

Appendix A: continued

Table A-3: General Values for A₁ and A₂)

Contents	A ₁		A ₂		Activity concentration for exempt material	Activity concentration for exempt material	Activity limits for exempt consignments	Activity limits for exempt consignments
	(Tbq)	(Ci)	(Tbq)	(Ci)	(Bq/g)	(Ci/g)	(Bq)	(Ci)
Only beta or gamma emitting radionuclides are known to be present	1 x 10 ¹	2.7 x 10 ⁰	2 x 10 ⁻²	5.4 x 10 ⁻¹	1 x 10 ¹	2.7 x 10 ⁻¹⁰	1 x 10 ⁴	2.7 x 10 ⁻⁷
Only alpha emitting radionuclides are known to be present	2 x 10 ⁻¹	5.4 x 10 ⁰	9 x 10 ⁻⁵	2.4 x 10 ⁻³	1 x 10 ⁻¹	2.7 x 10 ⁻¹²	1 x 10 ³	2.7 x 10 ⁻⁸
No relevant data are available	1 x 10 ⁻³	2.7 x 10 ⁻²	9 x 10 ⁻⁵	2.4 x 10 ⁻³	1 x 10 ⁻¹	2.7 x 10 ⁻¹²	1 x 10 ³	2.7 x 10 ⁻⁸

Table A-4 Activity-mass Relationships for Uranium

Uranium Enrichment ¹ wt % U-235 present	Specific Activity	
	TBq/g	Ci/g
0.45	1.8 x 10 ⁻⁸	5.0 x 10 ⁻⁷
0.72	2.6 x 10 ⁻⁸	7.1 x 10 ⁻⁷
1	2.8 x 10 ⁻⁸	7.6 x 10 ⁻⁷
1.5	3.7 x 10 ⁻⁸	1.0 x 10 ⁻⁶
5	1.0 x 10 ⁻⁷	2.7 x 10 ⁻⁶
10	1.8 x 10 ⁻⁷	4.8 x 10 ⁻⁶
20	3.7 x 10 ⁻⁷	1.0 x 10 ⁻⁵
35	7.4 x 10 ⁻⁷	2.0 x 10 ⁻⁵
50	9.3 x 10 ⁻⁷	2.5 x 10 ⁻⁵
90	2.2 x 10 ⁻⁶	5.8 x 10 ⁻⁵
93	2.6 x 10 ⁻⁶	7.0 x 10 ⁻⁵
95	3.4 x 10 ⁻⁶	9.1 x 10 ⁻⁵

120.800: LICENSING AND OPERATIONAL REQUIREMENTS FOR LOW-LEVEL RADIOACTIVE WASTE FACILITIES

120.801: Purpose and Scope

(A) 105 CMR 120.800 establishes procedures, performance objectives, criteria, terms and conditions governing the issuance of licenses for the treatment, storage or disposal of low-level radioactive wastes received from other persons, as well as the development, operation, closure, post-closure observation and maintenance, and institutional control of a low-level radioactive waste treatment, storage or disposal facility. The requirements of 105 CMR 120.800 are in addition to, and not in substitution for, other applicable requirements of 105 CMR 120.000.

(B) 105 CMR 120.800 is applicable to any low-level radioactive waste facility for treatment, storage, or disposal of all classes of waste, which are not exempt from regulation pursuant to 105 CMR 120.200 as well as any wastes that the Board has required to be treated, stored or disposed of at a low-level radioactive waste facility.

(C) 105 CMR 120.800 is applicable to any method of treatment, storage or disposal except shallow land burial, as defined in 105 CMR 120.803. Shallow land burial is prohibited.

(D) Class A, B, C, as defined in 105 CMR 120.200, and mixed waste may be accepted for storage, treatment or disposal at a facility, if the Board so determines. Waste received at a facility shall be handled in accordance with the operational requirements of 105 CMR 120.800.

105 CMR: DEPARTMENT OF PUBLIC HEALTH

120.801: continued

(E) Any facility licensed pursuant to 105 CMR 120.800 may also accept NARM waste if the Board so determines. The limits of the quantities and concentrations of such NARM waste that may be accepted shall be specified as part of the waste acceptance criteria to be determined by the Board.

(F) No waste shall be acceptable for storage, treatment or disposal at a facility if either the Operator or the Department has reason to believe that the waste, as originally generated, was not radioactive. Acceptance of such waste shall be subject to penalty.

(G) No waste shall be accepted from an electric-power-generating facility if such waste requires regulations more stringent than the most stringent management required for any waste that may be accepted at the facility from another generator.

(H) In addition to the requirements of 105 CMR 120.800 all facility operations are subject to the requirements of 105 CMR 120.001, 120.100, 120.200 and 120.750. If a conflict in 105 CMR 120.000 exists, the more stringent provision shall apply.

(I) 105 CMR 120.800 does not authorize the treatment, storage or disposal of byproduct material as defined in 105 CMR 120.005: *Byproduct Material* in quantities greater than 10,000 kilograms containing more than five millicuries of radium-226. Nor do they apply to the disposal of radioactive material as provided for in 105 CMR 120.200.

120.802: Regulatory Authority

The authority for the Department of Public Health to promulgate 105 CMR 120.800 is found in: M.G.L. c. 111, §§ 3, 5M, 5N, 5O and 5P; M.G.L. c. 111H, §§ 1, 7, 8, 11, 13, 16 and 31.

120.803: Definitions

As used in 105 CMR 120.800 the following definitions apply:

Accident means any event arising from the storage, treatment, recycling or disposal of waste that causes a discharge or dispersal of waste or elements contained in the waste from its intended place of confinement.

Active Maintenance means any significant activity needed during the period of institutional control to maintain a reasonable assurance that the performance objectives in 105 CMR 120.811 and 120.812 are met. The term includes major remedial action such as replacement of disposal unit barrier. Active maintenance does not include custodial activities such as repair of fencing, repair or replacement of monitoring equipment, revegetation, minor additions to soil cover, minor repair of disposal unit barriers, and general disposal site upkeep such as mowing grass.

Adverse Effect means an injurious impact which is significant in relation to the public health, safety, or environmental interest being protected.

Affected Community means a community, other than a site community, which is identified in an environmental impact report prepared pursuant to M.G.L. c. 111H, § 30, and can be expected to experience significant impacts as a result of the location, development, operation, closure, post-closure observation and maintenance or institutional control of a facility.

ALARA [acronym for "as low as reasonably achievable"] means making every reasonable effort to maintain exposures to radiation as far below the dose limits in 105 CMR 120.200 as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest.

120.803: continued

Board means the Low-Level Radioactive Waste Management Board established in M.G.L. c. 111H, § 2.

Buffer Zone means a parcel of land which is an integral part of a facility that is controlled by the licensee and acts as a surrounding boundary to the facility.

Chelating Agent means certain organic compounds capable of forming (multiple) coordinate bonds with metals through two or more atoms of the organic compound, typically resulting in enhanced thermodynamic stability in solution and greatly altered behavior of the metal ions. Examples include amine polycarboxylic acids (*e.g.*, EDTA, DTPA), and polycarboxylic acids (*e.g.*, citric acid, carboic acid, and gluconic acid).

Chief Executive Officer means the city manager in any city having a city manager, the mayor in any other city, the town manager in any town having a town manager, the chairman of the Board of Selectmen in any other town.

Closure means the permanent termination of low-level radioactive waste acceptance at a facility, including closure prior to the scheduled closing date, and the implementation of a closure plan.

Closure Plan means the plan, required as a condition of a facility license, prepared pursuant to regulations adopted under M.G.L. c. 111H, § 16, to assure safe facility closure after operation.

Commencement of Construction means initiation of site alteration or physical on-site construction activities. The term does not mean site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring or testing to establish background information related to the suitability of the site or the protection of environmental values.

Community means a city or town of the Commonwealth.

Community Supervisory Committee means a committee, established pursuant to M.G.L. c. 111H, § 21, to facilitate the participation of a community, in which a candidate site is located, in the activities established by M.G.L. c. 111H.

Comprehensive Operating Contract means a contract entered into by an Operator and the Board pursuant to M.G.L. c. 111H, § 33.

Container means the primary vessel, exclusive of other reusable shielding or other packaging materials, in which waste is placed and received for treatment, storage or disposal; or the vessel into which waste is repackaged for storage or disposal and potential retrieval.

Days means calendar days; provided that in computing time periods such periods shall exclude the day of the event which starts the period running, and further provided that if the last day of a period falls on a Sunday, legal holiday or declared state of emergency day, such period shall be extended to the close of business on the next business day.

Department means Department of Public Health.

Department Environmental Monitoring Program means a monitoring program established by the Department, after consultation with the department of environmental protection and the board of health of each site community, for the purpose of collecting and analyzing environmental data prior to construction and throughout the construction, operation, closure, post-closure observation and maintenance and institutional control of a facility.

Detailed Site Characterization means the on-site investigatory and analytical step of site selection established in M.G.L. c. 111H, § 23 and conducted prior to the selection of any superior site.

120.803: continued

Development means all activities undertaken with respect to a low-level radioactive waste facility during the period commencing with the selection of any superior site pursuant to M.G.L. c. 111H, § 23 and continuing until the commencement of facility operation pursuant to M.G.L. c. 111H, § 39.

Disposal means the isolation of low-level radioactive waste from the biosphere inhabited by human beings and their food chains.

Disposal Unit means a discrete portion of a facility into which waste is emplaced for disposal.

Dose Modeling Program means a computational program for converting measured or expected radioactivity to dose equivalent for the relevant critical organ(s) which employs a formula selected by the facility operator and approved by the Department.

Emplacement of Waste means the placement of waste into a disposal unit for disposal.

Engineered Barrier means a manmade structure or device that is intended to improve a facility's ability to meet the performance objectives set forth in 105 CMR 120.811 through 120.814.

Facility means a parcel of land, together with the structures, equipment and improvements thereon or appurtenant thereto, which, pursuant to M.G.L. c. 111H, is being developed, is used, or has been used for the treatment, storage or disposal of low-level radioactive waste; but does not include any property used for temporary storage of low-level radioactive waste in sealed containers by a broker.

Facility License means a license to operate a facility issued by the Department pursuant to M.G.L. c. 111H, § 31.

Generator means a person, including a broker, who produces low-level radioactive waste.

Ground Water means water below the land surface in a saturated zone, including perched ground water.

Inadvertent Intruder means a person who, without regulatory authorization, enters upon the site of a facility after closure to engage in normal activities.

Institutional Control means the continued observation, monitoring and care of a facility following transfer of the facility license from the Operator to the Board.

Institutional Control Account means an account within the Low-Level Radioactive Waste Trust Fund established in M.G.L. c. 111H, § 41 for the purpose of paying institutional control costs pursuant to M.G.L. c. 111H, §§ 9 and 47.

Intruder Barrier means a sufficient layer of material surrounding waste that inhibits contact with the waste and helps to ensure that radiation exposures to an inadvertent intruder will meet the performance objectives set forth in 105 CMR 120.800, or engineered structures that provide equivalent protection to the inadvertent intruder.

Low-level Radioactive Waste means radioactive material that:

- (1) is neither high-level waste, nor spent nuclear fuel, nor by-product material as defined in Section 11(e)(2) of the Atomic Energy Act of 1954, as amended, 42 U.S.C. §2014(e); and
- (2) is classified by the Federal Government as low-level radioactive waste, but not including waste which remains a Federal responsibility, as designated in Section 3(b) of the Low-Level Radioactive Waste Policy Act, as amended, 42 U.S.C. §2021c(b), as in effect as of December 8, 1987.

Low-level Radioactive Waste Trust Fund means a trust fund established pursuant to M.G.L. c. 10, § 35H which shall consist of surcharges collected from users of the low-level radioactive waste facility in an amount determined by the board on an annual basis, which shall be used to meet the obligations set forth in M.G.L. c. 111H, §§ 9 and 47.

120.803: continued

Manifest means a detailed record of the characteristics and quantities of packaged waste as presented for transportation, treatment, storage, or disposal which usually accompanies waste transfers for these purposes.

Mass Wasting means the movement of rock or soil material under the influence of gravity either as the movement of the product of weathering down a slope or as mass movement of rock or soil along joint planes or bedding planes. Mass wasting includes but is not limited to creep, mud flows, earth flow, soil flow, rock avalanche, landslide, landslip and slumping.

Mixed Waste means low-level radioactive waste containing material that either:

- (1) is listed in 310 CMR 30.131 through 30.136; or
- (2) causes the waste to exhibit any of the characteristics identified in 310 CMR 30.120.

Monitoring means observing and making measurements to provide data on a facility, its site, its surrounding environment, and its health safety and environmental impacts.

NARM means any naturally occurring or accelerator-produced radioactive material as defined in 105 CMR 120.001. It does not include byproduct, source, or special nuclear material.

Neighboring Community means a community, other than a site community, which, according to the most recent federal census, has at least 20% of its population residing within three miles of any superior site.

Operation means the control, supervision or implementation of the actual physical activities involved in the acceptance, storage, treatment, disposal or monitoring of low-level radioactive waste at a facility and the maintenance of the facility and any other responsibilities of the operation pertaining to the facility.

Operator means a person designated in accordance with the procedures established in M.G.L. c. 111H, §§ 22 and 27 to develop and operate a low-level radioactive waste facility.

Operator Environmental Monitoring Program means a monitoring program conducted by the Operator for the purpose of collecting and analyzing environmental data during the preoperational, operational, closure, post-closure observation and maintenance, and institutional control stages of a facility.

Person means any agency or political subdivision of the federal government or the commonwealth or of any state, any public or private corporation or authority, individual, firm, joint stock company, partnership, association, trust, estate, institution or other entity, and any officer, employee or agent of such person, and any group of such persons.

Post-closure Observation and Maintenance means the active monitoring and maintenance of a facility which has been closed in preparation for transfer of the facility's license from the Operator to the Board.

Public Interest means the common welfare, convenience, benefit and necessity of the people of the Commonwealth, including public health, safety and the environment.

Public Meeting means a public hearing, satisfying the requirements of M.G.L. c. 30A, § 2, in which an agency presents information, responds to inquiries and hears testimony of interested persons.

Radioactivity means the transformation of unstable atomic nuclei with the emission of radiation.

Radionuclide means an isotope that eventually undergoes spontaneous disintegration, with the emission of radiation.

Radioactive Material means any solid, liquid, or gas which emits radiation spontaneously.

Retrieval means the recovery of waste in an intact container.

120.803: continued

Retrievability means the ability to recover waste in an intact container without substantial destruction of the engineered barriers surrounding the waste containers.

