MICHIGAN DEPARTMENT OF PUBLIC HEALTH

RADIATION SAFETY SECTION

(By authority conferred on the department of public health by section 13521 of Act No. 368 of the Public Acts of 1978, as amended, and section 48 of Act No. 306 of the Public Acts of 1969, as amended, being SS333.13521 and 24.248 of the Michigan Compiled Laws)

PART 1. GENERAL PROVISIONS

R 325.5001. Purpose and scope

Rule 1. These rules, except as otherwise specifically provided, apply to all persons who own, receive, acquire, possess, use or transfer any source of radiation in this state. Regulation by the state of source material, byproduct material and special nuclear material in quantities not sufficient to form a critical mass is subject to an agreement between the state and the NRC and to 10 CFR Part 150 of NRC regulations. These rules do not apply to a person to the extent that the person is subject to regulation by the NRC. A person is subject to these rules unless specifically exempted under the act.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5002. Hearing procedure.

Rule 2. (1) Prior to the issuance of an order, the department shall afford opportunity for hearing which shall be conducted pursuant to Act No. 306 of the Public Acts of 1969 as amended being §§24.201 et. seq. of the Michigan Compiled Laws.

(2) In a contested case, the department shall conduct a hearing as provided in Act No. 306 of the Public Acts of 1969 as amended.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5003. Definitions Ab to Ai.

Rule 3. (1) "Absorbed dose" means the energy imparted to matter by radiation per unit mass of irradiated material at the place of interest. The special unit of absorbed dose is the rad.

(2) "Accelerator" or "particle accelerator" means a radiation machine designed for or capable of accelerating electrically charged particles such as electrons, protons or deuterons with an electrical potential in excess of 1 MeV. Radiation machines designed and used exclusively for the production of electron beams or x-radiation for any of the following purposes except those capable of producing radioactive material in excess of exempt quantities listed in schedule B of Rule 147 are excluded from this definition:

(a) The diagnosis or treatment of patients.

(b) Industrial radiography.

(c) Examination of the microscopic structure of materials.

(d) Manufacturing process control.

(e) Research and development.

(f) Demonstration of scientific principles for educational purposes.

(3) "Accelerator material" means any material made radioactive by exposing it in a particle accelerator.

(4) "Act" means Act No. 305 of the Public Acts of 1972 being §§325.451 et. seq. of the Michigan Compiled Laws. The terms defined in the Act have the same meanings when used in these rules.

(5) "Agreement material" means "byproduct material", "source material", or "special nuclear material in quantities not sufficient to form a critical mass" which is subject to regulation by this state under an agreement between the NRC and this state pursuant to section 274 of the federal atomic energy act of 1954, as amended, being 42. U.S.C. §2021 (Supp. 1973).

(6) "Agreement state" means a state with which the NRC has entered into an effective agreement pursuant to section 274b of the federal atomic energy act of 1954, as amended, being 42 U.S.C. §2021 (Supp. 1973).

(7) "Airborne radioactive material" means any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors or gases.

(8) "Airborne radioactivity area" means a room, enclosure or operating area in which airborne radioactive material exists in concentrations in excess of the amounts specified in column 1, table I of rules 261 to 269 or a room, enclosure or operating area in which airborne radioactive material exists in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed 25% of the amounts specified in column 1, table I of rules 261 to 269.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5004. Definitions Al to Au.

Rule 4. (1) "Aluminum equivalent" means the thickness of type 1100 aluminum alloy with nominal chemical composition of 99.00% minimum aluminum and 0.12% copper which will provide the same attenuation, under specified conditions, as the material in question.

(2) "Atomic Energy Commission" or "AEC" means the United States atomic energy commission, which was abolished by Section 104 of the federal energy reorganization act of 1974, being Public Law 93-438. See nuclear regulatory commission.

(3) "Attenuation block" means a block or stack, having dimensions 20 centimeters by 20 centimeters by 3.8 centimeters, of type 1100 aluminum alloy or other material with the same aluminum equivalent.

