3	2E+4	7E-6	2E-8	8E-5	8E-4
		Y, see $^{172}\text{Ta}$	-	1E+4	6E-6	2E-8	-	-
73	Tantalum-176	W, see $^{172}\text{Ta}$	4E+3	1E+4	5E-6	2E-8	5E-5	5E-4
		Y, see $^{172}\text{Ta}$	-	1E+4	5E-6	2E-8	-	-
73	Tantalum-177	W, see $^{172}\text{Ta}$	1E+4	2E+4	8E-6	3E-8	2E-4	2E-3
		Y, see $^{172}\text{Ta}$	-	2E+4	7E-6	2E-8	-	-
73	Tantalum-178	W, see $^{172}\text{Ta}$	2E+4	9E+4	4E-5	1E-7	2E-4	2E-3
		Y, see $^{172}\text{Ta}$	-	7E+4	3E-5	1E-7	-	-
73	Tantalum-179	W, see $^{172}\text{Ta}$	2E+4	5E+3	2E-6	8E-9	3E-4	3E-3
		Y, see $^{172}\text{Ta}$	-	9E+2	4E-7	1E-9	-	-

<u>Section 380-11.7 Tables of Concentrations</u>			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
			Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )				
73	Tantalum-180m	W, see $^{172}\text{Ta}$	2E+4	7E+4	3E-5	9E-8	3E-4	3E-3
		Y, see $^{172}\text{Ta}$	-	6E+4	2E-5	8E-8	-	-
73	Tantalum-180	W, see $^{172}\text{Ta}$	1E+3	4E+2	2E-7	6E-10	2E-5	2E-4
		Y, see $^{172}\text{Ta}$	-	2E+1	1E-8	3E-11	-	-
73	Tantalum-182m <sup>2</sup>	W, see $^{172}\text{Ta}$	2E+5	5E+5	2E-4	8E-7	-	-
		Y, see $^{172}\text{Ta}$	St wall (2E+5)	-	-	-	3E-3	3E-2
73	Tantalum-182	W, see $^{172}\text{Ta}$	8E+2	3E+2	1E-7	5E-10	1E-5	1E-4
		Y, see $^{172}\text{Ta}$	-	1E+2	6E-8	2E-10	-	-
73	Tantalum-183	W, see $^{172}\text{Ta}$	9E+2	1E+3	5E-7	2E-9	-	-
		Y, see $^{172}\text{Ta}$	LLI wall (1E+3)	-	-	-	2E-5	2E-4
73	Tantalum-184	W, see $^{172}\text{Ta}$	2E+3	5E+3	2E-6	8E-9	3E-5	3E-4
		Y, see $^{172}\text{Ta}$	-	5E+3	2E-6	7E-9	-	-
73	Tantalum-185 <sup>2</sup>	W, see $^{172}\text{Ta}$	3E+4	7E+4	3E-5	1E-7	4E-4	4E-3
		Y, see $^{172}\text{Ta}$	-	6E+4	3E-5	9E-8	-	-
73	Tantalum-186 <sup>2</sup>	W, see $^{172}\text{Ta}$	5E+4	2E+5	1E-4	3E-7	-	-
		Y, see $^{172}\text{Ta}$	St wall (7E+4)	-	-	-	1E-3	1E-2
74	Tungsten-176	W, see $^{172}\text{Ta}$	2E+3	7E+3	3E-6	9E-9	-	-
		Y, see $^{172}\text{Ta}$	LLI wall (3E+3)	-	-	-	4E-5	4E-4
74	Tungsten-177	W, see $^{172}\text{Ta}$	1E+4	5E+4	2E-5	7E-8	1E-4	1E-3
		Y, see $^{172}\text{Ta}$	2E+4	9E+4	4E-5	1E-7	3E-4	3E-3
74	Tungsten-178	W, see $^{172}\text{Ta}$	5E+3	2E+4	8E-6	3E-8	7E-5	7E-4
		Y, see $^{172}\text{Ta}$	2E+6	7E+6	7E-4	2E-6	7E-3	7E-2
74	Tungsten-179 <sup>2</sup>	W, see $^{172}\text{Ta}$	2E+4	3E+4	1E-5	5E-8	2E-4	2E-3
		Y, see $^{172}\text{Ta}$	2E+3	7E+3	3E-6	9E-9	-	-
74	Tungsten-181	W, see $^{172}\text{Ta}$	2E+3	7E+3	3E-6	9E-9	-	-
		Y, see $^{172}\text{Ta}$	LLI wall (3E+3)	-	-	-	4E-5	4E-4
74	Tungsten-185	W, see $^{172}\text{Ta}$	2E+3	7E+3	3E-6	9E-9	-	-
		Y, see $^{172}\text{Ta}$	LLI wall (3E+3)	-	-	-	4E-5	4E-4
74	Tungsten-187	W, see $^{172}\text{Ta}$	2E+3	7E+3	3E-6	9E-9	-	-
		Y, see $^{172}\text{Ta}$	LLI wall (3E+3)	-	-	-	4E-5	4E-4
74	Tungsten-187	W, see $^{172}\text{Ta}$	2E+3	7E+3	3E-6	9E-9	-	-
		Y, see $^{172}\text{Ta}$	LLI wall (3E+3)	-	-	-	4E-5	4E-4

<u>Section 380-11.7 Tables of Concentrations</u>			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation					
			ALI ( $\mu\text{Ci}$ )	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 -	- 7E-6	- 7E-5
75	Rhenium-177 <sup>2</sup>	D, all compounds except those given for W	9E+4 St wall (1E+5)	3E+5 -	1E-4 -	4E-7 -	- 2E-3	- 2E-2
		W, oxides, hydroxides, and nitrates	-	4E+5	1E-4	5E-7	-	-
75	Rhenium-178 <sup>2</sup>	D, see <sup>177</sup> Re	7E+4 St wall (1E+5)	3E+5 -	1E-4 -	4E-7 -	- 1E-3	- 1E-2
		W, see <sup>177</sup> Re	-	3E+5	1E-4	4E-7	-	-
75	Rhenium-181	D, see <sup>177</sup> Re	5E+3	9E+3	4E-6	1E-8	7E-5	7E-4
		W, see <sup>177</sup> Re	-	9E+3	4E-6	1E-8	-	-
75	Rhenium-182 (12.7 h)	D, see <sup>177</sup> Re	7E+3	1E+4	5E-6	2E-8	9E-5	9E-4
		W, see <sup>177</sup> Re	-	2E+4	6E-6	2E-8	-	-
75	Rhenium-182 (64.0 h)	D, see <sup>177</sup> Re	1E+3	2E+3	1E-6	3E-9	2E-5	2E-4
		W, see <sup>177</sup> Re	-	2E+3	9E-7	3E-9	-	-
75	Rhenium-184m	D, see <sup>177</sup> Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see <sup>177</sup> Re	-	4E+2	2E-7	6E-10	-	-
75	Rhenium-184	D, see <sup>177</sup> Re	2E+3	4E+3	1E-6	5E-9	3E-5	3E-4
		W, see <sup>177</sup> Re	-	1E+3	6E-7	2E-9	-	-
75	Rhenium-186m	D, see <sup>177</sup> Re	1E+3	2E+3	7E-7	-	-	-
		St wall (2E+3)		St wall (2E+3)	-	3E-9	2E-5	2E-4
		W, see <sup>177</sup> Re	-	2E+2	6E-8	2E-10	-	-
75	Rhenium-186	D, see <sup>177</sup> Re	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
		W, see <sup>177</sup> Re	-	2E+3	7E-7	2E-9	-	-
75	Rhenium-187	D, see <sup>177</sup> Re	6E+5	8E+5	4E-4	-	8E-3	8E-2
		St wall (9E+5)		St wall (9E+5)	-	1E-6	-	-
		W, see <sup>177</sup> Re	-	1E+5	4E-5	1E-7	-	-
75	Rhenium-188m <sup>2</sup>	D, see <sup>177</sup> Re	8E+4	1E+5	6E-5	2E-7	1E-3	1E-2
		W, see <sup>177</sup> Re	-	1E+5	6E-5	2E-7	-	-



Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2  Inhalation ALI ( $\mu\text{Ci}$ )	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 ( $\mu\text{Ci}/\text{ml}$ )
75	Rhenium-188	D, see <sup>177</sup> Re W, see <sup>177</sup> Re	2E+3 -	3E+3 3E+3	1E-6 1E-6	4E-9 4E-9	2E-5 -	2E-4 -
75	Rhenium-189	D, see <sup>177</sup> Re W, see <sup>177</sup> Re	3E+3 -	5E+3 4E+3	2E-6 2E-6	7E-9 6E-9	4E-5 -	4E-4 -
76	Osmium-180 <sup>2</sup>	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 <sup>2</sup>	D, see <sup>180</sup> Os W, see <sup>180</sup> Os Y, see <sup>180</sup> 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 <sup>180</sup> Os W, see <sup>180</sup> Os Y, see <sup>180</sup> 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 <sup>180</sup> Os W, see <sup>180</sup> Os Y, see <sup>180</sup> 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 <sup>180</sup> Os W, see <sup>180</sup> Os Y, see <sup>180</sup> 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 <sup>180</sup> Os W, see <sup>180</sup> Os Y, see <sup>180</sup> 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 - -
76	Osmium-191	D, see <sup>180</sup> Os  LLI wall (3E+3) W, see <sup>180</sup> Os Y, see <sup>180</sup> Os	2E+3  - - -	2E+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 <sup>180</sup> Os  LLI wall (2E+3) W, see <sup>180</sup> Os Y, see <sup>180</sup> Os	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 <sup>180</sup> Os  LLI wall (6E+2) W, see <sup>180</sup> Os Y, see <sup>180</sup> Os	4E+2  - - -	4E+1  - 6E+1 8E+0	2E-8  - 2E-8 3E-9	6E-11  - 8E-11 1E-11	-  8E-6 - -	-  8E-5 - -

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Inhalation		Col. 1 Air (μCi/ml)	Col. 2 Water (μCi/ml)	Monthly Average Concentration (μCi/ml)
				Col. 2 ALI (μCi)	Col. 3 DAC (μCi/ml)			
77	Iridium-182 <sup>2</sup>	D, all compounds except those given for W and Y	4E+4	1E+5	6E-5	2E-7	-	-
		St wall (4E+4)	-	-	-	-	6E-4	6E-3
		W, halides, nitrates, and metallic iridium	-	2E+5	6E-5	2E-7	-	-
		Y, oxides and hydroxides	-	1E+5	5E-5	2E-7	-	-
77	Iridium-184	D, see <sup>182</sup> Ir	8E+3	2E+4	1E-5	3E-8	1E-4	1E-3
		W, see <sup>182</sup> Ir	-	3E+4	1E-5	5E-8	-	-
		Y, see <sup>182</sup> Ir	-	3E+4	1E-5	4E-8	-	-
77	Iridium-185	D, see <sup>182</sup> Ir	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see <sup>182</sup> Ir	-	1E+4	5E-6	2E-8	-	-
		Y, see <sup>182</sup> Ir	-	1E+4	4E-6	1E-8	-	-
77	Iridium-186	D, see <sup>182</sup> Ir	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
		W, see <sup>182</sup> Ir	-	6E+3	3E-6	9E-9	-	-
		Y, see <sup>182</sup> Ir	-	6E+3	2E-6	8E-9	-	-
77	Iridium-187	D, see <sup>182</sup> Ir	1E+4	3E+4	1E-5	5E-8	1E-4	1E-3
		W, see <sup>182</sup> Ir	-	3E+4	1E-5	4E-8	-	-
		Y, see <sup>182</sup> Ir	-	3E+4	1E-5	4E-8	-	-
77	Iridium-188	D, see <sup>182</sup> Ir	2E+3	5E+3	2E-6	6E-9	3E-5	3E-4
		W, see <sup>182</sup> Ir	-	4E+3	1E-6	5E-9	-	-
		Y, see <sup>182</sup> Ir	-	3E+3	1E-6	5E-9	-	-
77	Iridium-189	D, see <sup>182</sup> Ir	5E+3	5E+3	2E-6	7E-9	-	-
		LLI wall (5E+3)	-	-	-	-	7E-5	7E-4
		W, see <sup>182</sup> Ir	-	4E+3	2E-6	5E-9	-	-
		Y, see <sup>182</sup> Ir	-	4E+3	1E-6	5E-9	-	-
77	Iridium-190m <sup>2</sup>	D, see <sup>182</sup> Ir	2E+5	2E+5	8E-5	3E-7	2E-3	2E-2
		W, see <sup>182</sup> Ir	-	2E+5	9E-5	3E-7	-	-
		Y, see <sup>182</sup> Ir	-	2E+5	8E-5	3E-7	-	-
77	Iridium-190	D, see <sup>182</sup> Ir	1E+3	9E+2	4E-7	1E-9	1E-5	1E-4
		W, see <sup>182</sup> Ir	-	1E+3	4E-7	1E-9	-	-
		Y, see <sup>182</sup> Ir	-	9E+2	4E-7	1E-9	-	-
77	Iridium-192m	D, see <sup>182</sup> Ir	3E+3	9E+1	4E-8	1E-10	4E-5	4E-4
		W, see <sup>182</sup> Ir	-	2E+2	9E-8	3E-10	-	-
		Y, see <sup>182</sup> Ir	-	2E+1	6E-9	2E-11	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2  Inhalation ALI ( $\mu\text{Ci}$ )	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 ( $\mu\text{Ci}/\text{ml}$ )
77	Iridium-192	D, see $^{182}\text{Ir}$ W, see $^{182}\text{Ir}$ Y, see $^{182}\text{Ir}$	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 $^{182}\text{Ir}$ W, see $^{182}\text{Ir}$ Y, see $^{182}\text{Ir}$	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 $^{182}\text{Ir}$ W, see $^{182}\text{Ir}$ Y, see $^{182}\text{Ir}$	1E+3 - -	3E+3 2E+3 2E+3	1E-6 9E-7 8E-7	4E-9 3E-9 3E-9	1E-5 - -	1E-4 - -
77	Iridium-195m	D, see $^{182}\text{Ir}$ W, see $^{182}\text{Ir}$ Y, see $^{182}\text{Ir}$	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 $^{182}\text{Ir}$ W, see $^{182}\text{Ir}$ Y, see $^{182}\text{Ir}$	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 <sup>2</sup>	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 <sup>2</sup>	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