Shallow Land Burial means a land disposal method that relies on the site's natural characteristics as the primary barrier for isolation of the waste.

Site means a parcel of land which, pursuant to M.G.L. c. 111, §§ 3, 5M, 5N, 5O, and 5P is being considered, developed or used or has been used as a location for a facility.

Site Community means the community in which is located all or any part of any superior site.

Source Minimization means minimizing the volume of radioactivity of low-level radioactive waste prior to its generation by such methods as:

- (1) avoiding unnecessary contamination of items during the use of radioactive materials;
- (2) carefully segregating radioactive waste from non-radioactive trash; or
- (3) substituting non-radioactive isotopes or radioisotopes with shorter half-lives where practicable.

Stability means structural stability.

Storage means the holding of low-level radioactive waste for treatment or disposal.

Subsidence means the process by which the earth's surface sinks, either rapidly or slowly, with little or no horizontal motion.

Superior Site means any site selected by the Board, after detailed site characterization, pursuant to M.G.L. c. 111H, § 23.

Surveillance means observation of a facility for purposes of visual detection of the need for maintenance or custodial care, evidence of intrusion, or compliance with other license or regulatory requirements.

Temporary Closure means the nonpermanent termination of low-level waste acceptance at a facility prior to its scheduled closing date.

Treatment means any method, technique, or process including source minimization, volume minimization, and storage for decay, designed to change the physical, radioactive, chemical, or biological characteristics or composition of low-level radioactive waste in order to render such waste safer for management, amenable for recovery, convertible to another usable material or reduced in volume.

Violation means any act or failure to act which constitutes or results in one or more of the following:

- (1) engaging in any business or other activity without a license or approval whenever engaging in such business or activity requires such license or approval.
- (2) engaging in any activity prohibited by, or not in compliance with, any statute, by-law, ordinance or regulation.
- (3) not fully doing, or not doing in timely fashion, anything required by any statute, by-law, ordinance or regulation.

Volume Minimization means treatment of low-level radioactive waste after its generation in order to minimize the physical dimensions of the waste and the space required for disposal.

Waste means low-level radioactive waste.

Waste Form means those physical and chemical characteristics of waste of primary importance in influencing its stability in a disposal environment.

Waste Management Area means that portion of a facility where low-level radioactive waste has been, is being or will be treated, stored or disposed of.

120.810: General Requirements

- (A) No person may treat, store or dispose of waste received from other persons, unless authorized by a license issued by the Department pursuant to 105 CMR 120.800 and 120.100.
- (B) No license shall be issued to operate a disposal facility which does not permit monitoring and retrieval of the waste.
- (C) In order to obtain a facility license pursuant to 105 CMR 120.800, an applicant shall provide full documentary evidence of having been designated an Operator, and shall demonstrate that the facility site has been selected and the facility is designed and will be constructed, operated, closed and controlled after closure so that the environmental and human exposure performance objectives set forth in 105 CMR 120.811 through 120.814 are satisfied.
- (D) Any facility so licensed shall be constructed, operated, closed and controlled after closure so that environmental and human exposure performance objectives set forth in 105 CMR 120.811 through 120.814 are satisfied.

120.811: Protection of the General Population from Releases of Radioactivity

Concentrations of radioactive material which may be released to the general environment in ground water, surface water, air, soil, plants, or animals shall not result in an annual dose exceeding an equivalent of 25 millirems (0.25 mSv) to the whole body, 75 millirems (0.75 mSv) to the thyroid, and 25 millirems (0.25 mSv) to any other organ of any member of the public. The Operator shall assume initiatives which are necessary to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable.

120.812: Protection of Individuals from Inadvertent Intrusion

Design, operation, and closure of a facility shall ensure protection of any individual inadvertently intruding into the facility and occupying the site or contacting the waste at any time after active institutional controls over the facility are removed.

120.813: Protection of Individuals During Operations

Operations at a facility shall be conducted in compliance with the standards for radiation protection set out in 105 CMR 120.200, except for releases of radioactivity in effluents from the facility, which shall be governed by 105 CMR 120.811. The Operator shall assume initiatives which are necessary to maintain radiation exposures as low as is reasonably achievable.

120.814: Stability of the Facility After Closure

The facility shall be sited, designed, used, operated, and closed to achieve long-term stability of the facility and to eliminate, to the extent practicable, the need for long-term active maintenance of the facility following closure so that only surveillance, monitoring, or minor custodial care are required.

120.815: Facility Design

- (A) Any disposal method utilized at a facility shall permit retrieval and monitoring of the waste.
- (B) Retrieval of waste from disposal units must be feasible through the institutional control period without adversely affecting the ability of the facility to meet the performance objectives set forth in 105 CMR 120.811 through 120.814.
- (C) The Operator shall provide extensive security for the facility during the development, operation, closure, post-closure observation and maintenance, and institutional control of the facility for a period of time that ensures the health and safety of the general public and the environment. The Operator shall allow site community participation in this security planning process.

120.815: continued

(D) Any facility accepting waste for disposal shall, to the extent practicable, be designed, operated, closed and controlled after closure so as to maintain the gross physical properties and identity of such waste and containers for a minimum of 100 years for Class A waste, 300 years for Class B waste, and 500 years for Class C waste.

(E) Any disposal facility shall have its engineered structures designed with the goal to totally hold their waste content for the period of the hazardous life of the radioactive waste (zero release design objective).

120.816: Facility Institutional Control

(A) The design of any facility accepting waste for disposal shall be based on the assumption that the period of active institutional controls shall not exceed 100 years.

(B) The actual institutional control period shall not be less than the minimum time required for any waste present at the site to decay to the maximum concentrations above natural background levels permitted to be released into air or water in unrestricted areas under federal and state law.

120.820: License Required

(A) No person may treat, store or dispose of low-level radioactive waste received from other persons unless authorized by a license issued by the Department pursuant to 105 CMR 120.800 and 120.100.

(B) The Department shall not license any facility pursuant to 105 CMR 120.800 unless the Operator has provided a certification by the Board that the facility is proposed to be sited on a superior site selected pursuant to M.G.L. c. 111H, § 23(g). Such certification shall not be made unless the time period set forth in M.G.L. c. 111H, § 24(a) for the filing of a petition for an adjudicatory proceeding has expired without such a petition being filed or, if such petition has been filed, until the Department of Environmental Protection has issued a final decision approving the selection of the superior site pursuant to M.G.L. c. 111H, § 24(c).

(C) Except as provided in M.G.L. c. 111H, § 12(b)(10), the Department shall not issue a facility license unless the person making application for such license has provided full documentation of having been designated an Operator in accordance with the procedures established pursuant to M.G.L. c. 111H, §§ 22 and 27.

(D) The Department shall not issue such a license unless the Operator has obtained all other permits and licenses required by law in order to commence construction of a facility.

120.821: Licensing Process

The procedures for a license application shall include the following:

(A) An Operator shall file an application with the Department pursuant to 105 CMR 120.124 and obtain a license as provided in 105 CMR 120.800 before commencement of construction of the facility. Failure to comply with this requirement may be grounds for denial of a license.

(B) After an Operator files, with the Secretary of the Executive Office of Environmental Affairs (EOEA), its notification of intent to apply for a facility license, it may file a facility license application with the Department.

(C) The license application shall be determined to be complete when the Department finds that all information required by 105 CMR 120.800 has been submitted and any additional requirements of 105 CMR 120.800 have been satisfied.

(D) The Department may deny a facility license if the Operator fails or refuses to correct deficiencies in the application within 30 days after notification of such a deficiency by the Department. Such summary denial shall be accompanied by an explanation of the reasons for the denial.

120.821: continued

(E) The Department shall set a decision schedule, for each complete application, setting forth the date by which it intends to prepare a draft license or draft denial and to issue a final license decision. The Department shall adhere to such decision schedule unless it finds that an extension of the schedule, not to exceed 90 days, is necessary to protect public health or the environment, in which case the Department must adhere to such decision schedule as extended.

(F) The Department shall give notice of the commencement of the public comment period by mail to the Operator, the community supervisory committee of each site community and the Board, and by publication in accordance with regulations adopted pursuant to M.G.L. c. 30, § 62A (MEPA), in a daily or weekly newspaper of general circulation within each site and neighboring community and by broadcasting on radio stations serving each such community.

(G) The public comment period shall continue for 45 days after the issuance of a draft license or draft denial. The Department shall extend the public comment period if it issues a modified draft license until 45 days after the issuance of such a modified draft license.

(H) Anyone may submit comments to the Department during the comment period. The Department shall make copies of all comments received available to persons upon request.

(I) The Department shall conduct at least one public meeting on the license application and the draft license or draft denial within each site community and other public meetings in neighboring communities upon request by the Chief Executive Officer of such community.

(J) The Department shall, after action by the Secretary of the Executive Office of Environmental Affairs on a draft environmental impact report pursuant to M.G.L. c. 111H, § 30 and M.G.L. c. 30, § 62C, prepare a draft license or draft denial. A draft license shall include facility design and performance specifications and all conditions required to operate the facility.

(K) A copy of the draft license or draft denial shall be sent to the Operator, the community supervisory committee of each site community, the Board and, upon request, to other interested persons, and shall be accompanied by an explanation of the reasons therefor and a description of the procedures to be followed in reaching a final license decision. Such description shall include the date on which the public comment period is to end; the dates and locations of scheduled public meetings on the draft license or draft denial, the procedures to be followed by persons wishing to participate in the process leading to the final license decision, and the name, address and telephone number of the person within the Department to contact for additional information.

(L) The Department shall send a copy of the final facility license decision to the Operator, the community supervisory committee of each site community, the Board, any person who submitted written comments during the public comment period and, upon request, to other interested persons. Such final decision shall be accompanied by a summary response to comments received during the public comment period and an explanation of the reasons for any difference between the draft license or denial and the final license decision.

120.822: Content of Application

(A) In addition to the requirements set forth in 105 CMR 120.100, an application for a facility license shall include the general information, specific technical information, institutional information, financial information, and the results of preoperational environmental monitoring set forth in 105 CMR 120.823 through 120.828.

(B) The applicant shall prepare, and submit as part of the application, a Safety Analysis Report (SAR). The Safety Analysis Report must follow the format described in the most current revision of United States Nuclear Regulatory Commission's publication, *Standard Format and Content of a License Application for a Low-Level Radioactive Waste Disposal Facility*, (NUREG-1199). The SAR must include all of the applicable information required in NUREG-1199, in addition to the information required in 105 CMR 120.823 through 120.828, and will be reviewed by the Department following the guidance contained in the most current revisions of NUREG-1200 and NUREG-1300.

120.822: continued

Only certain general sections of NUREG-1199, which do not specifically address disposal facilities, are of direct relevance to treatment and storage facilities.

120.823: General Information

The general information shall include each of the following:

(A) Identity of the Operator including:

- (1) The full name address, telephone numbers and description of the business or occupation of the Operator; and
- (2) If the Operator is a partnership, the name and address of each partner and the principal location where the partnership does business.
- (3) If the Operator is a corporation or an unincorporated association:
 - (a) The state where it is incorporated or organized and the principal location where it does business; and
 - (b) The names and addresses of its directors and principal officers.
- (4) If the Operator is acting as an agent or representative of another person in filing the application, all information required under 105 CMR 120.823(A) must be supplied with respect to the other person.

(B) Qualifications of the Operator:

- (1) The organizational structure of the Operator, both offsite and onsite, including a description of lines of authority, key positions and assignments or responsibilities, whether in the form of administrative directives, contract provisions, or otherwise. The Operator shall, at any time during licensing, development, operation, closure, post-closure observation and maintenance or institutional control of the facility, immediately notify the Department of any significant change in its organizational structure information;
- (2) The technical qualifications, including training and experience, of the Operator and members of the Operator's staff to engage in the proposed activities. Minimum training and experience requirements for personnel filling key positions described in 105 CMR 120.823(B)(1) must be provided. The Operator shall, at any time during licensing, development, operation, closure, post-closure observation and maintenance or institutional control of the facility, immediately notify the Department of any significant change in its technical qualifications information;
- (3) A description of the Operator's personnel training program; and,
- (4) A plan to maintain an adequate complement of trained personnel to carry out waste receipt, handling, treatment, storage, and disposal operations in a safe manner.

(C) A description of:

- (1) The location of the proposed facility;
- (2) The general character of the proposed activities;
- (3) The types and quantities of waste to be treated, stored, and/or disposed of; and
- (4) The proposed facility and equipment.

(D) Proposed schedules for construction, receipt of waste, treatment and storage of waste, and first emplacement of waste at the proposed facility.

120.824: Specific Technical Information

The specific technical information shall include the following information needed for demonstration that the performance objectives and applicable technical requirements of 105 CMR 120.800 will be met:

(A) A description of the natural characteristics of the site and demographic characteristics of the surrounding areas and populations as determined by site selection and characterization activities. The description shall include geologic, geochemical, geotechnical, hydrologic, cultural, scenic, historical, ecologic, archaeologic, meteorologic, climatologic, and biotic features of the facility and vicinity.

120.824: continued

(B) An identification of any known natural resources, the exploitation of which could result in inadvertent intrusion upon the site.

(C) A description of the design features of the facility, its waste management areas and any disposal units including, in particular, design features or other provisions for normal and abnormal or accident conditions. The description shall include those design features related to the following:

- (1) Prevention or minimization of infiltration by water, plants, and animals;
- (2) Water management features for water that may enter any disposal units or other waste management areas;
- (3) Integrity and stability of engineered barriers;
- (4) Stability of intruder barriers surrounding wastes;
- (5) Facility drainage;
- (6) Adequacy of the size of the buffer zone;
- (7) Monitoring;
- (8) Retrievability;
- (9) Occupational exposures;
- (10) Facility closure;
- (11) Minimization to the extent practicable of long term active maintenance; and,
- (12) Protection from inadvertent intrusion.

(D) A description of the relationship of the principal design features of the facility to the performance objectives set forth in 105 CMR 120.811 through 120.814, and to natural site characteristics and natural events or phenomena associated with the site.

(E) A description of codes and standards which the Operator has applied to the design and which will apply to construction of waste management areas and any disposal units. Such standards shall meet local, state and national building code standards.