(4) "Authorized recipient" means any person licensed or otherwise authorized in writing by the department, the federal government or any agency thereof, or an agreement state to possess radioactive material or as authorized to the extent permitted by exemption from these rules.

(5) "Automatic exposure control" means a device which automatically controls 1 or more technique factors in order to obtain at a preselected location a required quantity of radiation.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5005. Definitions B.

Rule 5. (1) "Barrier" includes a primary protective barrier, a secondary protective barrier or a personnel barrier.

(2) "Beam axis" means a line from the source through the centers of the x-ray or gamma-ray fields.

(3) "Beam-limiting device" means a device which provides a means to restrict the dimensions of the x-ray or gamma-ray field.

(4) "Byproduct material" means any radioactive material, except special nuclear material, yielded in or made radioactive by exposing it to the radiation incident to the process of producing or utilizing special nuclear material.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5006. Definitions C.

Rule 6. (1) "Calendar quarter" means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be arranged so that a day is not included in more than 1 calendar quarter nor is a day in any 1 year omitted from inclusion within a calendar quarter. A licensee or registrant shall not change the method observed by him of determining calendar quarters for purposes of these rules except at the beginning of a calendar year.

(2) "Coefficient of variation" means the ratio of the standard deviation to the mean value of a population of observations. It is estimated using the following equation:

$$C = \frac{s}{\overline{X}} = \frac{1}{\overline{X}}\left[\sum_{i=1}^{n}\frac{\left(X_i - \overline{X}\right)^2}{n-1}\right]^{\frac{1}{2}}$$

where: s = Estimated standard deviation of the population.
$\overline{X}$ = Mean value of observations in sample.
X_i = i th observation in sample.
n = Number of observations in sample.

(3) "Controlled area" means a restricted area.

(4) "Cooling curve" means the graphical relationship between heat units stored and cooling time.

(5) "Curie" means the quantity of radioactive material which decays at the rate of 3.7×10^{10} disintegrations per second (dps). Commonly used submultiples of the curie (Ci) are the millicurie (mCi), the microcurie (μCi) and the nanocurie (nCi). One millicurie = 0.001 curie = 3.7×10^{7} dps. One microcurie = 0.000001 curie = 3.7×10^{4} dps. One nanocurie = 0.000000001 curie = 37 dps. Curie is the special unit of measurement of radioactivity.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5007. Definitions D.

Rule 7. (1) "Department" means the department of public health.

(2) "Diagnostic source assembly" means a diagnostic tube housing assembly with a beam-limiting device attached.

(3) "Diagnostic type tube housing" means an x-ray tube housing constructed so that the leakage radiation at a distance of 1 meter from the tube target does not exceed 0.10 roentgen per hour under the following conditions:

(a) For capacitor energy storage equipment when operated at is leakage technique factors.

(b) For field emission equipment rated for pulsed operation when operated at its leakage technique factors.

(c) For all other equipment when operated at 70 kVp and 10 milliamps or its calculated equivalent.

(4) "Diagnostic x-ray system" means an x-ray system designed for irradiation of any part of the human or animal body for the purpose of diagnosis or visualization.

(5) "Dose" means absorbed dose or dose equivalent as appropriate.

(6) "Dose equivalent" means the absorbed dose in rads times certain modifying factors and is a quantity that expresses on a common scale for all radiation a measure of the postulated effect on a given organ from small amounts of radiation. The special unit of dose equivalent is the rem.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5008. Definitions E and F.

Rule 8. (1) "Electrically grounded" means provided with an electrically conducting connection which joins the electrical circuit or equipment to the earth or to the nearest available conducting body which serves in place of the earth.

(2) "Exposure" means the quotient of dQ by dm where dQ is the absolute value of the total charge of the ions of 1 sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass dm are completely stopped in air. The special unit of exposure is the roentgen.

(3) "Exposure rate" means the exposure per unit of time, such as R/min, mR/h.