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2	Col. 3	Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Inhalation				
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
79	Gold-193	D, all compounds except those given for W and Y	9E+3	3E+4	1E-5	4E-8	1E-4	1E-3
		W, halides and nitrates	-	2E+4	9E-6	3E-8	-	-
		Y, oxides and hydroxides	-	2E+4	8E-6	3E-8	-	-
79	Gold-194	D, see $^{193}\text{Au}$	3E+3	8E+3	3E-6	1E-8	4E-5	4E-4
		W, see $^{193}\text{Au}$	-	5E+3	2E-6	8E-9	-	-
		Y, see $^{193}\text{Au}$	-	5E+3	2E-6	7E-9	-	-
79	Gold-195	D, see $^{193}\text{Au}$	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
		W, see $^{193}\text{Au}$	-	1E+3	6E-7	2E-9	-	-
		Y, see $^{193}\text{Au}$	-	4E+2	2E-7	6E-10	-	-
79	Gold-198m	D, see $^{193}\text{Au}$	1E+3	3E+3	1E-6	4E-9	1E-5	1E-4
		W, see $^{193}\text{Au}$	-	1E+3	5E-7	2E-9	-	-
		Y, see $^{193}\text{Au}$	-	1E+3	5E-7	2E-9	-	-
79	Gold-198	D, see $^{193}\text{Au}$	1E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		W, see $^{193}\text{Au}$	-	2E+3	8E-7	3E-9	-	-
		Y, see $^{193}\text{Au}$	-	2E+3	7E-7	2E-9	-	-
79	Gold-199	D, see $^{193}\text{Au}$	3E+3	9E+3	4E-6	1E-8	-	-
		LLI wall (3E+3)	-	-	-	-	4E-5	4E-4
		W, see $^{193}\text{Au}$	-	4E+3	2E-6	6E-9	-	-
79	Gold-200m	D, see $^{193}\text{Au}$	1E+3	4E+3	1E-6	5E-9	2E-5	2E-4
		W, see $^{193}\text{Au}$	-	3E+3	1E-6	4E-9	-	-
		Y, see $^{193}\text{Au}$	-	2E+4	1E-6	3E-9	-	-
79	Gold-200 <sup>2</sup>	D, see $^{193}\text{Au}$	3E+4	6E+4	3E-5	9E-8	4E-4	4E-3
		W, see $^{193}\text{Au}$	-	8E+4	3E-5	1E-7	-	-
		Y, see $^{193}\text{Au}$	-	7E+4	3E-5	1E-7	-	-
79	Gold-201 <sup>2</sup>	D, see $^{193}\text{Au}$	7E+4	2E+5	9E-5	3E-7	-	-
		St wall (9E+4)	-	-	-	-	1E-3	1E-2
		W, see $^{193}\text{Au}$	-	2E+5	1E-4	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	-	-

Section 380-11.7 Tables of Concentrations		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
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 <sup>193m</sup> Hg	2E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>193m</sup> 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 <sup>193m</sup> Hg	8E+2	4E+1	2E-8	6E-11	1E-5	1E-4
		W, see <sup>193m</sup> 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 <sup>193m</sup> Hg	2E+3	5E+3	2E-6	7E-9	3E-5	3E-4
		W, see <sup>193m</sup> 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 <sup>193m</sup> Hg	1E+4	4E+4	1E-5	5E-8	2E-4	2E-3
		W, see <sup>193m</sup> 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 <sup>193m</sup> Hg	3E+3	7E+3	3E-6	1E-8	4E-5	4E-4
		W, see <sup>193m</sup> Hg	-	5E+3	2E-6	7E-9	-	-
80	Mercury-197	Vapor	-	8E+3	4E-6	1E-8	-	-
		Organic D	7E+3	1E+4	6E-6	2E-8	9E-5	9E-4
		D, see <sup>193m</sup> Hg	6E+3	1E+4	5E-6	2E-8	8E-5	8E-4
		W, see <sup>193m</sup> Hg	-	9E+3	4E-6	1E-8	-	-
80	Mercury-199m <sup>2</sup>	Vapor	-	8E+4	3E-5	1E-7	-	-
		Organic D	6E+4	2E+5	7E-5	2E-7	-	-
		St wall (1E+5)	-	-	-	-	1E-3	1E-2
		D, see <sup>193m</sup> Hg	6E+4	1E+5	6E-5	2E-7	8E-4	8E-3
		W, see <sup>193m</sup> Hg	-	2E+5	7E-5	2E-7	-	-
80	Mercury-203	Vapor	-	8E+2	4E-7	1E-9	-	-
		Organic D	5E+2	8E+2	3E-7	1E-9	7E-6	7E-5
		D, see <sup>193m</sup> Hg	2E+3	1E+3	5E-7	2E-9	3E-5	3E-4
		W, see <sup>193m</sup> Hg	-	1E+3	5E-7	2E-9	-	-
81	Thallium-194m <sup>2</sup>	D, all compounds	5E+4	2E+5	6E-5	2E-7	-	-
		St wall (7E+4)	-	-	-	-	1E-3	1E-2
81	Thallium-194 <sup>2</sup>	D, all compounds	3E+5	6E+5	2E-4	8E-7	-	-
		St wall (3E+5)	-	-	-	-	4E-3	4E-2