(F) A description of the construction and operation of the facility, its waste management areas and any disposal units. The description shall include as a minimum the following:

- (1) Methods of constructing any disposal units;
- (2) Types of intruder barriers and onsite traffic controls;
- (3) Methods and areas of waste treatment and storage;
- (4) Drainage systems to control surface water or groundwater access to the wastes;
- (5) Operator's environmental monitoring and surveillance;
- (6) Receipt and handling of waste and inspection of waste and package integrity;
- (7) Procedures for and areas of waste segregation;
- (8) Any waste emplacement;
- (9) Worker monitoring and surveillance;
- (10) Survey control program; and,
- (11) Methods to be employed in the handling and any disposal of wastes containing chelating agents or other non-radiological substances that might affect meeting the performance objectives set forth in 105 CMR 120.811 through 120.814.

(G) A description of the kind, amount, classification and specifications of waste proposed to be treated, stored or disposed of at the facility and a description of total facility design capacity and facility expected operating life.

(H) A description of the quality assurance program for the determination of natural site characteristics and for quality assurance during the design, construction, operation, and closure of the facility including, in particular, the receipt, handling, and emplacement of waste. Audits and managerial controls must be included.

(I) A description of the radiation safety program for control of radioactive effluents to ensure compliance with the performance objective set forth in 105 CMR 120.811; for control of occupational radiation exposure to ensure compliance with the requirements of 105 CMR 120.200 and for control of contamination of personnel, vehicles, equipment, buildings, and the facility. Both routine operations and accidents shall be addressed. The program description must include procedures, instrumentation, facilities, and equipment.

120.824: continued

(J) A description of the Operator's environmental monitoring and the Operator's plans for taking remedial measures when necessary.

(K) A description of the administrative procedures that the Operator will apply to control activities at the facility.

(L) A description of the plan for facility closure and post closure observation and maintenance including those design features intended to facilitate facility closure and to minimize the need for long term active maintenance. Such plan shall include:

- (1) A description of the relationship between individual waste containers (or disposal units, in the case of a disposal facility) and final closure;
- (2) Procedures to be implemented to ensure that any disposal units at a facility will not be adversely affected by closure.

(M) A description of the waste containment within any disposal units as it applies to the design objective to provide total containment of wastes within disposal units for 100 years for Class A waste, 300 years for Class B waste, and 500 years for Class C waste.

(N) A description of the circumstances under which retrieval of waste would be necessary or desirable and the plans and the procedures to be used to effect retrieval. The description shall include an analysis of the impacts of waste retrieval on public and worker health and safety and the environment.

(O) A description of the waste minimization program that would be instituted to reduce the volume and activity of low-level radioactive waste generated at the facility pursuant to 105 CMR 120.890.

120.825: Technical Analyses

(A) The specific technical information shall also include the following analyses needed to demonstrate that the performance objectives set forth in 105 CMR 120.811 through 120.814 will be met:

- (1) Pathways analyzed in demonstrating protection of the general population from releases of radioactivity shall include air, soil, groundwater, surface water, plants and animals. The analyses shall clearly identify and differentiate between the roles performed by the natural site characteristics and facility design features in isolating and segregating the wastes. The analyses shall demonstrate that there is assurance that the exposures to humans from the release of radioactivity will not exceed the limits set forth in 105 CMR 120.811.
- (2) Analyses of the protection of individuals from inadvertent intrusion shall demonstrate that waste classification and segregation requirements will be met and that intruder barriers will be provided.
- (3) Analyses of the protection of individuals during operations shall include assessments or expected exposures due to routine operations and potential accidents during handling, treatment, storage, and disposal of waste. The analyses shall demonstrate that exposures will be controlled to meet the requirements of 105 CMR 120.200.
- (4) Analyses of the long term stability of the facility and the need for active long-term maintenance after closure shall be based upon analyses of active natural processes (such as, in the case of a disposal facility, erosion, mass wasting, slope failure, settlement of wastes, infiltration through adjacent soils, and surface drainage of the facility). The analyses shall demonstrate that there will not be a need for long term active maintenance of the facility following closure.

(B) The Operator shall, at any time during licensing, development, operation, closure, post-closure observation and maintenance or institutional control of the facility, immediately notify the Department of any significant change in its technical analysis required to be submitted pursuant to 105 CMR 120.800. Such notification shall include a substitute technical analysis, satisfying the requirements of the Section and demonstrating that the performance objectives set forth in 105 CMR 120.811 through 120.814 will be met by the facility.

120.826: Institutional Information

The institutional information submitted by the Operator shall include:

- (A) Certifications by the Board that the facility is proposed to be sited on land owned by the Commonwealth in fee simple absolute and that the Board is prepared to accept transfer of the license when the provisions of 105 CMR 120.870 are met and to assume responsibility for institutional control of the facility after closure and post-closure observation and maintenance are completed.
- (B) All material submitted to, or substantially relied upon by the Board in support of its certification of the operator pursuant to M.G.L. c. 111H, § 22(c).

120.827: Financial Information

- (A) The Operator shall show that it either possesses the necessary funds or has reasonable assurance of obtaining the necessary funds, or a combination of the two, to cover the estimated costs of conducting all licensed activities over the planned operating life of the project, including costs of facility development, construction, operation, and closure. The Operator shall demonstrate that it is in compliance with all the financial criteria for operator certification set forth in 345 CMR 3.12: *Financial Criteria for Operator Certification*.
- (B) The Operator shall provide the Department with a certification issued by the Board that the amount expected to be contained in the institutional control account of the Low-Level Radioactive Waste Trust Fund will be adequate to pay the costs of institutional control of the facility pursuant to M.G.L. c. 111H, §§ 9 and 47. At any time that the Board determines that changes in inflation, technology of facility operations or other changes have significantly altered the factual basis for the certification issued pursuant to 105 CMR 120.827(B), it shall immediately notify the Department. Such notification shall include any proposal for changes in the schedule of surcharges for the Low-Level Radioactive Waste Trust Fund, adopted pursuant to M.G.L. c. 111H, § 38(c), deemed necessary by the Board.

120.828: Preoperational Environmental Monitoring

- (A) At the time a license application is submitted, the Operator shall present the results of preoperational environmental monitoring conducted to provide basic environmental data on the facility and site characteristics. The preoperational environmental monitoring program shall conform with that described in NUREG-1388 to the extent applicable to the type of facility, M.G.L. c. 111H, and the requirements of 105 CMR 120.831. The Operator shall include information about the ecology, meteorology, climate, hydrology, geology including geophysics and geotechnical engineering, geochemistry, seismology, and radiologic characteristics of the site and all other relevant information required in 105 CMR 120.824, 120.825 and 120.831 necessary to demonstrate the suitability of the site for the intended use.
- (B) For those characteristics that are subject to seasonal variation, any data collected by the Operator, together with data from the detailed site characterization conducted by the Board, shall cover a period of at least 12 consecutive months.
- (C) The Operator shall continue the preoperational environmental monitoring program through the Department's license review period.

120.829: Standards for Issuance of a License

A facility license may be issued by the Department, following action of the Secretary of Environmental Affairs on a final environmental impact report pursuant to M.G.L. c. 111H, § 30 and M.G.L. c. 30, § 62C, if it finds that:

- (A) The issuance of the license will not constitute an unreasonable risk to the health and safety of the public;

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120.829: continued

(B) The Operator is qualified by reason of training and experience to carry out the proposed treatment, storage, or disposal operations in a manner that protects health and minimizes danger to life or property;

(C) The Operator's proposed facility design, environmental monitoring plan, equipment, operations, procedures, facility closure, post-closure observation and maintenance and institutional control are adequate to protect the public health and safety and demonstrate that the performance objectives set forth in 105 CMR 120.811 through 120.814 will be satisfied;

(D) The Operator has demonstrated that the applicable technical requirements of 105 CMR 120.800 will be met;

(E) The Operator's proposal for institutional control demonstrates that such control will be provided for a length of time not less than the minimum time required for any waste present at the site to decay to the maximum concentrations above natural background levels permitted to be released into air or water in unrestricted areas under federal and state law, and that the institutional control meets the requirements of 105 CMR 120.871;

(F) The financial and surety arrangements comply with all the financial criteria for operator certification set forth in 345 CMR 3.12; and

(G) The Operator has provided a written statement indicating that the Operator's proposed facility design, equipment, operations procedures, closure, post-closure observation and maintenance, and institutional control meet all applicable environmental, public health, labor, occupational health and safety standards and regulations.

120.830: Conditions of Licenses

(A) Each person licensed by the Department pursuant to 105 CMR 120.800 shall confine possession and use of materials to the locations and purposes authorized in the license.

(B) The Operator shall not treat, store or dispose of waste until the Operator has received written notification from the Department that the Department has inspected the facility and has found it to be in conformance with the design and construction described in the application for a license.

(C) The Operator shall be subject to the provisions of M.G.L. c. 111H, and to all rules, regulations, and orders of the Department. The terms and conditions of the license are subject to amendment, revision, or modification, by reason of amendments to, or by reason of rules, regulations, and orders issued in accordance with the terms of M.G.L. c. 111H.

(D) The Department may incorporate in any license at the time of issuance, or thereafter, by appropriate rule, regulation or order, additional requirements and conditions with respect to the Operator's receipt, possession, treatment, storage, or disposal of waste as it deems appropriate or necessary in order to protect public health, safety or environment.

(E) The Department may require tests, reports and the keeping of records, and provide for such inspections of activities under the license that may be necessary or appropriate to effectuate the purposes of M.G.L. c. 111H and 105 CMR 120.800.

(F) The Department may issue orders to assure compliance with 105 CMR 120.800, or to cease activity in violation of 105 CMR 120.800; it may revoke, suspend or modify licenses and impose a civil penalty or have the Attorney General bring an action to restrain, prevent or enjoin any conduct prohibited by 105 CMR 120.800 or compel action ordered by the Department as shall be stated in 105 CMR 120.016: *Enforcement*.

120.830: continued

(G) Each Operator shall notify the Department in writing immediately following the filing of a voluntary or involuntary petition for bankruptcy under any Chapter of Title 11 (Bankruptcy) of the United States Code by or against:

- (1) The Operator;
- (2) An entity (as that term is defined in 11 U.S.C. §101(14)) controlling the Operator or listing the license of Operator as property of the estate; or,
- (3) An affiliate (as that term is defined in 11 U.S.C. §101(2)) of the license.

Such notification shall indicate the bankruptcy court in which the petition for bankruptcy was filed and the date of the filing of the petition.

(H) A license issued under 105 CMR 120.800, or any right thereunder, may not be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of the license to any person, unless the Department finds, after securing full information, that the transfer is in accordance with the provisions of M.G.L. c. 111H and 105 CMR 120.800 and the Department gives its consent in writing in the form of a license amendment.

(I) The Operator shall submit written statements under oath upon request of the Department, at any time before transferring of the license, to enable the Department to determine whether the license should be modified, suspended, or revoked.

(J) The license may be transferred to the Board upon the full implementation of the facility closure plan as approved by the Department, and completion of post-closure observation and maintenance in accordance with 105 CMR 120.800.

(K) The authority to treat, store, and dispose of wastes expires on the date stated in the license. Any expiration date on a license applies only to the site operations activities and to the authority to treat, store, and dispose of waste. Failure to renew the license shall not relieve the Operator of responsibility for implementing site closure, post-closure observation and maintenance, or transfer of the license to the Board.

120.831: Environmental Monitoring

(A) The Operator must submit an environmental monitoring plan, of which the preoperational environmental monitoring required in 105 CMR 120.828 is a component, as part of the complete license application. The extent and duration of the Operator environmental monitoring program shall take into account the nature of the licensed operation. In the case of a low-level radioactive waste disposal facility, the Operator environmental monitoring program shall, at a minimum, conform to the general guidance provided in U.S. Nuclear Regulatory Commission publication, *Environmental Monitoring of Low-Level Radioactive Waste Disposal Facility*, NUREG-1388 (published in 1989).

The Operator shall submit with the license application a baseline health study of the site community and any affected community. The study shall be paid for by the Operator and conducted by the Department's Bureau of Environmental Health Assessment following the design requirements for such a study that are currently being used by the Department. A comparison health study shall be conducted every five years and paid for by the Operator.

The environmental monitoring programs for treatment and storage facilities shall be designed for the specific needs of those facilities.

(B) During facility development, construction, operation, closure, post-closure observation and maintenance, until the facility license is transferred to the Board, the Operator shall establish and conduct the Operator environmental monitoring program as required by 105 CMR 120.831 and in accordance with the environmental monitoring plan approved by the Department as a condition of the final license.

(C) Within 30 days of the issuance of a facility license, the Department shall, after consultation with the Department of Environmental Protection and the Board of Health of each site community, establish and conduct a comprehensive environmental monitoring program at the facility site which will compliment and validate the Operator environmental monitoring program.

120.831: continued

(D) The Department environmental monitoring program and the Operator environmental monitoring program shall each employ the best available monitoring technology to collect and analyze data concerning standing and running surface water and drainage; groundwater samples from offsite, site boundary and waste management area wells; soil and sedimentation samples, air samples, vegetation and wildlife samples, and direct radiation measurements offsite, at the site boundary and in the waste management area.

(E) Both the Department environmental monitoring program and the Operator environmental monitoring program shall be designed to:

- (1) Establish baseline environmental data on the site;
- (2) Provide data to allow evaluation of facility impacts on public health, safety and the environment, and evaluate the need for mitigative measures at the facility;
- (3) Provide early warning of the magnitude and extent of any migration of radionuclides and/or any hazardous chemicals;
- (4) Determine compliance with applicable regulations, with conditions of the facility license pursuant to 105 CMR 120.830, and with the terms of the comprehensive operating contract; and
- (5) Provide reliable environmental data throughout development, operation, closure, post-closure observation and maintenance and institutional control at the facility.

(F) Both the Department environmental monitoring program and the Operator environmental monitoring program shall be designed to detect:

- (1) Any seepage through engineered barriers.
- (2) The structural stability of engineered barriers.
- (3) External or internal conditions that may cause physical changes leading to enhanced water movement or compromises in stability.

(G) Both the Department environmental monitoring program and the Operator environmental monitoring program shall include:

- (1) Facility measurements.
 - (a) Soil sampling
 - (b) Pore water sampling
 - (c) Pore gas sampling
 - (d) In situ measurements
 - (e) Geophysical remote sensing
 - (f) Photogrammetric techniques
 - (g) Subsurface hydrological monitoring
 - (h) Subsurface physical monitoring
 - (i) Subsurface chemical monitoring
- (2) Measurements at a representative test area.
 - (a) Use of a surrogate facility for area testing.
 - (b) Use of replaceable monitoring and nondestructive test systems.
 - (c) Undisturbed region not directly impacted by engineered facility or facility activity (representative of natural or background conditions).