(4) "Facility" means the location at which 1 or more devices or sources of radiation are installed or located within 1 building or under 1 roof and are under the same administrative control.

(5) "Field emission equipment" means equipment which uses an x-ray tube in which electron emission from the cathode is due solely to the action of an electric field.

(6) "Filter" means material placed in the useful beam to absorb preferentially the less penetrating radiation.

(7) "Fluoroscopic imaging assembly" means a component which comprises a reception system in which x-ray photons produce a fluoroscopic image. It includes equipment housings, electrical interlocks if any, the primary protective barrier, and structural material providing linkage between the image receptor and the diagnostic source assembly.

(8) "Food and drug administration" or "FDA" means the United States food and drug administration established by the federal food, drug and cosmetic act of 1938, as amended, being Public Law 75-717.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5009. Definitions G and H.

Rule 9. (1) "General purpose radiographic x-ray system" means a radiographic x-ray system which, by design or use, is not limited to radiographic examination of specific anatomical regions.

(2) "Half-value layer" or "HVL" means the thickness of specified material which attenuates the beam of radiation to an extent that the exposure rate is reduced to 1/2 of its original value. In this definition the contribution of all scattered radiation, other than any which might be present initially in the beam concerned, is deemed to be excluded.

(3) "High radiation area" means an area, accessible to individuals, in which there exists such radiation, that an individual could receive in any 1 hour a dose in excess of 100 millirems.

(4) "Human use" means the internal or external administration of radiation or radioactive materials to human beings.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5010. Definitions I.

Rule 10. (1) "Image receptor" means a device, such as a fluorescent screen or radiographic film, which transfers incident x-ray photons into a visible image or into another form which can be made into a visible image by further transformations.

(2) "Individual" means a human being.

(3) "Inspection" means an official examination or observation to determine compliance with the act, these rules, license conditions, registration conditions or orders of the department.

(4) "Installation" means a location, having boundaries specified by the licensee or registrant, where for a period of more than 30 days, 1 or more sources of radiation are used, operated or stored. A part of a building, an entire building, a plant or plant site may be designated as an installation.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5011. Definitions L.

Rule 11. (1) "Leakage radiation" means radiation emanating from the diagnostic or therapeutic source assembly except for the useful beam and radiation produced when the exposure switch or timer is not activated.

(2) "Leakage technique factors" means the technique factors associated with the tube housing assembly which are used in measuring leakage radiation. They are defined as follows:

(a) For capacitor energy storage equipment, the maximum rated number of exposures in an hour for operation at the maximum rated peak tube potential with the quantity of charge per exposure being 10 millicoulombs (mAs) or the minimum obtainable from the unit, whichever is larger.

(b) For field emission equipment rated for pulsed operation, the maximum rated number of x-ray pulses in an hour for operation at the maximum rated peak tube potential.

(c) For all other equipment, the maximum rated continuous tube current for the maximum rated peak tube potential.

(3) "Level" means radiation flux or intensity at a specific point. It is sometimes expressed in terms of the dose an individual would receive if he were at that point or location.

(4) "License" means a license issued pursuant to parts 2 or 3 except where otherwise specified.

(5) "Light field" means the area of intersection of the light beam from the beam-limiting device and 1 of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the illumination is 1/4 of the maximum in the intersection.

(6) "Line-voltage regulation" means the difference between the no-load and the load line potentials expressed as a percent of the load line potential; that is,

Percent line-voltage regulation $=100\ (V_n - V_i)/V_i$

Where: V_n = No-load line potential and

V_i = Load line potential.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5012. Definitions M to O.

Rule 12. (1) "Manufactured" means produced or prepared for use or sale by an industrial manufacturing process. It includes factory assembly of components but does not include assembly of manufactured parts at the site of use.

(2) "Maximum line current" means the rms current in the supply line of an x-ray machine operating at its maximum rating.

(3) "Naturally occurring material" means radioactive material found radioactive in the normal isotopic distribution of elements rather than rendered radioactive by artificial means.