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
81	Thallium-195 <sup>2</sup>	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 <sup>2</sup>	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
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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )				
82	Lead-214 <sup>2</sup>	D, all compounds	9E+3	8E+2	3E-7	1E-9	1E-4	1E-3
83	Bismuth-200 <sup>2</sup>	D, nitrates	3E+4	8E+4	4E-5	1E-7	4E-4	4E-3
		W, all other compounds	-	1E+5	4E-5	1E-7	-	-
83	Bismuth-201 <sup>2</sup>	D, see <sup>200</sup> Bi	1E+4	3E+4	1E-5	4E-8	2E-4	2E-3
		W, see <sup>200</sup> Bi	-	4E+4	2E-5	5E-8	-	-
83	Bismuth-202 <sup>2</sup>	D, see <sup>200</sup> Bi	1E+4	4E+4	2E-5	6E-8	2E-4	2E-3
		W, see <sup>200</sup> Bi	-	8E+4	3E-5	1E-7	-	-
83	Bismuth-203	D, see <sup>200</sup> Bi	2E+3	7E+3	3E-6	9E-9	3E-5	3E-4
		W, see <sup>200</sup> Bi	-	6E+3	3E-6	9E-9	-	-
83	Bismuth-205	D, see <sup>200</sup> Bi	1E+3	3E+3	1E-6	3E-9	2E-5	2E-4
		W, see <sup>200</sup> Bi	-	1E+3	5E-7	2E-9	-	-
83	Bismuth-206	D, see <sup>200</sup> Bi	6E+2	1E+3	6E-7	2E-9	9E-6	9E-5
		W, see <sup>200</sup> Bi	-	9E+2	4E-7	1E-9	-	-
83	Bismuth-207	D, see <sup>200</sup> Bi	1E+3	2E+3	7E-7	2E-9	1E-5	1E-4
		W, see <sup>200</sup> Bi	-	4E+2	1E-7	5E-10	-	-
83	Bismuth-210m	D, see <sup>200</sup> Bi	4E+1	5E+0	2E-9	-	-	-
		Kidneys	(6E+1)	Kidneys	(6E+0)	9E-12	8E-7	8E-6
		W, see <sup>200</sup> Bi	-	7E-1	3E-10	9E-13	-	-
83	Bismuth-210	D, see <sup>200</sup> Bi	8E+2	2E+2	1E-7	-	1E-5	1E-4
		Kidneys	-	(4E+2)	-	5E-10	-	-
		W, see <sup>200</sup> Bi	-	3E+1	1E-8	4E-11	-	-
83	Bismuth-212 <sup>2</sup>	D, see <sup>200</sup> Bi	5E+3	2E+2	1E-7	3E-10	7E-5	7E-4
		W, see <sup>200</sup> Bi	-	3E+2	1E-7	4E-10	-	-
83	Bismuth-213 <sup>2</sup>	D, see <sup>200</sup> Bi	7E+3	3E+2	1E-7	4E-10	1E-4	1E-3
		W, see <sup>200</sup> Bi	-	4E+2	1E-7	5E-10	-	-
83	Bismuth-214 <sup>2</sup>	D, see <sup>200</sup> Bi	2E+4	8E+2	3E-7	1E-9	-	-
		St wall	(2E+4)	-	-	-	3E-4	3E-3
		W, see <sup>200</sup> Bi	-	9E-2	4E-7	1E-9	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
84	Polonium-203 <sup>2</sup>	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 <sup>2</sup>	D, see <sup>203</sup> Po W, see <sup>203</sup> Po	2E+4 -	4E+4 7E+4	2E-5 3E-5	5E-8 1E-7	3E-4 -	3E-3 -
84	Polonium-207	D, see <sup>203</sup> Po W, see <sup>203</sup> Po	8E+3 -	3E+4 3E+4	1E-5 1E-5	3E-8 4E-8	1E-4 -	1E-3 -
84	Polonium-210	D, see <sup>203</sup> Po W, see <sup>203</sup> Po	3E+0 -	6E-1 6E-1	3E-10 3E-10	9E-13 9E-13	4E-8 -	4E-7 -
85	Astatine-207 <sup>2</sup>	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 WLM)	7E-6 9E-9 (or 1.0 WL)	2E-8 3E-11	- -	- -
86	Radon-222	With daughters removed With daughters present	- -	1E+4 1E+2 (or 4	4E-6 3E-8 (or 0.33 WLM)	1E-8 1E-10 WL)	- -	- -
87	Francium-222 <sup>2</sup>	D, all compounds	2E+3	5E+2	2E-7	6E-10	3E-5	3E-4
87	Francium-223 <sup>2</sup>	D, all compounds	6E+2	8E+2	3E-7	1E-9	8E-6	8E-5
88	Radium-223	W, all compounds	5E+0	7E-1	3E-10	9E-13	-	-
88	Radium-224	W, all compounds	Bone surf (9E+0) 8E+0	- 2E+0	- 7E-10	- 2E-12	1E-7 -	1E-6 -
88	Radium-225	W, all compounds	Bone surf (2E+1) 8E+0	- 7E-1	- 3E-10	- 9E-13	2E-7 -	2E-6 -
88	Radium-225	W, all compounds	Bone surf (2E+1) 8E+0	- 7E-1	- 3E-10	- 9E-13	2E-7 -	2E-6 -



Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2  Inhalation ALI ( $\mu\text{Ci}$ )	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 ( $\mu\text{Ci}/\text{ml}$ )
88	Radium-226	W, all compounds	2E+0 Bone surf (5E+0)	6E-1 -	3E-10 -	9E-13 -	- 6E-8	- 6E-7
88	Radium-227 <sup>2</sup>	W, all compounds	2E+4 Bone surf (2E+4)	1E+4 Bone surf (2E+4)	6E-6 -	- 3E-8	- 3E-4	- 3E-3
88	Radium-228	W, all compounds	2E+0 Bone surf (4E+0)	1E+0 -	5E-10 -	2E-12 -	- 6E-8	- 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 -	- 5E-11	- 3E-5	- 3E-4
		W, halides and nitrates	-	5E+1	2E-8	7E-11	-	-
		Y, oxides and hydroxides	-	5E+1	2E-8	6E-11	-	-
89	Actinium-225	D, see <sup>224</sup> Ac	5E+1 LLI wall (5E+1)	3E-1 Bone surf (5E-1)	1E-10 -	- 7E-13	- 7E-7	- 7E-6
		W, see <sup>224</sup> Ac	-	6E-1	3E-10	9E-13	-	-
		Y, see <sup>224</sup> Ac	-	6E-1	3E-10	9E-13	-	-
89	Actinium-226	D, see <sup>224</sup> Ac	1E+2 LLI wall (1E+2)	3E+0 Bone surf (4E+0)	1E-9 -	- 5E-12	- 2E-6	- 2E-5
		W, see <sup>224</sup> Ac	-	5E+0	2E-9	7E-12	-	-
		Y, see <sup>224</sup> Ac	-	5E+0	2E-9	6E-12	-	-
89	Actinium-227	D, see <sup>224</sup> Ac	2E-1 Bone surf (4E-1)	4E-4 Bone surf (8E-4)	2E-13 -	- 1E-15	- 5E-9	- 5E-8
		W, see <sup>224</sup> Ac	-	2E-3 Bone surf (3E-3)	7E-13 -	- 4E-15	- -	- -
		Y, see <sup>224</sup> Ac	-	4E-3	2E-12	6E-15	-	-
89	Actinium-228	D, see <sup>224</sup> Ac	2E+3 -	9E+0 Bone surf (2E+1)	4E-9 -	- 2E-11	3E-5 -	3E-4 -
		W, see <sup>224</sup> Ac	-	4E+1	2E-8	-	-	-
			-	Bone surf (6E+1)	-	8E-11	-	-
		Y, see <sup>224</sup> Ac	-	4E+1	2E-8	6E-11	-	-