(H) Both the Department environmental monitoring program and the Operator environmental monitoring program shall include a quality assurance program utilizing the best available methods of monitoring plan formulation, data acquisition, database creation, data verification, and data validation to minimize instances of false negative measurements. Data shall be processed, synthesized and organized so as to be suitable for use to evaluate the performance of the facility's engineered barriers and to ensure the protection of the public health, safety and the environment.

(I) Both the Department environmental monitoring program and the Operator environmental monitoring program shall be upgraded to provide the maximum protection of public health, safety and the environment based on the results of the quality assurance program.

120.831: continued

(J) A copy of all Department environmental monitoring program and Operator environmental monitoring program records and analyses shall be kept at the Board field office in the site community for public review.

(K) The Department environmental monitoring program shall provide, to the maximum extent feasible, for the participation of officials and citizens of each site community and the training of such persons to facilitate their participation.

(L) The Board of Health of each site community shall be entitled to obtain portions of the samples collected pursuant to the environmental monitoring programs for independent analysis by a laboratory certified to conduct such analysis by the U.S. Environmental Protection Department.

(M) The Operator shall cooperate with the Department environmental monitoring program and shall reimburse the Department and each site community annually for the costs thereof until the facility license is transferred to the Board pursuant to 105 CMR 120.870.

(N) The Department shall:

- (1) Issue an annual report describing and evaluating the findings of the environmental monitoring program.
- (2) Hold a public meeting within 60 days of the issuance of the report for public review and comment on the report in:
 - (a) Each site community; and,
 - (b) Each affected and neighboring community, if the chief executive officer of such a community so requests.
- (3) Consider and evaluate all comments made at such public meetings or submitted in writing within 60 days of the issuance of the report.

(O) The Operator shall have plans for taking corrective measures if either the Department environmental monitoring program or the Operator environmental monitoring program detects, or indicates the threat of, migration of radionuclides or hazardous chemicals or increased on-site or off-site radiation levels which would indicate that the performance objectives set forth in 105 CMR 120.811 through 120.814 may not be met including:

- (1) A restorative and protection action plan.
- (2) A dose modeling program for site workers and the general public.
- (3) A dose modeling program in the event of an accidental release to the environment.

(P) The Department, in consultation with the Board, may issue an order to temporarily close the facility if it finds that there is a potential hazard to public health, safety or the environment which justifies such temporary closure. A facility that is temporarily closed shall remain closed as long as necessary for remedial action, and, in any event, through any period of facility clean-up and stabilization. Prior to authorizing the reopening of a temporarily closed facility, the Department shall:

- (1) Conduct a minimum of one public meeting relative to the reopening in each site community, and other public meetings in neighboring communities upon the request of the chief executive officer of such community;
- (2) Issue a summary response to all comments made at such public meetings or made in writing during the time the facility is temporarily closed, and an explanation of the reasons for authorizing the reopening.

120.832: Facility Design

(A) Facility design features shall be directed toward long-term isolation of waste and avoidance of the need for continuing active maintenance after closure.

(B) The facility design and operation shall be compatible with the facility closure and closure plan and lead to closure that ensures that the performance objectives set forth in 105 CMR 120.811 through 120.814 will be met.

120.832: continued

(C) The facility shall be designed to complement and improve, where appropriate, the ability of the facility's natural characteristics to assure that the performance objectives will be met.

(D) Engineered barriers shall be designed to minimize to the extent practicable, water infiltration, to direct percolating of surface water away from waste, and to resist degradation by surface geologic processes and biotic activity.

(E) Surface features shall direct surface water drainage away from disposal units at velocities and gradients which will not result in erosion that will require ongoing active maintenance.

(F) The facility shall be designed to minimize to the extent practicable the contact of percolating or surface water with waste.

(G) The facility design shall incorporate subsidence monitoring and minimization; long term stability of any disposal units, storage and structural components; and facility safety systems to ensure protection of facility workers, members of the general public, and the environment.

(H) The design of any disposal facility shall incorporate structural monitoring provisions for a program which allows:

- (1) Regular visual inspections of the exterior portions of any disposal units;
- (2) Remote sensing of inaccessible areas, where applicable; and,
- (3) Meters and gauges, as necessary.

(I) The Operator shall ensure that the facility design and operation plans allow for proper inspection and receipt of all incoming waste shipments and packages.

(J) The buffer zone shall not be used for receipt or storage of waste.

NOTE: Short-term and long-term performance of a disposal facility may be achieved by a combination of factors, including disposal method and engineered barriers, waste form and packaging, facility operation, institutional controls, natural site features, and waste classification and inventory limits.

120.833: Facility Construction

(A) The Operator shall present facility construction plans to be approved by the Department prior to commencement of construction.

(B) The Operator may begin construction once the Department has determined that:

- (1) The operator environmental monitoring program and Department environmental monitoring program, together with the detailed site characterization of the site, has yielded comprehensive baseline data.
- (2) All required financial assurances have been accepted.
- (3) All pre-construction conditions of the facility license have been satisfied.

(C) The Operator shall ensure that construction of the facility meets all the requirements of 105 CMR 120.800 and the license.

(D) The Board shall appoint a resident engineer who shall represent the Board daily at the site during construction of the facility and who shall, in cooperation with officials at each site community, check, inspect, and report to the Board as to events at the construction site.

(E) The Department will periodically inspect the construction process to ensure that the requirements of 105 CMR 120.800 and the license are being met.

(F) The Operator shall construct, install, and make additions and improvements to such structures and equipment as are determined by the Department to be necessary.

120.834: Operating Budget Reimbursements

Once a license has been issued, and annually thereafter until the facility license is transferred to the Board pursuant to 105 CMR 120.870, the Department shall establish a payment to be made by the Operator. This payment shall equal the Department's expected annual operating budget for the next fiscal year for its activities with respect to the facility, except that the payment shall be adjusted by the amount of any operating deficit or surplus previously incurred by the Department. The Operator shall make such payment to the Commonwealth prior to the commencement of the fiscal year.

120.840: Facility Opening

(A) Prior to the acceptance of waste at a facility, the Operator shall notify the Department and the Board that the construction of the facility is complete and in compliance with all requirements of 105 CMR 120.800 and all license conditions, and that the facility is ready to accept waste.

(B) Prior to the acceptance of waste at a facility, the Operator shall file with the Department the waste acceptance criteria, approved by the Board, that will be utilized at the facility.

(C) Upon written notification from the Department that the Operator is in compliance with all the regulations and conditions of the facility license, and upon a determination of compliance with the comprehensive operating contract by the Board, commencement of operations may begin. The Operator shall be required to begin accepting waste within 30 days after such notification.

(D) No person may ship or transport any waste to a facility without the written consent of the Operator.

120.841: Facility Operation

(A) Wastes designated as Class A pursuant to 105 CMR 120.247 shall be segregated from other wastes by emplacing them in disposal units that are sufficiently separated from disposal units for the other waste classes so that any interaction between Class A wastes and other wastes will not result in the failure to meet the performance objectives of 105 CMR 120.800. This segregation is not necessary for Class A wastes if they meet the stability requirements in 105 CMR 120.247(B).

(B) Wastes designated as Class C pursuant to 105 CMR 120.247 shall be disposed of with intruder barriers that are designed to protect against an inadvertent intrusion for at least 500 years.

(C) Waste arriving at the facility shall comply with all other pertinent Sections of 105 CMR 120.000 with regard to waste classification, waste characteristics, labeling, manifests, the waste acceptance criteria approved by the Board and any applicable provisions of the comprehensive operating contract.

(D) The Operator shall have specific procedures to ensure compliance of waste with all applicable waste acceptance criteria.

(E) The Operator of any disposal facility shall require evidence of a certificate signifying the Department's approval of the waste minimization statement or plan of a generator, pursuant to 105 CMR 120.890 as a condition of access to the facility.

(F) Any facility accepting mixed waste shall provide an equivalent level of environmental protection as that required by M.G.L. c. 21C and 310 CMR 30.000.

(G) The Operator shall provide adequate training for all site workers in the proper handling of radioactive waste to ensure radiological controls. Such training shall include, but not be limited to:

120.841: continued

- (1) Basic Radiation Principles
- (2) Basic Radiation Protection
- (3) Radiation Biology
- (4) Decontamination Methods
- (5) Personnel Safety Precautions/Work Habits
- (6) Accident Response Actions/Notifications

120.842: Receipt, Handling, and Inspection of Waste

- (A) The Operator shall submit a plan for the receipt, inspection, and handling of waste entering the facility. The plan shall include, but not be limited to, the waste acceptance criteria approved by the Board.
- (B) The Operator shall ensure that special inspection and receiving plans are in place in case of damaged transportation vehicles or packages, incorrect manifests or shipping documents, or non-compliance with any Section of 105 CMR 120.000.
- (C) The plans and procedures for moving the waste shall be implemented and equipment shall be utilized so as to minimize contact or the possibility of contact with water.
- (D) Upon arrival to the facility, all waste shall enter a waste inspection area and remain there until the Department can inspect the manifests and the integrity of the waste being received.
- (E) The Department shall inspect each shipment of waste before the shipment is accepted for storage, treatment or disposal. Any shipment that is not found to be in compliance with applicable regulations, license conditions, and waste acceptance criteria shall be held in a controlled area within the facility until a representative from the generator is contacted, and the generator or its agent remedies the deficiency; the operator shall notify the board of health of each site community of any such failure of compliance.
- (F) The generator shall be assessed a daily penalty until the deficiency is remedied and the shipment complies with applicable regulations, license conditions and waste acceptance criteria.
- (G) After a transport vehicle is unloaded and leaves the waste management area, it shall not leave the facility until it is again inspected by the Department and decontaminated, if necessary.
- (H) Once inspected, wastes accepted for disposal shall be emplaced in a manner to ensure that container integrity is maintained during emplacement, and that the minimization of void spaces between the containers permits the ability to fill the void spaces. Once inspected, wastes accepted for storage shall be placed in storage in a manner to ensure that container integrity is maintained throughout the period of storage.
- (I) Void spaces between waste containers in disposal units shall be filled with material appropriate to reducing future subsidence of the disposal units.
- (J) Closure measures set forth in the approved facility closure plan shall be carried out as each disposal unit is filled and sealed.
- (K) Waste shall be emplaced and sealed in a manner that limits the radiation dose rate at the surface of the engineered barrier to levels that at a minimum will permit the Operator to comply with all provisions of 105 CMR 120.207 at the time of license transferral as provided in 105 CMR 120.800.
- (L) Waste shall be handled in a manner to minimize workers exposure to radiation utilizing ALARA (As Low As Reasonably Achievable) techniques.
- (M) Waste shall be emplaced to ensure retrievability and the ability to monitor through the end of the institutional control period.

120.842: continued

(N) Following receipt and acceptance of a shipment of waste, the Operator shall record the date of any emplacement of the waste, the waste's location in the facility, the condition of the waste containers as received, any remedial measures taken pursuant to 105 CMR 120.842(E), any discrepancies between materials listed on the manifest and those received, and any evidence of leaking or damaged containers or radiation or contamination levels in excess of limits specified in the regulations of the U.S. Department of Transportation (49 CFR 173.441 and 173.443, revised as of November 1, 1984, as amended) and the Department. The Operator shall briefly describe any repackaging operations of any of the waste containers included in the shipment, plus any other information required by the Department as a license condition.

(O) Facility operations shall not have an adverse effect on the implementation of closure plan measures.

(P) Only wastes containing or contaminated with radioactive material shall be accepted at the facility.

(Q) Waste received at a disposal facility shall not be intentionally diluted by the Operator to alter its classification as identified on the manifest.

120.843: Facility Boundaries and Markers

(A) The boundaries and locations of any disposal unit shall be accurately located, adequately marked, and mapped.

(B) A buffer zone of land shall be maintained between the waste management area and the facility boundary. The buffer zone shall be of adequate dimensions to carry out environmental monitoring activities specified in 105 CMR 120.831 and satisfy the requirements of 310 CMR 41.27(b).

120.844: Contingency Plans for Facility Operations

(A) The Operator shall have contingency plans for unplanned occurrences, such as fires, accidents, radiological contaminations or releases of radioactivity into the environment, severe natural events, and any operational repair and waste recovery activities that may adversely affect the health and safety of the facility workers or general public. Any retrieval of waste pursuant to such contingency plans shall conform to the terms approved in the license.

(B) The plans shall identify the necessary minimal training, management, procedures, equipment, communications and notification systems, and human resources needed and required to provide emergency response to unplanned occurrences.

(C) The Operator shall include in the license application:

(1) Signed agreements with necessary emergency units that will respond to the requests from the Operator.

(2) A demonstration of adequate emergency response capability as deemed appropriate by the Department.

120.845: Facility Maintenance

The Operator shall maintain the facility so as to remain in compliance with all the terms and conditions of the license and 105 CMR 120.000.

120.850: Funding for Facility Closure

(A) The Operator shall provide assurances prior to the commencement of operations, that sufficient funds will be available to carry out facility closure. These assurances shall be based on Department-approved cost estimates reflecting the Department-approved facility closure plan. The Operator's cost estimates must take into account total costs that would be incurred if an independent contractor were hired to perform the closure work. The assurances shall establish that there will be sufficient funds for:

120.850: continued

- (1) Decontamination, stabilization or dismantlement of facility components.
- (2) Closure of the facility so that following transfer of the facility license to the Board, the need for ongoing active maintenance is minimized to the extent practicable and only minor custodial care, surveillance, and monitoring are required.

(B) In order to avoid unnecessary duplication and expense, the Department may accept financial sureties that have been consolidated with earmarked financial or surety arrangements established to meet requirements of Federal or other State agencies or local governmental bodies for such closure. The Department may accept these arrangements only if they are considered adequate to satisfy the requirements of 105 CMR 120.800 and that the portion of the surety which covers the closure of the facility is clearly identified and committed for use in accomplishing these activities.

(C) The Operator's financial or surety arrangement shall be submitted annually for review by the Department to ensure that sufficient funds are available for completion of the closure plan assuming that the work has to be performed by an independent contractor.

(D) The amount of the Operator's financial or surety arrangement shall change in accordance with changes in the predicted costs of implementing the closure plan. Factors affecting closure cost estimates include, but are not limited to inflation, increases in the amount of disturbed land, changes in engineering plans, and closure that has already been accomplished. The financial or surety arrangements shall be sufficient at all times to cover the costs of closure of any disposal units that are expected to be used before the next license renewal.

(E) Financial or surety arrangements shall be written for a specified period of time and provide for automatic renewal unless the person who issues the surety notifies the Department, the Board, and the Operator not less than 90 days prior to the renewal date of its intention not to renew. In such a situation, the Operator must submit a replacement surety within 30 days after notification of cancellation. If the Operator fails to provide a replacement surety acceptable to the Department, the Board may collect on the original surety.