(4) "Nuclear regulatory commission" or "NRC" means the United States nuclear regulatory commission established by section 201 of the federal energy reorganization act of 1974, being Public Law 93-438.

(5) "Occupational dose" means the dose received in the course of occupational exposure as calculated or estimated from dosimeters.

(6) "Occupational exposure" means radiation exposure received by an individual in a restricted area, or in the course of employment in which the individual's duties involve being exposed to radiation. It does not include exposure of an individual to radiation for the purpose of diagnosis or therapy of the individual.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5013. Definitions P.

Rule 13. (1) "Particle accelerator" or "accelerator" means a radiation machine designed for or capable of accelerating electrically charged particles such as electrons, protons or deuterons, with an electrical potential in excess of 1 MeV. Radiation machines designed and used exclusively for the production of electron beams or x-radiation for any of the following purposes except those capable of producing radioactive material in excess of exempt quantities listed in schedule B of rule 147 are excluded from this definition:

(a) The diagnosis or treatment of patients.

(b) Industrial radiography.

(c) Examination of the microscopic structure of materials.

(d) Manufacturing process control.

(e) Research and development.

(f) Demonstration of scientific principles for educational purposes.

(2) "Peak tube potential" means the maximum value of the potential difference across the x-ray tube during an exposure.

(3) "Personnel barrier" means a barrier which restricts personnel from potential radiation exposure by restricting access to the vicinity of a source of radiation.

(4) "Personnel monitoring equipment" means a device such as a film badge, pocket dosimeter or thermoluminescent dosimeter (TLD) designed to be worn or carried by an individual for the purpose of estimating the radiation dose received by him.

(5) "Physician" means an individual licensed by this state to prescribe or dispense drugs in the practice of medicine.

(6) "Primary protective barrier" means the material, excluding filters, placed in the useful beam to reduce the radiation exposure for protection purposes.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5014. Definitions Ra.

Rule 14. (1) "Rad" means 1/100 of a joule of absorbed radiation energy per kilogram of material, or 100 ergs per gram and is the special unit of absorbed dose.

(2) "Radiation" means ionizing radiation.

(3) "Radiation area" means an area, accessible to individuals, in which there exists such radiation that an individual could receive in any 1 hour a dose in excess of 5 millirems, or in any 5 consecutive days a dose in excess of 100 millirems.

(4) "Radiation machine" means a device capable of producing radiation except that which produces radiation only from radioactive material.

(5) "Radiation monitoring" means the periodic or continuous determination of the exposure rate or contamination level in an area (area monitoring) or of the dose received by an individual (personnel monitoring).

(6) "Radiation protection supervisor" means the individual specified by the licensee or registrant who has the authority and the responsibility for radiation protection.

(7) "Radiation worker" means an individual assigned work with or around sources of radiation or who, during the performance of his assigned duties, receives or is likely to receive a dose in any calendar quarter in excess of 300 millirems.

(8) "Radioactivity" means the property of certain isotopes of the basic elements of spontaneously emitting nuclear particles or gamma radiation or of emitting x-radiation following orbital electron capture or of undergoing spontaneous fission.

(9) "Rated line voltage" means the range of potentials, in volts, of the supply line specified by the manufacturer at which the x-ray machine is designed to operate.

(10) "Rated output current" means the maximum allowable load current of the x-ray high-voltage generator.

(11) "Rated output voltage" means the allowable peak potential, in volts, at the output terminals of the x-ray high-voltage generator.

(12) "Rating" means the operating limits specified by the manufacturer.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5016. Definitions Re to Ro.

Rule 16. (1) "Recording" means producing a permanent form of a radiographic image resulting from x-ray or gamma-ray photons.

(2) "Rem" means the absorbed dose in rads multiplied by appropriate modifying factors which are determined by the quality of radiation and the conditions of exposure and is the special unit of dose equivalent. For the purpose of these regulations, each of the following is considered to be equivalent to a dose of one rem:

(a) An exposure of 1 roentgen of x or gamma radiation.

(b) A dose of 1 rad due to x, gamma or beta radiation.