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation				
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
90	Thorium-226 <sup>2</sup> W, all compounds except those given for Y	5E+3	2E+2	6E-8	2E-10	-	-
		St wall (5E+3)	-	-	-	7E-5	7E-4
	Y, oxides and hydroxides	-	1E+2	6E-8	2E-10	-	-
90	Thorium-227 W, see <sup>226</sup> Th Y, see <sup>226</sup> Th	1E+2	3E-1	1E-10	5E-13	2E-6	2E-5
		-	3E-1	1E-10	5E-13	-	-
90	Thorium-228 W, see <sup>226</sup> Th Y, see <sup>226</sup> Th	6E+0	1E-2	4E-12	-	-	-
		Bone surf (1E+1)	Bone surf (2E-2)	-	3E-14	2E-7	2E-6
		-	2E-2	7E-12	2E-14	-	-
90	Thorium-229 W, see <sup>226</sup> Th Y, see <sup>226</sup> Th	6E-1	9E-4	4E-13	-	-	-
		Bone surf (1E+0)	Bone surf (2E-3)	-	3E-15	2E-8	2E-7
		-	2E-3	1E-12	-	-	-
		-	Bone surf (3E-3)	-	4E-15	-	-
90	Thorium-230 W, see <sup>226</sup> Th Y, see <sup>226</sup> Th	4E+0	6E-3	3E-12	-	-	-
		Bone surf (9E+0)	Bone surf (2E-2)	-	2E-14	1E-7	1E-6
		-	2E-2	6E-12	-	-	-
		-	Bone surf (2E-2)	-	3E-14	-	-
90	Thorium-231 W, see <sup>226</sup> Th Y, see <sup>226</sup> Th	4E+3	6E+3	3E-6	9E-9	5E-5	5E-4
		-	6E+3	3E-6	9E-9	-	-
90	Thorium-232 W, see <sup>226</sup> Th Y, see <sup>226</sup> Th	7E-1	1E-3	5E-13	-	-	-
		Bone surf (2E+0)	Bone surf (3E-3)	-	4E-15	3E-8	3E-7
		-	3E-3	1E-12	-	-	-
		-	Bone surf (4E-3)	-	6E-15	-	-
90	Thorium-234 W, see <sup>226</sup> Th Y, see <sup>226</sup> Th	3E+2	2E+2	8E-8	3E-10	-	-
		LLI wall (4E+2)	-	-	-	5E-6	5E-5
		-	2E+2	6E-8	2E-10	-	-
91	Protactinium-227 <sup>2</sup> W, all compounds except those given for Y Y, oxides and hydroxides	4E+3	1E+2	5E-8	2E-10	5E-5	5E-4
		-	1E+2	4E-8	1E-10	-	-

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )			
91	Protactinium-228 W, see <sup>227</sup> Pa	1E+3	1E+1	5E-9	-	2E-5	2E-4
			Bone surf				
		-	(2E+1)	-	3E-11	-	-
	Y, see <sup>227</sup> Pa	-	1E+1	5E-9	2E-11	-	-
91	Protactinium-230 W, see <sup>227</sup> Pa	6E+2	5E+0	2E-9	7E-12	-	-
			Bone surf				
		(9E+2)	-	-	-	1E-5	1E-4
	Y, see <sup>227</sup> Pa	-	4E+0	1E-9	5E-12	-	-
91	Protactinium-231 W, see <sup>227</sup> Pa	2E-1	2E-3	6E-13	-	-	-
			Bone surf				
		(5E-1)	(4E-3)	-	6E-15	6E-9	6E-8
	Y, see <sup>227</sup> Pa	-	4E-3	2E-12	-	-	-
			Bone surf				
		-	(6E-3)	-	8E-15	-	-
91	Protactinium-232 W, see <sup>227</sup> Pa	1E+3	2E+1	9E-9	-	2E-5	2E-4
			Bone surf				
		-	(6E+1)	-	8E-11	-	-
	Y, see <sup>227</sup> Pa	-	6E+1	2E-8	-	-	-
			Bone surf				
		-	(7E+1)	-	1E-10	-	-
91	Protactinium-233 W, see <sup>227</sup> Pa	1E+3	7E+2	3E-7	1E-9	-	-
			LLI wall				
		(2E+3)	-	-	-	2E-5	2E-4
	Y, see <sup>227</sup> Pa	-	6E+2	2E-7	8E-10	-	-
91	Protactinium-234 W, see <sup>227</sup> Pa	2E+3	8E+3	3E-6	1E-8	3E-5	3E-4
	Y, see <sup>227</sup> Pa	-	7E+3	3E-6	9E-9	-	-
92	Uranium-230	4E+0	4E-1	2E-10	-	-	-
			Bone surf				
		(6E+0)	(6E-1)	-	8E-13	8E-8	8E-7
	W, UO <sub>3</sub> , UF <sub>4</sub> , UCl <sub>4</sub>	-	4E-1	1E-10	5E-13	-	-
	Y, UO <sub>2</sub> , U <sub>2</sub> O <sub>8</sub>	-	3E-1	1E-10	4E-13	-	-
92	Uranium-231	5E+3	8E+3	3E-6	1E-8	-	-
			LLI wall				
		(4E+3)	-	-	-	6E-5	6E-4
	W, see <sup>230</sup> U	-	6E+3	2E-6	8E-9	-	-
	Y, see <sup>230</sup> U	-	5E+3	2E-6	6E-9	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
92	Uranium-232	D, see <sup>230</sup> U	2E+0 Bone surf (4E+0)	2E-1 Bone surf (4E-1)	9E-11 -	-	-	-
		W, see <sup>230</sup> U	-	4E-1	2E-10	6E-13	6E-8	6E-7
		Y, see <sup>230</sup> U	-	8E-3	3E-12	5E-13	-	-
						1E-14	-	-
92	Uranium-233	D, see <sup>230</sup> U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 -	-	-	-
		W, see <sup>230</sup> U	-	7E-1	3E-10	3E-12	3E-7	3E-6
		Y, see <sup>230</sup> U	-	4E-2	2E-11	1E-12	-	-
						5E-14	-	-
92	Uranium-234 <sup>3</sup>	D, see <sup>230</sup> U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 -	-	-	-
		W, see <sup>230</sup> U	-	7E-1	3E-10	3E-12	3E-7	3E-6
		Y, see <sup>230</sup> U	-	4E-2	2E-11	1E-12	-	-
						5E-14	-	-
92	Uranium-235 <sup>3</sup>	D, see <sup>230</sup> U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	6E-10 -	-	-	-
		W, see <sup>230</sup> U	-	8E-1	3E-10	3E-12	3E-7	3E-6
		Y, see <sup>230</sup> U	-	4E-2	2E-11	1E-12	-	-
						6E-14	-	-
92	Uranium-236	D, see <sup>230</sup> U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 -	-	-	-
		W, see <sup>230</sup> U	-	8E-1	3E-10	3E-12	3E-7	3E-6
		Y, see <sup>230</sup> U	-	4E-2	2E-11	1E-12	-	-
						6E-14	-	-
92	Uranium-237	D, see <sup>230</sup> U	2E+3 LLI wall (2E+3)	3E+3 -	1E-6 -	4E-9 -	-	-
		W, see <sup>230</sup> U	-	2E+3	7E-7	2E-9	3E-5	3E-4
		Y, see <sup>230</sup> U	-	2E+3	6E-7	2E-9	-	-
92	Uranium-238 <sup>3</sup>	D, see <sup>230</sup> U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	6E-10 -	-	-	-
		W, see <sup>230</sup> U	-	8E-1	3E-10	3E-12	3E-7	3E-6
		Y, see <sup>230</sup> U	-	4E-2	2E-11	1E-12	-	-
						6E-14	-	-
92	Uranium-239 <sup>2</sup>	D, see <sup>230</sup> U	7E+4	2E+5	8E-5	3E-7	9E-4	9E-3
		W, see <sup>230</sup> U	-	2E+5	7E-5	2E-7	-	-
		Y, see <sup>230</sup> U	-	2E+5	6E-5	2E-7	-	-
92	Uranium-240	D, see <sup>230</sup> U	1E+3	4E+3	2E-6	5E-9	2E-5	2E-4
		W, see <sup>230</sup> U	-	3E+3	1E-6	4E-9	-	-
		Y, see <sup>230</sup> U	-	2E+3	1E-6	3E-9	-	-