(F) Proof of forfeiture shall not be necessary to collect the surety so that, in the event that the Operator cannot provide an acceptable replacement surety within the required time, the surety shall be automatically collected prior to its expiration. The conditions described above shall be clearly stated on any surety instrument which is not open ended, and shall be agreed to by all parties.

(G) Financial or surety arrangements generally acceptable to the Department include surety bonds, cash deposits, certificates of deposit, deposits of government securities, escrow accounts, irrevocable letters or lines of credit, trust funds, and combinations of the above or such other types of arrangements as may be approved by the Department. Self-insurance, or any arrangement which essentially constitutes pledging the assets of the Operator, will not satisfy the surety requirement.

(H) The Operator's financial or surety arrangement shall remain in effect until closure has been completed and approved by the Department, and the license has been transferred to the Board.

120.851: Application for Renewal or Closure

An application for renewal or an application for closure must be filed at least one year prior to the date scheduled for facility closure in the facility closure plan. A final closure application shall include a final revision and specific details of the facility closure plan included as part of the license application submitted under 105 CMR 120.824(L) that includes each of the following:

- (A) Any additional geologic, hydrologic, or other data pertinent to the long-term containment of any emplaced wastes obtained during the operational period.

120.851: continued

(B) The results of tests, experiments, or any other analyses relating to treatment, storage or disposal of waste, final closure and sealing, migration of radionuclides and interaction with emplacement media, or any other tests, experiments, or analysis pertinent to the long-term containment of any emplaced waste within the facility.

(C) Any proposed revision of plans for:

- (1) Decontamination, stabilization and/or dismantlement of facility components; or,
- (2) Post-closure observation and maintenance of the facility.

(D) Any significant new information regarding the environmental impact of final closure activities and long-term performance of the facility.

120.852: Procedures for Review of Application for Facility Closure and Closure Plan

(A) The Department shall conduct a public meeting on the final closure plan at times to be determined after consultation with the Board in each site community, and other public meetings in neighboring communities upon request by the chief executive office of such community. The Board shall participate in each such public meeting.

(B) The Department shall accept written comments on the submitted plan from any interested person within 45 days of public notice of the availability of the plan. Prior to its acceptance of the plan, the Department shall consider and evaluate all comments made at a public meeting or submitted in writing.

(C) Upon review and consideration of an application for closure, the Department shall permit closure of the facility if there is assurance that the long-term performance objectives set forth in 105 CMR 120.814 will be met during post closure observation and maintenance and institutional control of the facility.

120.853: Facility Closure

(A) The Operator shall monitor the facility and carry out the closure plan until the facility closure is complete. The Department shall, in cooperation with appropriate officials of each site community, periodically inspect the Operator's implementation of the facility closure plan to ensure that the requirements in 105 CMR 120.800 and the conditions of the facility license are satisfied.

(B) Facility closure shall be conducted so as to ensure the stability of the facility until the facility license is transferred to the Management Board pursuant to 105 CMR 120.870: *Post-closure Observation and Maintenance*.

120.860: Post-closure Observation and Maintenance

The Operator shall observe, monitor, and carry out necessary maintenance and repairs at the facility until a period of five years after the site closure is complete and the license is transferred by the Department in accordance with 105 CMR 120.870. The Operator environmental monitoring program of the facility shall continue as approved by the Department. Responsibility for the facility must be maintained by the Operator for not less than five years. A longer time period for post-closure observation and maintenance may be required as part of the site closure plan, based on facility-specific conditions.

120.870: Transfer of License

Following the period of post-closure observation and maintenance, the Operator may apply to transfer the facility license to the Board. The license shall be transferred under M.G.L. c. 111H, § 46 if the Department finds:

(A) That the closure of the facility has been completed in conformance with the Operator's facility closure plan, as amended and approved as part of the license;

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- (B) That the performance objectives set forth in 105 CMR 120.811 through 120.814 are met;
- (C) That all records of the Operator's development, operation, closure and post-closure observations and maintenance of the facility have been transferred to the Board in compliance with M.G.L. c. 111H, § 44, and that the Board has certified the adequacy of the amount contained in the institutional control account of the Low-level Radioactive Waste Trust Fund to pay the costs of institutional control of the facility pursuant to M.G.L. c.111H, §§ 9 and 47;
- (D) That the Board has adopted a plan for institutional control of the facility and to accept transfer of the license, and is prepared to continue the Operator environmental monitoring program; and
- (E) That the Management Board is prepared to assume responsibility for and satisfy the institutional requirements as set forth in 105 CMR 120.800.

120.871: Institutional Control

The Board shall conduct an institutional control program which shall physically control access to the facility following transfer of control of the facility from the facility Operator. The institutional control program shall also include, but not be limited to, continuing the Operator environmental monitoring, periodic surveillance, minor custodial care, and other requirements as determined by the Department; and administration of funds to cover the costs for these activities. The period of institutional controls shall be determined by the Department and shall satisfy the requirements set forth in 105 CMR 120.816.

120.880: Maintenance of Records, Reports, and Transfers

- (A) The Operator shall maintain any records and make any reports in connection with the licensed activities as are required by the conditions of the license or by 105 CMR 120.800 or any order of the Department.
- (B) Records required by 105 CMR 120.800 or by license conditions shall be maintained for a period specified by 105 CMR 120.800 or by license condition. If a retention period is not otherwise specified, these records shall be maintained and transferred to the Board as a condition of license transfer unless the Department authorizes their disposition because of inaccuracies or obsolescence or that disposing of such records will not adversely affect the public health and safety of the general public and the environment.
- (C) Records which are required to be maintained pursuant to 105 CMR 120.800 may be the original or a reproduced copy or microfilm if this reproduced copy or microfilm is capable of producing copy that is clear and legible at the end of the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures. The licensee shall maintain adequate safeguards against tampering with and loss of records.
- (D) Copies of all records of the location and the quantity of wastes contained in the facility shall be transferred to the Board upon license transfer to the Board.
- (E) Following receipt and acceptance of a shipment of radioactive waste, the licensee shall record the date that the shipment is received at the disposal facility, the date of disposal of the waste, a traceable shipment manifest number, a description of any engineered barrier or structural overpack provided for disposal of the waste, the location of disposal at the disposal site, the containment integrity of the waste disposal containers as received, any discrepancies between materials listed on the manifest and those received, the volume of any pallets, bracing, or other shipping or onsite generated materials that are contaminated, and are disposed of as contaminated or suspect materials, and any evidence of leaking or damaged disposal containers or radiation or contamination levels in excess of limits specified in Department of Transportation and Agency regulations. The licensee shall briefly describe any repackaging operations of any of the disposal containers included in the shipment, plus any other information required by the Agency as a license condition. The licensee shall retain these records until the Agency transfers or terminates the license that authorizes the activities described in 105 CMR 120.800.

120.880: continued

(F) Annual reports:

- (1) The Operator shall submit an annual report to the Department by the end of the first calendar quarter of each year for the preceding year.
- (2) The annual reports shall include:
 - (a) A copy of the Operator's financial report or a certified financial statement,
 - (b) Specification of the quantity of each of the principal contaminants released to unrestricted areas in liquid and in airborne effluents during the preceding year,
 - (c) The data of the Operator environmental monitoring program,
 - (d) A summary of any disposal unit surveys and maintenance activities,
 - (e) A summary, by waste class, of activities and quantities of any radionuclides disposed of,
 - (f) Any instances in which observed site characteristics were significantly different from those described in the application for a license; and,
 - (g) Any other information the Department may require.
- (3) The report shall identify and discuss any instance, during the reporting period, in which monitoring results, maintenance performed or the quantities of waste released are significantly different from those expected.

(G) The Operator shall comply with the recordkeeping requirements of 105 CMR 120.001.

(H) Any transfer of byproduct, source, and special nuclear materials by the Operator is subject to the requirements in 105 CMR 120.140.

(I) In addition to the other requirements of 105 CMR 120.880, the licensee shall store, or have stored, manifest and other information pertaining to receipt and disposal of radioactive waste in an electronic recordkeeping system.

- (1) The manifest information that must be electronically stored is:
 - (a) That required in 10 CFR part 20, Appendix G, with the exception of shipper and carrier telephone numbers and shipper and consignee certifications; and,
 - (b) That information required 105 CMR 120.880(E).
- (2) As specified in facility license conditions, the licensee shall report the stored information, or subsets of this information, on a computer-readable medium.

120.881: Tests on Facilities

Each Operator shall perform, or permit the Department to perform, any tests the Department deems appropriate or necessary for the administration of 105 CMR 120.800, including, but not limited to, tests of:

- (A) Wastes and facility components used for the receipt, storage, treatment, handling or disposal of wastes;
- (B) Radiation detection and monitoring instruments; or,
- (C) Other equipment and devices used in connection with the receipt, possession, handling, treatment, storage, or disposal of waste.

120.882: Department Inspection of Facilities

- (A) Each Operator shall annually, and at such other times as requested by the Department, provide detailed and accurate information, in a report, for the purpose of determining compliance with 105 CMR 120.800, including, but not limited to:
 - (1) The type, volume, radioactivity, source and characteristics of the waste treated, stored, or disposed of at the facility;
 - (2) The Operator's current and projected waste management activities, including source minimization, volume minimization, on-site storage, treatment, packaging and transportation practices.

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120.882: continued

(B) The Operator shall allow the duly authorized representatives of the Department, at all reasonable times, without advance notice to enter and examine any property, facility, or activity involving treatment, storage, and disposal of the waste. The Operator shall afford such inspectors unfettered access, equivalent to access provided to persons regularly employed at the facility, following proper identification and compliance with applicable access control measures for security, radiological protection and personal safety. Such inspectors are authorized to make such inspections, conduct such test, reviews, studies, monitoring, or sampling or examine books, paper and records as the Department deems necessary for administration or enforcement of M.G.L. c. 111H or 105 CMR 120.800. Such inspectors may copy and take away copies of, for the Agency's use, any record required to be kept pursuant to 105 CMR 120.800.

(C) An annual summary of the Department's inspection and enforcement activities with respect to the facility shall be transmitted to the Board and to the board of health of each site community.

120.885: Waivers

The Department may waive the application of any provision of 105 CMR 120.800 if it finds that:

(A) The performance objectives set forth in 105 CMR 120.811 through 120.814 will be met; and,

(B) Public health, safety and the environment will be protected; and,

(C) Strict application of the section to be waived would undermine the public interest; and,

(D) Specific substitute requirements can be adopted which will result in the substantial protection of the process established in M.G.L. c. 111, §§ 3, 5M, 5N, 5O, and 5P and the rights of persons affected by the action and the Operator; and,

(E) The action made possible by the waiver will not violate the provisions of M.G.L. c. 111H or any other state or federal law.

120.890: LOW-LEVEL RADIOACTIVE WASTE MINIMIZATION REGULATIONS GENERAL PROVISIONS

120.891: Purpose and Scope

(A) The purpose of 105 CMR 120.890 is to ensure that source and volume minimization and storage for decay are integral parts of every radioactive material user's, as well as generator's, waste management program. 105 CMR 120.890 has been made, after consultation with the Board, as required in M.G.L. c. 111H, § 13.

(B) 105 CMR 120.890 apply to all radioactive material users, licensees and generators as defined in 105 CMR 120.893.

(C) 105 CMR 120.890 do not apply to radioactive materials that are exempt from licensing as specified in 105 CMR 120.100.

(D) The requirements of 105 CMR 120.890 are in addition to, and not in substitution for, 105 CMR 120.001, 120.100, 120.200 and 120.800.

120.892: Regulatory Authority

The authority for the Department of Public Health to promulgate 105 CMR 120.890 is found in: M.G.L. c. 111, §§ 3, 5M, 5N, 5O, 5P; M.G.L. c. 111H, §§ 1, 7, 8, 11, 13, 16, 31.

120.893: Definitions

As used in 105 CMR 120.890, the following definitions apply:

120.893: continued

Board means the Low-level Radioactive Waste Management Board established in M.G.L. c. 111H, § 2.

Days means calendar days; provided that in computing time periods such periods shall exclude the day of the event which starts the period running, and further provided that if the last day of a period falls on a Sunday, legal holiday or declared state of emergency day, such period shall be extended to the close of business on the next business day.

Department means the Department of Public Health.

Development means all activities undertaken with respect to a low-level radioactive waste facility during the period commencing with the selection of any superior site pursuant to M.G.L. c. 111H, § 23 and continuing until the commencement of facility operation pursuant to M.G.L. c. 111H, § 39.

Disposal means the isolation of low-level radioactive waste from the biosphere inhabited by human beings and their food chains.

Generator means a person, including a broker, who produces low-level radioactive waste.

Generator Guidance means the document titled *Low-level Radioactive Waste Minimization Guidance* compiled by the Department for the guidance of waste generators.

Half-life means the time in which half the atoms of a particular radioactive substance disintegrate to another nuclear form.

Licensee means a person holding a license issued pursuant to 105 CMR 120.100 by the Department of Public Health to transfer, acquire, own, possess or use quantities of, or devices or equipment utilizing, radioactive material.

Low-level Radioactive Waste means radioactive material that"

- (1) is neither high-level waste, nor spent nuclear fuel, nor by-product material as defined in section 11(e)(2) of the Atomic Energy Act of 1954, as amended, 42 U.S.C. §2014(e); and
- (2) is classified by the Federal Government as low-level radioactive waste, but not including waste which remains a Federal responsibility, as designated in section 3(b) of the Low-Level Radioactive Waste Policy Act, as amended, 42 U.S.C. §2021c(b), as in effect as of December 8, 1987.

Management means the storage, packaging, treatment, transportation, or disposal, where applicable, of low-level radioactive waste.

Management Plan means the low-level radioactive waste management plan adopted by the board pursuant to M.G.L. c. 111H, § 12 to provide for the safe and efficient management of low-level radioactive waste.

Manifest means a detailed record of the characteristics and quantities of packaged waste as presented for transportation, treatment, storage, or disposal which usually accompanies waste transfers for these purposes.

Minimization Plan means the plan required by each generator which identifies actions to allow for "storage for decay" of short-lived radioisotopes, and actions to achieve source and volume minimization.

Mixed Waste means low-level radioactive waste containing material that either:

- (1) is listed in 310 CMR 30.131 through 30.136; or
- (2) causes the waste to exhibit any of the characteristics identified in 310 CMR 30.120.

120.893: continued

Person means any agency or political subdivision of the federal government or the commonwealth, or of any state, any public or private corporation or authority, individual, firm, joint stock company, partnership, association, trust, estate, institution or other entity, and any officer, employee or agent of such person, and any group of such persons.