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )			
92	Uranium-natural <sup>3</sup> D, see <sup>230</sup> U	1E+1 Bone surf (2E+1)	1E+0 Bone surf (2E+0)	5E-10 -	- 3E-12	- 3E-7	- 3E-6
	W, see <sup>230</sup> U	-	8E-1	3E-10	9E-13	-	-
	Y, see <sup>230</sup> U	-	5E-2	2E-11	9E-14	-	-
93	Neptunium-232 <sup>2</sup> W, all compounds	1E+5 -	2E+3 Bone surf (5E+2)	7E-7 -	- 6E-9	2E-3 -	2E-2 -
93	Neptunium-233 <sup>2</sup> 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
93	Neptunium-237 W, all compounds	5E-1 Bone surf (1E+0)	4E-3 Bone surf (1E-2)	2E-12 -	- 1E-14	- 2E-8	- 2E-7
93	Neptunium-238 W, all compounds	1E+3 -	6E+1 Bone surf (2E+2)	3E-8 -	- 2E-10	2E-5 -	2E-4 -
93	Neptunium-239 W, all compounds	2E+3 LLI wall (2E+3)	2E+3 -	9E-7 -	3E-9 -	- 2E-5	- 2E-4
93	Neptunium-240 <sup>2</sup> W, all compounds	2E+4	8E+4	3E-5	1E-7	3E-4	3E-3
94	Plutonium-234 W, all compounds except PuO <sub>2</sub>	8E+3 -	2E+2 2E+2	9E-8 8E-8	3E-10 3E-10	1E-4 -	1E-3 -
94	Plutonium-235 <sup>2</sup> W, see <sup>234</sup> Pu Y, see <sup>234</sup> Pu	9E+5 -	3E+6 3E+6	1E-3 1E-3	4E-6 3E-6	1E-2 -	1E-1 -

## Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
94	Plutonium-236	W, see $^{234}\text{Pu}$	2E+0 Bone surf (4E+0)	2E-2 Bone surf (4E-2)	8E-12 -	-	-	-
		Y, see $^{234}\text{Pu}$	-	4E-2	2E-11	6E-14	-	6E-7
94	Plutonium-237	W, see $^{234}\text{Pu}$	1E+4	3E+3	1E-6	5E-9	2E-4	2E-3
		Y, see $^{234}\text{Pu}$	-	3E+3	1E-6	4E-9	-	-
94	Plutonium-238	W, see $^{234}\text{Pu}$	9E-1 Bone surf (2E+0)	7E-3 Bone surf (1E-2)	3E-12 -	-	-	-
		Y, see $^{234}\text{Pu}$	-	2E-2	8E-12	2E-14	2E-8	2E-7
94	Plutonium-239	W, see $^{234}\text{Pu}$	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	-	-	-
		Y, see $^{234}\text{Pu}$	-	2E-2	7E-12	2E-14	2E-8	2E-7
			-	Bone surf (2E-2)	-	2E-14	-	-
94	Plutonium-240	W, see $^{234}\text{Pu}$	8E-1 Bone surf (1E+0)	6E-3 Bone surf (1E-2)	3E-12 -	-	-	-
		Y, see $^{234}\text{Pu}$	-	2E-2	7E-12	2E-14	2E-8	2E-7
			-	Bone surf (2E-2)	-	2E-14	-	-
94	Plutonium-241	W, see $^{234}\text{Pu}$	4E+1 Bone surf (7E+1)	3E-1 Bone surf (6E-1)	1E-10 -	-	-	-
		Y, see $^{234}\text{Pu}$	-	8E-1	3E-10	8E-13	1E-6	1E-5
			-	Bone surf (1E+0)	-	1E-12	-	-
94	Plutonium-242	W, see $^{234}\text{Pu}$	8E-1 Bone surf (1E+0)	7E-3 Bone surf (1E-2)	3E-12 -	-	-	-
		Y, see $^{234}\text{Pu}$	-	2E-2	7E-12	2E-14	2E-8	2E-7
			-	Bone surf (2E-2)	-	2E-14	-	-
94	Plutonium-243	W, see $^{234}\text{Pu}$	2E+4	4E+4	2E-5	5E-8	2E-4	2E-3
		Y, see $^{234}\text{Pu}$	-	4E+4	2E-5	5E-8	-	-