Radioactive Material means any solid, liquid, or gas which emits radiation spontaneously.

Radioactive Material User means any person who requires a license or registration with the Department of Public Health pursuant to 105 CMR 120.000 to use radioactive materials for any purpose.

Radioactivity means the transformation of unstable atomic nuclei with the emission of radiation.

Source Minimization means minimizing the volume of radioactivity of low-level radioactive waste prior to its generation by such methods as:

- (1) avoiding unnecessary contamination of items during the use of radioactive materials;
- (2) carefully segregating radioactive waste from non-radioactive trash; or
- (3) substituting non-radioactive isotopes or radioisotopes with shorter half-lives where practicable.

Storage means the holding of low-level radioactive waste for treatment or disposal.

Storage for Decay means a procedure in which low-level radioactive waste with a relatively short half-life is held for natural radioactive decay in compliance with applicable federal and state regulations.

Treatment means any method, technique, or process including source minimization, volume minimization, and storage for decay, designed to change the physical, radioactive, chemical, or biological characteristics or composition of low-level radioactive waste in order to render such waste safer for management, amenable for recovery, convertible to another usable material or reduced in volume.

Volume Minimization means treatment of low-level radioactive waste after its generation in order to minimize the physical dimensions of the waste and the space required for disposal.

Waste means low-level radioactive waste.

Waste Facility means a facility that is licensed in Massachusetts for the purposes of treating, storing or disposing of low level radioactive waste.

120.895: Objectives

The following are the objectives of 105 CMR 120.890:

- (A) To protect public health and safety and the environment by ensuring that radioactive material users avail themselves of all the opportunities to produce less waste.
- (B) To minimize the use of radioactive sources (this is a major objective of the Department's minimization program).
- (C) To reduce the amount of waste requiring treatment, storage and disposal. To this end all radioactive materials users should strive to achieve "zero production" of low-level radioactive waste and frivolous or unnecessary uses of radioactive materials should be avoided, especially if non-radioactive alternatives are available.
- (D) To ensure waste material is well characterized so as to reduce disposal liabilities and conserve disposal capacity.

120.895: continued

(E) To permit evaluation of the waste generation activity, allowing for optimal minimization controls that are consistent with waste management policies and procedures authorized by federal and state law and regulation as of December 8, 1987.

(F) To identify opportunities to achieve source minimization, volume minimization and storage for decay. These opportunities shall include activities required in M.G.L. c. 111H, § 13, including avoiding unnecessarily contaminating items while using radioactive materials; segregating radioactive waste from non-radioactive trash; and identifying the objective of substituting short-lived radionuclides or non-radioactive materials for long-lived radionuclides, where possible.

(G) To be consistent with the promotion of responsible research and innovation.

120.896: Statement and Plan Requirements

All radioactive material users and generators of low-level radioactive waste are required to examine their operations and institute waste minimization/reduction/elimination programs as follows:

(A) All radioactive material users, as well as all generators, of low-level radioactive waste must prepare a statement indicating the measures they have taken to minimize/ reduce/eliminate any waste that may result from their operations. The statement should contain the rationale for the use of a radioactive material, the quantities proposed, and the choice of radionuclide. The statement should contain a consideration of the fate of any anticipated radioactive waste that would be generated.

(B) Those persons whose operations result in 100 cubic feet or more of waste per annum, and such waste requires disposal, must develop and institute waste minimization programs predicated on detailed plans. The required elements of such a waste minimization program are described in 105 CMR 120.897.

(C) A minimization statement or plan, as applicable, shall be submitted with each new application for a license to manufacture, produce, transfer, receive, acquire, own, possess, or use radioactive materials. Current licensees shall submit a minimization statement or plan within 90 days of the promulgation of 105 CMR 120.890. The minimization statement or plan shall be updated yearly as part of the annual survey required by M.G.L. c. 111H, § 7.

(D) Persons who do not require a license from the Department for their operations but require access to a waste facility licensed by the Department shall submit, pursuant to 105 CMR 120.890, a statement or plan regarding their waste which shall be updated yearly as part of the annual survey required by M.G.L. c. 111H, § 7.

(E) The Department shall evaluate each minimization statement or plan submitted pursuant to 105 CMR 120.896(D) in accordance with 105 CMR 120.895, 120.896, 120.897, and upon approval, shall issue a certificate.

(F) The approved minimization statement or plan shall be written into the license as a condition of the license as required in 105 CMR 120.100.

120.897: Waste Minimization Plan Content

A waste minimization plan shall include:

(A) A waste minimization policy statement that presents the generator's goals for achieving waste minimization/reduction/elimination, and assigns responsibility to an individual or group to accomplish the objectives. The plan shall be approved by the highest official of the company or institution or his/her designee, and include a statement committing to a defined implementation schedule.

120.897: continued

(B) A summary report which characterizes the generator's waste streams and assesses the opportunities for waste minimization. The report shall include a systematic review of processes, current applicable technologies, procedures and cost requirements. An operational assessment of the generator's activities will be required in order to collect the necessary data and compile the summary report. Sample assessment forms and a flow chart illustrating the assessment overview can be found in the Department's *Low-Level Radioactive Waste Minimization Guidance*. The following assessment activities are expected to be included in the waste minimization plan and will be used to evaluate the plan:

- (1) A description of the facility and the process or service that generates the waste. This may be accomplished by reviewing design, operating and maintenance documentation.
- (2) Identification and characterization of the waste streams which result from the process or service. Potential sources of information include process flow diagrams, analytical test data, waste shipment manifests, radioactive material purchase and inventory records.
- (3) Prioritization of the radioactive sources and waste streams to select one or more for minimization. Concerns which should be addressed when making this selection will include:
 - minimization potential
 - reclassification potential
 - compliance with current and future regulations
 - potential liability
 - volume and activity of the waste
 - cost/benefit relationship
- (4) Analysis and selection of a technically-feasible minimization technique or technology. The process or service that generates the waste will be analyzed relative to the candidate techniques or technologies. If techniques or technologies have been developed, and minimization is believed to have reached optimum levels, the summary report will indicate what activities will allow minimization to continue.
- (5) Analysis of the direct and indirect capital costs and operating costs associated with the minimization activity as compared to on-site storage and increasing disposal costs.
- (6) Evaluation of both tangible and intangible benefits and detriments of minimization.
- (7) Evaluation of the progress or success of the minimization effort. This action should be undertaken periodically after minimization plans are instituted.
- (8) An operational assessment whenever a new product or substantial change in service is being considered.
- (9) Procedures which rely on reduction of the radioactivity of the waste through decay in storage. These should include the following:
 - (a) Identification of the radioisotopes and waste which can be considered for decay in storage, and development of a written set of procedures outlining handling and processing steps necessary to isolate those wastes.
 - (b) Identification of an area where the storage for decay can occur, and evaluation of the size of the area to ensure it is spacious enough to accommodate all wastes to be accumulated through the entire decay cycle.
 - (c) Identification of adjacent unrestricted areas to ensure adequate shielding is available to maintain radiation levels below specified limits.
 - (d) Establishment of adequate security measures for the storage for decay area.
 - (e) Establishment of a radiation survey procedure to measure radiation levels in adjacent unrestricted areas at least weekly.
 - (f) Development of written procedures to monitor the waste in the storage for decay area to ensure it has decayed to background levels prior to disposal.
 - (g) Maintenance of all records for all storage for decay and disposal activities, especially radiation surveys.

(C) Specification of the considerations necessary to achieve the required goals. These considerations shall include:

- (1) The scope of work necessary to develop and implement the program;
- (2) A best estimate of the schedule for implementing each identified task;
- (3) Requirements for anticipated personnel, materials and equipment;
- (4) A range of cost estimates of all program elements; and
- (5) If a minimization program is already in place, the measures necessary to allow minimization to continue at an optimum level should be indicated.

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(D) A statement describing how future business plans will evaluate source and volume minimization for the expected waste streams.

(E) A description of the strategies to be used to measure the success of the minimization program.

(F) A summary of employee training activities which ensure that:

- (1) All employees who work with radioactive materials have basic knowledge of common waste problems;
- (2) All workers involved directly with the minimization program have the necessary technological skills.

[Note: Guidance for the preparation of a minimization plan may be found in the Generator Guidance which is available from the Department.]

120.900: RADIATION SAFETY REQUIREMENTS FOR WIRELINE SERVICE OPERATIONS AND SUBSURFACE TRACER STUDIES

120.901: Purpose and Scope

(A) 105 CMR 120.900 prescribes requirements for the issuance of a license or certificate of registration authorizing the use of sources of radiation for well logging in a single well. 105 CMR 120.900 also establishes radiation safety requirements for persons using sources of radiation for wireline service operations including mineral logging, radioactive markers, and subsurface tracer studies. The requirements of 105 CMR 120.900 are in addition to, and not in substitution for, the requirements of 105 CMR 120.001, 120.020, 120.750, 120.100 and 120.200.

(B) 105 CMR 120.900 applies to all licensees or registrants who use sources of radiation for wireline service operations including mineral logging, radioactive markers, uranium sinker bars, or subsurface tracer studies. 105 CMR 120.900 does not apply to the use of radioactive material in tracer studies involving multiple wells, such as field flood studies, or to the use of sealed sources auxiliary to well-logging but not lowered into wells.

120.902: Definitions

As used in 105 CMR 120.900, the following definitions apply:

Energy Compensated Source (ECS) means a small sealed source with an activity not exceeding 3.7 megabecquerel (100 μ Ci), used within a logging tool or other tool components, to provide a reference standard to maintain the tool's calibration when in use.

Field Station means a facility where radioactive sources may be stored or used and from which equipment is dispatched to temporary jobsites.

Fresh Water Aquifer for the purpose of this part, means a geologic formation that is capable of yielding fresh water to a well or spring.

Injection Tool means a device used for controlled subsurface injection of radioactive tracer material.

Irretrievable Well-logging Source means any sealed source containing radioactive material that is pulled off or not connected to the wireline that suspends the source in the well and for which all reasonable effort at recovery has been expended.

Logging Assistant means the individual who, under the personal supervision of a logging supervisor, handles sealed sources or tracers that are not in logging tools or shipping containers or who performs surveys required by 105 CMR 120.951.

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Logging Supervisor means the individual who uses licensed material or provides personal supervision of the utilization of sources of radiation at a temporary jobsite and who is responsible to the licensee or registrant for assuring compliance with the requirements of the Agency's regulations and the conditions of the license or registration.

Logging Tool means a device used subsurface to perform well-logging.

Mineral Logging means any logging performed for the purpose of mineral exploration other than oil or gas.

Personal Supervision means guidance and instruction by the logging supervisor who is physically present at a temporary jobsite and watching the performance of the operation in such proximity that contact can be maintained and immediate assistance given as required.

Personnel Monitoring Badge means an individual personnel dosimeter that is processed and evaluated by accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor.

Radioactive Marker means radioactive material placed subsurface or on a structure intended for subsurface use for the purpose of depth determination or direction orientation.

Safety Review means a periodic review provided by the licensee for its employees on radiation safety aspects of well logging. The review may include, as appropriate, the result of internal inspections, new procedures or equipment, accidents or errors that have been observed, and opportunities for employees to ask safety questions.

Source Holder means a housing or assembly into which a radioactive source is placed for the purpose of facilitating the handling and use of the source in well-logging operations.

Subsurface Tracer Study means the release of unsealed radioactive material or a substance tagged with radioactive material for the purpose of tracing the movement or position of the radioactive material or tagged substance in the well-bore or adjacent formation.

Surface Casing for Protecting Fresh Water Aquifers means a pipe or tube used as a lining in a well to isolate fresh water aquifers from the well.

Temporary Jobsite means a location to which radioactive materials have been dispatched to perform wireline service operations or subsurface tracer studies.

Tritium Neutron Generator Target Source means a tritium source used within a neutron generator tube to produce neutrons for use in well-logging applications.

Uranium Sinker Bar means a weight containing depleted uranium used to pull a logging tool toward the bottom of well.

Well-bore means a drilled hole in which wireline service operations and subsurface tracer studies are performed.

Well-logging means the lowering and raising of measuring devices or tools which may contain sources of radiation into well-bores or cavities for the purpose of obtaining information about the well and/or adjacent formations.

Wireline means a cable containing one or more electrical conductors which is used to lower and raise logging tools in the well-bore.

Wireline Service Operation means any evaluation or mechanical service which is performed in the well-bore using devices on a wireline.

120.903: Licensing and Registration Requirements for Wireline Service Operations

The Agency will approve an application for a specific license for the use of licensed material or a registration for use of radiation machines if the applicant meets the following requirements:

- (A) The applicant satisfies the general requirements specified in 105 CMR 120.020 for radiation machine facilities or 105 CMR 120.100 for radioactive material, as applicable, and any special requirements contained in 105 CMR 120.900;
- (B) The applicant submits an adequate program for training logging supervisors and logging assistants that includes:
 - (1) Initial training;
 - (2) On-the-job training;
 - (3) Annual safety reviews provided by the licensee;
 - (4) Means the applicant will use to demonstrate the logging supervisor's knowledge and understanding of and ability to comply with 105 CMR 120.900 and licensing requirements and the applicant's operating and emergency procedures; and
 - (5) Means the applicant will use to demonstrate the logging assistant's knowledge and understanding of and ability to comply with the applicant's operating and emergency procedures.
- (C) The applicant shall submit to the Agency written operating and emergency procedures as described in 105 CMR 120.932 or an outline or summary of the procedures that includes the important radiation safety aspects of the procedures.
- (D) The applicant shall establish and submit to the Agency its program for annual inspections of the job performance of each logging supervisor to ensure that 105 CMR 120.000, license or registration requirements, and the applicant's operating and emergency procedures are followed. Inspection records must be retained for three years after each annual internal inspection.
- (E) The applicant submits a description of the applicant's overall organizational structure as it applies to the radiation safety responsibilities in industrial radiography, including specified delegation of authority and responsibility;
- (F) If an applicant intends to perform leak testing of sealed sources, the applicant shall identify the manufacturers and model numbers of the leak test kits to be used. If the applicant wants to analyze its own wipe samples, the applicant shall establish procedures to be followed and submit a description of these to the Agency. The description must include the:
 - (1) Instruments to be used;
 - (2) Methods of analyzing the samples; and
 - (3) Pertinent experience of the person who will analyze the wipe samples.

120.904: Agreement with Well Owner or Operator

No licensee shall perform wireline service operations with a sealed source(s) unless, prior to commencement of the operation, the licensee has a written agreement with the well operator, well owner, drilling contractor, or land owner. The licensee shall retain a copy of the written agreement for three years after the well logging operation has been completed. The written agreement shall identify who will meet the following requirements:

- (A) (1) In the event a sealed source is lodged downhole, a reasonable effort at recovery will be made.
- (2) A person may not attempt to recover a sealed source in a manner which, in the licensee's opinion, could result in its rupture.
- (3) The licensee shall conduct radiation monitoring to detect any contamination.
 - (a) If the licensee detects evidence of that a sealed source has ruptured or licensed materials have caused contamination, the licensee shall initiate immediately the emergency procedures required in 105 CMR 120.932.
 - (b) If contamination results from the use of licensed material in well logging, the licensee shall decontaminate all work areas, equipment, and unrestricted areas.

120.904: continued

- (c) During efforts to recover a sealed source lodged in the well, the licensee shall continuously monitor, with an appropriate radiation detection instrument or a logging tool with a radiation detector, the circulating fluid from the well, if any, to check for contamination resulting from damage to the sealed source.
- (4) If the environment, any equipment, or personnel are contaminated with licensed material, they must be decontaminated before release from the site or release for unrestricted use.
- (5) If the sealed source is classified as irretrievable after reasonable efforts at recovery have been expended, the following requirements must be implemented within 30 days:
- (a) Each irretrievable well logging source must be immobilized and sealed in place with a cement plug.
 - (b) A means to prevent inadvertent intrusion on the source, unless the source is not accessible to any subsequent drilling operations; and,
 - (c) A permanent identification plaque, constructed of long lasting material such as stainless steel, brass, bronze, or monel, must be mounted at the surface of the well, unless the mounting of the plaque is not practical. The size of the plaque must be at least 17 cm (seven inches) square and three mm (1/8") thick. The plaque must contain:
 1. The word "CAUTION";
 2. The radiation symbol (the conventional color requirement need not be met);
 3. The date of abandonment;
 4. The name of the well operator or well owner;
 5. The well name and well identification number(s) or other designation;
 6. The sealed source(s) by radionuclide and quantity of activity;
 7. The source depth and the depth to the top of the plug; and,
 8. An appropriate warning, depending on the specific circumstances of each abandonment. (Appropriate warnings may include: (A) "Do not drill below plug back depth"; (B) "Do not enlarge casing"; or (C) "Do not re-enter the hole", followed by the words, "before contacting the Massachusetts Radiation Control Program".)
- (B) In the event a decision is made to abandon the sealed source downhole, the requirements of 105 CMR 120.904(A) and any other Commonwealth Agency having applicable regulations shall be met.
- (C) The licensee shall retain a copy of the written agreement for three years after the completion of the well logging operation.
- (D) A licensee may apply, pursuant to 105 CMR 120.904, for Agency approval, on a case-by-case basis, of proposed procedures to abandon an irretrievable well logging source in a manner not otherwise authorized in 105 CMR 120.904(A)(5).

EQUIPMENT CONTROL

120.911: Labels, Security, and Transport Requirements

- (A) Labels.
- (1) The licensee may not use a source, source holder, or logging tool that contains licensed material unless the smallest component that is transported as a separate piece of equipment with the licensed material inside bears a durable, legible, and clearly visible marking or label. The marking or label must contain the radiation symbol specified in 105 CMR 120.237(A) without the conventional color requirements, and the wording "DANGER (or CAUTION) RADIOACTIVE MATERIAL."
 - (2) The licensee may not use a container to store licensed material unless the container has securely attached to it a durable, legible, and clearly visible label. The label must contain the radiation symbol specified in 105 CMR 120.237(A) and the wording "CAUTION (or DANGER), RADIOACTIVE MATERIAL, NOTIFY CIVIL AUTHORITIES (or NAME OF COMPANY)."
 - (3) The licensee may not transport licensed material unless the material is packaged, labeled, marked, and accompanied with appropriate shipping papers in accordance with 105 CMR 120.775.

120.911: continued

(B) Security Precautions during Storage and Transportation.

(1) The licensee shall store each source containing licensed material in a storage container or transportation package. The container or package must be locked and physically secured to prevent tampering or removal of licensed or registered material from storage by unauthorized personnel. The licensee shall store licensed or registered material in a manner which will minimize danger from explosion or fire.

(2) The licensee shall lock and physically secure the transport package containing licensed or registered material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal of the licensed or registered material from the vehicle.

120.914: Radiation Survey Instruments

(A) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments capable of detecting beta and gamma radiation at each field station and temporary jobsite to make physical radiation surveys as required by 105 CMR 120.900 and 120.221. Instrumentation shall be capable of measuring 0.1 milliroentgen (2.58×10^{-8} C/kg) per hour through at least 50 milliroentgens (1.29×10^{-5} C/kg) per hour.

(B) Each radiation survey instrument shall be calibrated:

(1) At intervals not to exceed six months and after each instrument servicing;

(2) For linear scale instruments, at two points located approximately $\frac{1}{10}$ and $\frac{9}{10}$ of full-scale on each scale; for logarithmic scale instruments, at mid-range of each decade, and at two points of at least one decade; and for digital instruments, at appropriate points; and,

(3) So that accuracy within plus or minus 20% of the true radiation level can be demonstrated on each scale.

(C) Calibration records shall be maintained for a period of three years for inspection by the Agency.

(D) The licensee shall have available additional calibrated and operable radiation detection instruments sensitive enough to detect the low radiation and contamination levels that could be encountered if a sealed source ruptured. The licensee may own the instruments or may have a procedure to obtain them in a timely manner from a second party.

120.915: Leak Testing of Sealed Sources

(A) Requirements. Each licensee using sealed sources of radioactive material shall have the sources tested for leakage. Records of leak test results shall be kept in units of becquerel (μCi) and maintained for inspection by the Agency for three years after the leak test is performed.

(B) Method of Testing. Tests for leakage shall be performed only by persons specifically authorized to perform such tests by the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State. The wipe sample shall be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample shall be analyzed for radioactive contamination, and the analysis shall be capable of detecting the presence of (185 becquerel) ($0.005 \mu\text{Ci}$) of radioactive material on the wipe sample.

(C) Interval of Testing. Each sealed source of radioactive material shall be tested at intervals not to exceed six months. Each ECS that is not exempt from testing in accordance with 105 CMR 120.915(A) shall be tested at intervals not to exceed three years. In the absence of a certificate from a transferor indicating that a test has been made prior to the transfer, the sealed source shall not be put into use until tested. If it is suspected that a sealed source may be leaking, it shall be removed from service immediately and tested for leakage as soon as practical.

120.915: continued

(D) Leaking or Contaminated Sources. If the test reveals the presence of 0.005 microcurie (185 Bq) or more of leakage or contamination, the licensee shall immediately withdraw the source from use and shall cause it to be decontaminated, repaired, or disposed of in accordance with 105 CMR 120.200. The licensee shall check the equipment associated with the leaking or contaminated source for radiation contamination and, if contaminated, have it decontaminated or disposed of by an NRC or Agreement State licensee. A report describing the equipment involved, the test results, and the corrective action taken shall be filed with the Agency within five working days.

(E) Exemptions. The following sources are exempted from the periodic leak test requirements of 105 CMR 120.915(A) through (D):

- (1) Hydrogen-3 sources;
- (2) Sources of radioactive material with a half-life of 30 days or less;
- (3) Sealed sources of radioactive material in gaseous form;
- (4) Sources of beta- and/or gamma-emitting radioactive material with an activity of 3.7 megabecquerel (100 μ Ci) or less; and
- (5) Sources of alpha-emitting radioactive material with an activity of 0.370 MB (10 μ Ci) or less.

120.916: Physical Inventory

Each licensee or registrant shall conduct a semi-annual physical inventory to account for all sources of radiation. Records of inventories shall be maintained for three years from the date of the inventory for inspection by the Agency and shall include the quantities and kinds of sources of radiation, the location where sources of radiation are assigned, the date of the inventory, and the name of the individual conducting the inventory. Physical inventory records may be combined with leak test records.

120.917: Utilization Records

Each licensee or registrant shall maintain current records, which shall be kept available for inspection by the Agency for three years from the date of the recorded event, showing the following information for each source of radiation:

- (A) Make, model number, and a serial number or a description of each source of radiation used;
- (B) The identity of the well-logging supervisor or field unit to whom assigned and the identity of the logging assistants present;
- (C) Locations where used and dates of use; and,
- (D) In the case of tracer materials and radioactive markers, the utilization record shall indicate the radionuclide and activity used in a particular well and the disposition of any unused tracer materials.

120.918: Design, Performance, and Certification Criteria for Sealed Sources Used in Downhole Operations

- (A) A licensee may use a sealed source for well logging applications if:
 - (1) The sealed source is doubly encapsulated;
 - (2) The sealed source contains licensed radioactive material whose chemical and physical forms are as insoluble and non-dispersible as practical; and
 - (3) Meets the requirement of 105 CMR 120.918(B), (C), or (D).
- (B) For a sealed source manufactured on or before July 14, 1989, a licensee may use the sealed source for well logging applications, if it meets the requirements of USAI N5.10-1968, "Classification of Sealed Radioactive Sources," or the requirements of 105 CMR 120.918(C) or (D).

120.918: continued

(C) For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source for well logging applications; if it meets the oil-well logging requirements of ANSI/HPS N.43.6-1997, "Sealed Radioactive Sources-Classifications."

(D) For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source for well logging applications, if:

(1) The sealed source's prototype has been tested and found to maintain its integrity after each of the following tests:

(a) Temperature. The test source must be held at -40°C for 20 minutes, 600°C for one hour and then be subject to a thermal shock test with a temperature drop from 600°C to 20 C within 15 seconds.

(b) Impact Test. A five kg steel hammer, 2.5 cm in diameter, must be dropped from a height of 1 m onto the test source.

(c) Vibration Test. The test source must be subjected to a vibration from 25 Hz to 500 Hz at five g amplitude for 30 minutes.

(d) Puncture Test. A one gram hammer and pin, 0.3 cm pin diameter, must be dropped from a height of 1 m onto the test source.

(e) Pressure Test. The test source must be subject to an external pressure of 1.695×10^7 pascals (24,600 pounds per square inch absolute).

(E) The requirements of 105 CMR 120.918(A), (B), (C), and (D) do not apply to sealed sources that contain radioactive material in gaseous form.

(F) The requirements in 105 CMR 120.918(A) through 105 CMR 120.918(D) do not apply to energy compensated sources (ECS). ECSs must be registered with the Agency under 105 CMR 120.128(N) or with the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or with an Agreement State.

120.920: Inspection, Maintenance and Opening of a Source or Source Holder

(A) Each licensee shall visually check source holders, logging tools, and source handling tools, for defects before each use to ensure that the equipment is in good working condition and that required labeling is present. If defects are found, the equipment must be removed from service until repaired, and a record must be made listing: the equipment involved, defects found, and retained for three years after the defect is found.

(B) Each licensee or registrant shall have a program for semi-annual visual inspection and routine maintenance of source holders, logging tools, injection tools, source handling tools, storage containers, transport containers, and uranium sinker bars to ensure that the required labeling is legible and that no physical damage is visible. If defects are found, the equipment must be removed from service until repaired, and a record must be made listing: date, equipment involved, inspection and maintenance operations performed, any defects found, and any actions taken to correct the defects. Records of inspection and maintenance shall be maintained for a period of three years for inspection by the Agency.

(C) Removal of a sealed source from a source holder or logging tool, and maintenance on sealed sources or holders in which sealed sources are contained may not be performed by the licensee unless a written procedure developed pursuant to 105 CMR 120.932 has been approved either by the Agency pursuant to 105 CMR 120.903(C), the NRC, an Agreement State or a Licensing State.

(D) If a sealed source is struck in the source holder, the licensee shall not perform any operation, such as drilling, cutting, or chiselling, on the source holder unless the licensee is specifically approved by the Agency to perform such operation.

(E) The repair, opening, or modification of any sealed source shall be performed only by persons specifically authorized to do so by the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State.

120.922: Handling Tools

The licensee shall provide and require the use of tools that will assure remote handling of sealed sources other than low activity calibration sources.

120.923: Subsurface Tracer Studies

(A) The licensee shall require all personnel handling radioactive tracer material to use protective gloves and, if required by the license, other appropriate protective clothing and equipment. The licensee shall take precautions to avoid ingestion or inhalation of radioactive tracer material and to avoid contamination of the field stations and temporary jobsites.

(B) A licensee may not knowingly inject radioactive material into fresh water aquifers without prior written authorization from the Agency.

120.924: Radioactive Markers

The licensee may use radioactive markers in wells only if the individual markers contain quantities of radioactive material not exceeding the quantities specified in 105 CMR 120.196: *Appendix B Table I*. The use of radioactive markers is subject to the requirements of 105 CMR 120.916.

120.925: Uranium Sinker Bars

The licensee may use a uranium sinker bar in well logging after the effective date of 105 CMR 120.000 only if it is legibly impressed with the words "CAUTION -- RADIOACTIVE -- DEPLETED URANIUM" and "NOTIFY CIVIL AUTHORITIES (or COMPANY NAME) IF FOUND."

120.926: Use of a Sealed Source in a Well Without a Surface Casing

The license may use a sealed source in a well without casing for protecting fresh water aquifers only if the licensee follows a procedure for reducing the probability of the source becoming lodged in the well. The procedure must be approved by the Agency pursuant to 105 CMR 120.903(C).

120.927: Energy Compensated Sources

The licensee may use an energy compensated source (ECS) which is contained within a logging tool, or other tool components, only if the ECS contains quantities of radioactive material not exceeding 3.7 megabecquerel. (100 μ Ci).

(A) For well-logging applications with a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of 105 CMR 120.915, 120.916 and 120.917.

(B) For well-logging applications without a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of 105 CMR 120.904, 120.915, 120.916, 120.917, 120.926 and 120.954.

120.928: Tritium Neutron Generator Target Source

Use of a tritium neutron generator target source, containing quantities not exceeding 1.110 terabecquerels (30 Ci) and in a well with a surface casing to protect fresh water aquifers, is subject to the requirements of 105 CMR 120.900 except 105 CMR 120.904, 120.918 and 120.954.

(B) Use of a tritium neutron generator target source containing quantities exceeding 1.110 terabecquerels (30 Ci) or in a well without a surface casing to protect fresh water aquifers, is subject to the requirements of 105 CMR 120.900 except 120.918.