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI (μCi)	Inhalation		Col. 1 Air (μCi/ml)	Col. 2 Water (μCi/ml)	Monthly Average Concentration (μCi/ml)
				Col. 2 ALI (μCi)	Col. 3 DAC (μCi/ml)			
94	Plutonium-244	W, see <sup>234</sup> Pu	8E-1 Bone surf (2E+0)	7E-3 Bone surf (1E-2)	3E-12 -	-	-	2E-7
		Y, see <sup>234</sup> Pu	-	2E-2 Bone surf (2E-2)	7E-12 -	-	-	-
94	Plutonium-245	W, see <sup>234</sup> Pu	2E+3	5E+3	2E-6	6E-9	3E-5	3E-4
		Y, see <sup>234</sup> Pu	-	4E+3	2E-6	6E-9	-	-
94	Plutonium-246	W, see <sup>234</sup> Pu	4E+2 LLI wall (4E+2)	3E+2 -	1E-7 -	4E-10 -	- 6E-6	- 6E-5
		Y, see <sup>234</sup> Pu	-	3E+2	1E-7	4E-10	-	-
95	Americium-237 <sup>2</sup>	W, all compounds	8E+4	3E+5	1E-4	4E-7	1E-3	1E-2
95	Americium-238 <sup>2</sup>	W, all compounds	4E+4	3E+3	1E-6	-	5E-4	5E-3
			-	(6E+3)	-	Bone surf 9E-9	-	-
95	Americium-239	W, all compounds	5E+3	1E+4	5E-6	2E-8	7E-5	7E-4
95	Americium-240	W, all compounds	2E+3	3E+3	1E-6	4E-9	3E-5	3E-4
95	Americium-241	W, all compounds	8E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
95	Americium-242m	W, all compounds	8E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
95	Americium-242	W, all compounds	4E+3	8E+1	4E-8	-	5E-5	5E-4
			-	Bone surf (9E+1)	-	1E-10	-	-
95	Americium-243	W, all compounds	8E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
95	Americium-244m <sup>2</sup>	W, all compounds	6E+4 St wall (8E+4)	4E+3 Bone surf (7E+3)	2E-6 -	-	1E-3	1E-2
95	Americium-244	W, all compounds	3E+3	2E+2	8E-8	-	4E-5	4E-4
			-	Bone surf (3E+2)	-	4E-10	-	-

Section 380-11.7 Tables of Concentrations

Section 380-11.7 Tables of Concentrations			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
			Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Col. 1 Air ( $\mu\text{Ci}/\text{ml}$ )	Col. 2 Water ( $\mu\text{Ci}/\text{ml}$ )	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )
				Col. 2 ALI ( $\mu\text{Ci}$ )	Col. 3 DAC ( $\mu\text{Ci}/\text{ml}$ )			
Atomic Radionuclide No.	Class							
95	Americium-245	W, all compounds	3E+4	8E+4	3E-5	1E-7	4E-4	4E-3
95	Americium-246m <sup>2</sup>	W, all compounds	5E+4	2E+5	8E-5	3E-7	-	-
			St wall (6E+4)	-	-	-	8E-4	8E-3
95	Americium-246 <sup>2</sup>	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	6E-1	2E-10	-	-	-
			Bone surf (8E+1)	Bone surf (6E-1)	-	9E-13	1E-6	1E-5
96	Curium-241	W, all compounds	1E+3	3E+1	1E-8	-	2E-5	2E-4
			-	Bone surf (4E+1)	-	5E-11	-	-
96	Curium-242	W, all compounds	3E+1	3E-1	1E-10	-	-	-
			Bone surf (5E+1)	Bone surf (3E-1)	-	4E-13	7E-7	7E-6
96	Curium-243	W, all compounds	1E+0	9E-3	4E-12	-	-	-
			Bone surf (2E+0)	Bone surf (2E-2)	-	2E-14	3E-8	3E-7
96	Curium-244	W, all compounds	1E+0	1E-2	5E-12	-	-	-
			Bone surf (3E+0)	Bone surf (2E-2)	-	3E-14	3E-8	3E-7
96	Curium-245	W, all compounds	7E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
96	Curium-246	W, all compounds	7E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
96	Curium-247	W, all compounds	8E-1	6E-3	3E-12	-	-	-
			Bone surf (1E+0)	Bone surf (1E-2)	-	2E-14	2E-8	2E-7
96	Curium-248	W, all compounds	2E-1	2E-3	7E-13	-	-	-
			Bone surf (4E-1)	Bone surf (3E-3)	-	4E-15	5E-9	5E-8



<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci}/\text{ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci}/\text{ml}$ )	Water ( $\mu\text{Ci}/\text{ml}$ )		
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci}/\text{ml}$ )				
96	Curium-249 <sup>2</sup>	W, all compounds	5E+4	2E+4	7E-6	-	7E-4	7E-3
			-	Bone surf (3E+4)	-	4E-8	-	-
96	Curium-250	W, all compounds	4E-2	3E-4	1E-13	-	-	-
			Bone surf (6E-2)	Bone surf (5E-4)	-	8E-16	9E-10	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	4E-3	2E-12	-	-	-
			Bone surf (1E+0)	Bone surf (9E-3)	-	1E-14	2E-8	2E-7
97	Berkelium-249	W, all compounds	2E+2	2E+0	7E-10	-	-	-
			Bone surf (5E+2)	Bone surf (4E+0)	-	5E-12	6E-6	6E-5
97	Berkelium-250	W, all compounds	9E+3	3E+2	1E-7	-	1E-4	1E-3
			-	Bone surf (7E+2)	-	1E-9	-	-
98	Californium-244 <sup>2</sup>	W, all compounds except those given for Y	3E+4	6E+2	2E-7	8E-10	-	-
			St wall (3E+4)	-	-	-	4E-4	4E-3
		Y, oxides and hydroxides	-	6E+2	2E-7	8E-10	-	-
98	Californium-246	W, see <sup>244</sup> Cf	4E+2	9E+0	4E-9	1E-11	5E-6	5E-5
		Y, see <sup>244</sup> Cf	-	9E+0	4E-9	1E-11	-	-
98	Californium-248	W, see <sup>244</sup> Cf	8E+0	6E-2	3E-11	-	-	-
			Bone surf (2E+1)	Bone surf (1E-1)	-	2E-13	2E-7	2E-6
		Y, see <sup>244</sup> Cf	-	1E-1	4E-11	1E-13	-	-
98	Californium-249	W, see <sup>244</sup> Cf	5E-1	4E-3	2E-12	-	-	-
			Bone surf (1E+0)	Bone surf (9E-3)	-	1E-14	2E-8	2E-7
		Y, see <sup>244</sup> Cf	-	1E-2	4E-12	-	-	-
			-	Bone surf (1E-2)	-	2E-14	-	-