120.929: Particle Accelerators

No licensee or registrant shall permit above-ground testing of particle accelerators, designed for use in well logging, which results in the production of radiation, except in areas or facilities controlled or shielded so that the requirements of 105 CMR 120.200, as applicable, are met.

RADIATION SAFETY REQUIREMENTS

120.931: Training Requirements

(A) The licensee or registrant may not permit any individual to act as a logging supervisor as defined in 105 CMR 120.900 until such individual has:

- (1) Successfully completed a course recognized by the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State, at least 24 hours of formal training in the subjects outlined in 105 CMR 20.960: *Appendix A*;
- (2) Received copies of and instruction in the regulations contained in 105 CMR 120.900 and the applicable sections of 105 CMR 120.001, 120.200 and 120.750 or their equivalent, conditions of appropriate license or certificate of registration, and the licensee's or registrant's operating and emergency procedures;
- (3) Demonstrated understanding of the requirements of 105 CMR 120.931(A)(1) and 120.931(A)(2) by successfully completing a written examination administered by the licensee or registrant;
- (4) Completed 320 hours of on-the-job training under the supervision of a logging supervisor; and
- (5) Demonstrated through a field evaluation, competence to use sources of radiation, related handling tools, and survey instruments which will be used on the job.

(B) The licensee or registrant may not permit any individual to act as a logging assistant until such individual has:

- (1) Received copies of and instruction in the regulations contained in 105 CMR 120.900 and in the applicable sections of 105 CMR 120.001, 120.200 and 120.750 and the licensee's or registrant's operating and emergency procedures and demonstrated an understanding thereof;
- (2) Demonstrated competence to use, under the personal supervision of the logging supervisor, the sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.

(C) The licensee or registrant shall provide safety review for logging supervisors and logging assistants at least once during each calendar year.

(D) The licensee or registrant shall maintain records documenting the training and reviews required by 105 CMR 120.931(A), (B) and (C) for inspection by the Agency for three years following termination of employment.

120.932: Operating and Emergency Procedures

The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:

- (A) Handling and use of sources of radiation, including the use of sealed sources in wells without surface casing for protecting fresh water aquifers if appropriate;
- (B) Methods and occasions for conducting radiation surveys, including surveys for detecting contamination;
- (C) Methods and occasions for locking and securing sources of radiation;
- (D) Personnel monitoring and the use of personnel monitoring equipment;
- (E) Transportation to temporary jobsites and field stations, including the packaging and placing of sources of radiation in vehicles, placarding of vehicles, and securing sources of radiation during transportation to prevent accidental loss, tampering or unauthorized removal;

120.932: continued

- (F) Minimizing exposure of individuals in the event of an accident;
- (G) Procedure for notifying proper personnel in the event of an accident;
- (H) Maintenance of records, including records generated by logging personnel at temporary jobsites;
- (I) Inspection and maintenance of sealed sources, source holders, logging tools, source handling tools, storage containers, transport containers, injection tools and uranium sinker bars;
- (J) Procedure to be followed in the event a sealed source is lodged downhole;
- (K) Procedures to be used for picking up, receiving, and opening packages containing radioactive material;
- (L) For the use of tracers, decontamination of the environment, equipment, and personnel;
- (M) Actions to be taken if a sealed source is ruptured, including actions to prevent the spread of contamination and minimize inhalation and ingestion of radioactive material and actions to obtain suitable radiation survey instruments as required by 105 CMR 120.914(B);
- (O) The use of remote handling tools for handling sealed sources and radioactive tracer material except low-activity calibration sources; and
- (P) Identifying and reporting to the Agency defects and noncompliance as required by 10 CFR Part 21 of the NRC regulations

120.933: Personnel Monitoring

- (A) The licensee or registrant may not permit any individual to act as a logging supervisor or to assist in the handling of sources of radiation unless each such individual wears, at all times during the handling of licensed radioactive material and sources of radiation, a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor. Each personnel monitoring badge shall be assigned to and worn by only one individual. Film badges shall be replaced at least monthly and other personnel monitoring badges replaced at least quarterly. After replacement, each personnel dosimeter must be promptly processed. If a personnel monitoring badge is lost or damaged, the worker shall cease work immediately until a replacement badge is provided and the exposure is calculated by the RSO or the RSO's designee for the time period from issuance to loss or damage of the badge. The results of the calculated exposure and the time period for which the personnel monitoring badge was lost or damaged shall be provided to the processor to adjust the individual's occupational exposure record.
- (B) The licensee shall provide bioassay services to individuals using radioactive materials in tracer studies if required by the license.
- (C) Personnel monitoring records shall be maintained for inspection until the Agency authorizes disposition.

120.941: Radiation Surveys

- (A) Radiation surveys shall be made and recorded for each area where radioactive materials are stored.
- (B) Before transporting licensed material, radiation surveys and/or calculations shall be made and recorded for the radiation levels in positions occupied by each individual in the vehicle and on the exterior of each vehicle used to transport the licensed radioactive material. Such surveys and/or calculations shall include each source of radiation or combination of sources to be transported in the vehicle.

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(C) If the sealed source is removed from the logging tool before the departure from the temporary jobsite, the logging tool detector shall be energized, or a survey meter used, to assure that the logging tool is free of contamination.

(D) If the licensee has reason to believe that, as a result of any operation involving a sealed source, the encapsulation of the sealed source could be damaged by the operation, the licensee shall conduct a radiation survey, including a contamination survey, during and after the operation.

(F) Records required pursuant to 105 CMR 120.951(A) through (E) shall include the dates, the identification of individual(s) making the survey, the identification of survey instrument(s) used, and an exact description of the location of the survey. Records of these surveys shall be maintained for inspection by the Agency for three years after completion of the survey.

120.951: Security

(A) A logging supervisor must be physically present at a temporary jobsite whenever licensed material are being handled or are not stored and locked in a vehicle or storage place. The logging supervisor may leave the jobsite in order to obtain assistance if a source becomes lodged in the well.

(B) During each logging or tracer application, the logging supervisor or other designated employee shall maintain direct surveillance of the operation to protect against unauthorized and/or unnecessary entry into a restricted area, as defined in 105 CMR 120.005.

120.952: Documents and Records Required at Field Stations

Each licensee or registrant shall maintain, for inspection by the Agency, the following documents and records for the specific devices and sources used at the field station:

- (A) Appropriate license, certificate of registration, or equivalent document;
- (B) Operating and emergency procedures;
- (C) Applicable regulations;
- (D) Records of the latest survey instrument calibrations pursuant to 105 CMR 120.914;
- (E) Records of the latest leak test results pursuant to 105 CMR 120.915;
- (F) Quarterly inventories required pursuant to 105 CMR 120.916;
- (G) Utilization records required pursuant to 105 CMR 120.917;
- (H) Records of inspection and maintenance required pursuant to 105 CMR 120.920;
- (I) Survey records required pursuant to 105 CMR 120.951; and,
- (J) Training records required pursuant to 105 CMR 120.931.

120.953: Documents and Records Required at Temporary Jobsites

Each licensee or registrant conducting operations at a temporary jobsite shall have the following documents and records available at that site for inspection by the Agency:

- (A) Operating and emergency procedures;
- (B) Survey records required pursuant to 105 CMR 120.951 for the period of operation at the site;

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- (C) Evidence of current calibration for the radiation survey instruments in use at the site;
- (D) When operating in the Commonwealth under reciprocity, a copy of the appropriate license, certificate of registration, or equivalent document(s); and,
- (E) Shipping papers for transportation of radioactive material.

120.954: Notification of Incidents, Abandonment, and Lost Sources

- (A) Notification of incidents and sources lost in other than downhole logging operations shall be made in accordance with provisions of 105 CMR 120.281 and 120.282 and 120.142.
- (B) Whenever a sealed source or device containing radioactive material is lodged downhole, the licensee shall:
 - (1) Monitor at the surface for the presence of radioactive contamination with a radiation survey instrument or logging tool during logging tool recovery operations; and,
 - (2) Notify the Agency immediately by telephone and subsequently, within 30 days, by confirmatory letter if the licensee knows or has reason to believe that a sealed source has been ruptured. This letter shall identify the well or other location, describe the magnitude and extent of the escape of radioactive material, assess the consequences of the rupture, and explain efforts planned or being taken to mitigate these consequences.
- (C) When it becomes apparent that efforts to recover the radioactive source will not be successful, the licensee shall:
 - (1) Advise the well-operator of an appropriate method of abandonment, which shall include:
 - (a) The immobilization and sealing in place of the radioactive source with a cement plug;
 - (b) The setting of a whipstock or other deflection device; and,
 - (c) The mounting of a permanent identification plaque, at the surface of the well, containing the appropriate information required by 105 CMR 120.954(D);
 - (2) Notify the Agency by telephone, giving the circumstances of the loss, and request approval of the proposed abandonment procedures; and
 - (3) File a written report with the Agency within 30 days of the abandonment, setting forth the following information:
 - (a) Date of occurrence and a brief description of attempts to recover the source;
 - (b) A description of the radioactive source involved, including radionuclide, quantity, and chemical and physical form;
 - (c) Surface location and identification of well;
 - (d) Results of efforts to immobilize and set the source in place;
 - (e) Depth of the radioactive source;
 - (f) Depth of the top of the cement plug;
 - (g) Depth of the well; and,
 - (h) Information contained on the permanent identification plaque.
- (D) Whenever a sealed source containing radioactive material is abandoned downhole, the licensee shall provide a permanent plaque for posting the well or well-bore (an example of a suggested plaque is shown in 105 CMR 120.900: *Appendix 120.770(B)*). This plaque shall:
 - (1) Be constructed of long-lasting material, such as stainless steel or monel; and,
 - (2) Contain the following information engraved on its face:
 - (a) The word "CAUTION";
 - (b) The radiation symbol without the conventional color requirement;
 - (c) The date of abandonment;
 - (d) The name of the well operator or well owner;
 - (e) The well name and well identification number(s) or other designation;
 - (f) The sealed source(s) by radionuclide and quantity of activity;
 - (g) The source depth and the depth to the top of the plug; and,
 - (h) An appropriate warning, depending on the specific circumstances of each abandonment. (Appropriate warnings may include: (A) "Do not drill below plug back depth"; (B) "Do not enlarge casing"; or (C) "Do not re-enter the hole", followed by the words, "before contacting the Massachusetts Radiation Control Program".)

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(E) The licensee shall immediately notify the Agency by telephone and subsequently by confirming letter if the licensee knows or has reason to believe that radioactive material has been lost in or to an underground potable aquifer. Such notice shall designate the well location, describe the magnitude and extent of loss of radioactive material, the consequences of such loss, and explain efforts planned or being taken to mitigate these consequences.

120.960: Appendix A -- Subjects to be Included in Training Courses for Logging Supervisors

I. Fundamentals of Radiation Safety.

- A. Characteristics of radiation
- B. Units of radiation dose and quantity of radioactivity
- C. Significance of radiation dose
 - 1. Radiation protection standards
 - 2. Biological effects of radiation dose
- D. Levels of radiation from sources of radiation
- E. Methods of minimizing radiation dose
 - 1. Working time
 - 2. Working distances
 - 3. Shielding
- F. Radiation safety practices including prevention of contamination and methods of decontamination.

II. Radiation Detection Instrumentation to be Used.

- A. Use of radiation survey instruments
 - 1. Operation
 - 2. Calibration
 - 3. Limitations
- B. Survey techniques
- C. Use of personnel monitoring equipment

III. Equipment to be Used.

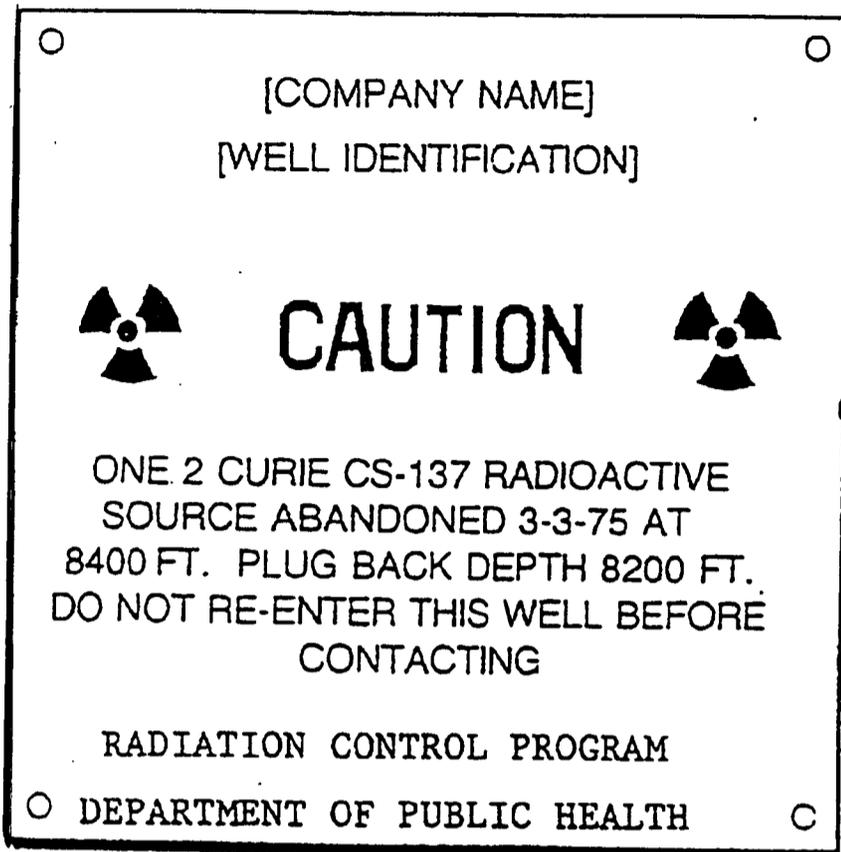
- A. Handling equipment
- B. Sources of radiation
- C. Storage and control of equipment
- D. Operation and control of equipment

IV. The Requirements of Pertinent Federal and Commonwealth Regulations

V. The Licensee's or Registrant's Written Operating and Emergency Procedures

VI. The Licensee's or Registrant's Record Keeping Procedures

120.961: Appendix B -- Example of Plaque for Identifying Wells Containing Sealed Sources Containing Radioactive Material Abandoned Downhole



The size of the plaque should be convenient for use on active or inactive wells, *e.g.*, a seven-inch square. Letter size of the word "CAUTION" should be approximately twice the letter size of the rest of the information, *e.g.*, 1/2-inch and 1/4-inch letter size, respectively.

REGULATORY AUTHORITY

105 CMR 120.000: M.G.L. c. 111, §§ 3, 5, 5M, 5N, 5O and 5P.