<u>Section 380-11.7 Tables of Concentrations</u>			Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )	
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation					
			ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )	Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )		
98	Californium-250	W, see <sup>244</sup> Cf	1E+0 Bone surf (2E+0)	9E-3 Bone surf (2E-2)	4E-12 -	- 3E-14	- 3E-8	- 3E-7
		Y, see <sup>244</sup> Cf	-	3E-2	1E-11	4E-14	-	-
98	Californium-251	W, see <sup>244</sup> Cf	5E-1 Bone surf (1E+0)	4E-3 Bone surf (9E-3)	2E-12 -	- 1E-14	- 2E-8	- 2E-7
		Y, see <sup>244</sup> Cf	-	1E-2	4E-12	-	-	-
			-	Bone surf (1E-2)	-	2E-14	-	-
98	Californium-252	W, see <sup>244</sup> Cf	2E+0 Bone surf (5E+0)	2E-2 Bone surf (4E-2)	8E-12 -	- 5E-14	- 7E-8	- 7E-7
		Y, see <sup>244</sup> Cf	-	3E-2	1E-11	5E-14	-	-
98	Californium-253	W, see <sup>244</sup> Cf	2E+2 Bone surf (4E+2)	2E+0 -	8E-10 -	3E-12 -	- 5E-6	- 5E-5
		Y, see <sup>244</sup> Cf	-	2E+0	7E-10	2E-12	-	-
98	Californium-254	W, see <sup>244</sup> Cf	2E+0	2E-2	9E-12	3E-14	3E-8	3E-7
		Y, see <sup>244</sup> Cf	-	2E-2	7E-12	2E-14	-	-
99	Einsteinium-250	W, all compounds	4E+4	5E+2	2E-7	-	6E-4	6E-3
			-	Bone surf (1E+3)	-	2E-9	-	-
99	Einsteinium-251	W, all compounds	7E+3	9E+2	4E-7	-	1E-4	1E-3
			-	Bone surf (1E+3)	-	2E-9	-	-
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	1E+1	4E-9	1E-11	-	-
			LLI wall (3E+2)	-	-	-	4E-6	4E-5
99	Einsteinium-254	W, all compounds	8E+0	7E-2	3E-11	-	-	-
			Bone surf (2E+1)	Bone surf (1E-1)	-	2E-13	2E-7	2E-6
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

Section 380-11.7 Tables of Concentrations

Atomic Radionuclide No.		Class	Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers	
			Col. 1 Oral Ingestion ALI (µCi)	Inhalation		Col. 1 Air (µCi/ml)	Col. 2 Water (µCi/ml)	Monthly Average Concentration (µCi/ml)	
				Col. 2 ALI (µCi)	Col. 3 DAC (µCi/ml)				
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	
101	Mendelevium-257	W, all compounds	7E+3	8E+1 Bone surf (9E+1)	4E-8 -	- 1E-10	1E-4 -	1E-3 -	
101	Mendelevium-258	W, all compounds	3E+1 Bone surf (5E+1)	2E-1 Bone surf (3E-1)	1E-10 -	- 5E-13	- 6E-7	- 6E-6	
		-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	Submersion <sup>1</sup>	-	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

Section 380-11.7 Tables of Concentrations		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
		Col. 1 Oral Ingestion ALI ( $\mu\text{Ci}$ )	Col. 2 <u>Inhalation</u> ALI ( $\mu\text{Ci}$ )	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 ( $\mu\text{Ci}/\text{ml}$ )
Atomic Radionuclide No.	Class						

FOOTNOTES:

<sup>1</sup> "Submersion" means that values given are for submersion in a hemispherical semi-infinite cloud of airborne material.

<sup>2</sup> These radionuclides have radiological half-lives of less than 2 hours. The total effective dose equivalent received during operations with these radionuclides might include a significant contribution from external exposure. The DAC 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  $1\text{E}-7 \mu\text{Ci}/\text{ml}$  for the listed DAC 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.

<sup>3</sup> For soluble mixtures of U-238, U-234, and U-235 in air, chemical toxicity may be the limiting factor. If the percent by weight (enrichment) of U-235 is not greater than 5, the concentration value for a 40-hour workweek is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40-hour workweek shall not exceed  $8\text{E}-3$  (SA)  $\mu\text{Ci}\text{-hr}/\text{ml}$ , where SA is the specific activity of the uranium inhaled. The specific activity for natural uranium is  $6.77\text{E}-7$  curies per gram U. The specific activity for other mixtures of U-238, U-235, and U-234, if not known, shall be:

$$\text{SA} = 3.6\text{E}-7 \text{ curies/gram U} \quad \text{U-depleted}$$

$$\text{SA} = [0.4 + 0.38 (\text{enrichment}) + 0.0034 (\text{enrichment})^2] \text{E}-6, \quad \text{enrichment} \geq 0.72$$

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 DAC for the mixture shall be the most restrictive DAC 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 ALI, DAC, 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

<u>Section 380-11.7 Tables of Concentrations</u>		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
Atomic Radionuclide No.	Class	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Monthly Average Concentration ( $\mu\text{Ci/ml}$ )
		Oral Ingestion ALI ( $\mu\text{Ci}$ )	Inhalation		Air ( $\mu\text{Ci/ml}$ )	Water ( $\mu\text{Ci/ml}$ )	
		ALI ( $\mu\text{Ci}$ )	ALI ( $\mu\text{Ci}$ )	DAC ( $\mu\text{Ci/ml}$ )			
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	-	-	-
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,							

Section 380-11.7 Tables of Concentrations

Section 380-11.7 Tables of Concentrations		Table I Occupational Values			Table II Effluent Concentrations		Table III Releases to Sewers
		Col. 1 Oral Ingestion ALI (µCi)	Col. 2		Col. 1 Air (µCi/ml)	Col. 2 Water (µCi/ml)	Monthly Average Concentration (µCi/ml)
			Col. 2 Inhalation ALI (µCi)	Col. 3 DAC (µCi/ml)			
Atomic Radionuclide No.	Class						

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 AMAD particle distribution assumed) prior to chemical separation of the uranium from the ore, the following values may be used for the DAC of the mixture: 6E-11 µCi of gross alpha activity from uranium-238, uranium-234, thorium-230, and radium-226 per milliliter of air; 3E-11 µCi of natural uranium per milliliter of air; or 45 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 subpart 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 "1" (i.e., "unity").

Example: If radionuclides "A," "B," and "C" are present in concentrations CA, CB, and CC, and if the applicable DACs are DAC<sub>A</sub>, DAC<sub>B</sub>, and DAC<sub>C</sub>, respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_A}{DAC_A} + \frac{C_B}{DAC_B} + \frac{C_C}{DAC_C} \leq 1$$