(c) A dose of 0.1 rad due to neutrons or high energy protons.*

(d) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye.

* If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron absorbed dose in rads, 1 rem of neutron radiation may, for purposes of these regulations, be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or, if there exists sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to 1 rem may be estimated from the following table:

Neutron Flux Dose Equivalents

Neutron Energy (Mev)	Number of neutrons per square centimeter for a dose equivalent of 1 rem (neutron/cm^2)			Average flux to deliver 100 millirem in 40 hours (neutrons/cm^2 per second)
Thermal	970	x	10^6	670
0.0001	720	x	10^6	500
0.005	820	x	10^6	570
0.02	400	x	10^6	280
0.1	120	x	10^6	80
0.5	43	x	10^6	30
1.0	26	x	10^6	18
2.5	29	x	10^6	20
5.0	26	x	10^6	18
7.5	24	x	10^6	17
10.0	24	x	10^6	17
10 to 30	14	x	10^6	10

(3) "Research and development" means theoretical analysis, exploration or experimentation; or the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and

testing of models, devices, equipment, materials and processes. This definition does not apply to human use.

(4) "Response time" means the time required for an instrument system to reach 90% of its final reading when the radiation-sensitive volume of the instrument system is exposed to a step change in radiation flux from zero sufficient to provide a steady state midscale reading.

(5) "Restricted area" or "controlled area" means an area access to which is controlled by a licensee or registrant for purposes of protection of individuals from exposure to radiation or radioactive materials. It does not include an area used for residential quarters, although a separate room in a residential building may be set apart as a restricted area.

(6) "Roentgen" means 2.58×10^{-4} Coulombs/kilogram of air and is the special unit of exposure.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5017. Definitions Se to So.

Rule 17. (1) "Sealed source" means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions which are likely to be encountered in normal use and handling.

(2) "Secondary protective barrier" means the material placed in the path of scattered and leakage radiation to reduce the radiation exposure for protection purposes.

(3) "Shall" means required to comply with these rules pursuant to the act and enforceable under the act and Act No. 306 of the Public Acts of 1969 as amended.

(4) "Should" means recommended when practicable to meet optimum radiation safety standards.

(5) "Source" as applied to x-ray means the focal spot of the x-ray tube.

(6) "Source-image receptor distance" or "SID" means the distance from the source to the center of the input surface of the image receptor.

(7) "Source material" means uranium or thorium, or any combination thereof, in any physical or chemical form; or ores which contain by weight 1/20 of 1% (0.05%) or more of uranium, thorium or any combination thereof. Source material does not include special nuclear material.

(8) "Source of radiation" means any radioactive material, or any device or equipment emitting or capable of producing radiation.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5018. Definitions Sp to Su.

Rule 18. (1) "Special nuclear material in quantities not sufficient to form a critical mass" means uranium enriched in the isotope U-235 in quantities not exceeding 350 grams of contained U-235; uranium-233 in quantities not exceeding 200 grams; plutonium in quantities not exceeding 200 grams; or any combination of them in accordance with the following formula: For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified above for the same kind of special nuclear material. The sum of the ratios for all of the kinds of special nuclear material in combination shall not exceed "1" (i.e., unity). For example, the following quantities in combination would not exceed the limitation and are within the formula:

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

(2) "Stationary equipment" means equipment which is installed in a fixed location.

(3) "Survey" means a critical evaluation of a facility or area incident to the production, use, release, disposal, or presence of sources of radiation under a specific set of conditions to determine actual or potential radiation hazards. When appropriate, the evaluation includes tests, physical examination, source inventory and accountability, and measurements of levels of radiation or concentration of radioactive material present.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5019. Definitions T.

Rule 19. (1) "Technique factors" means the conditions of operation. They are specific as follows:

(a) For the capacitor energy storage equipment, peak tube potential in kV, and quantity of charge in mAs.

(b) For field emission equipment rated for pulsed operation, peak tube potential in kV, and number of x-ray pulses.

(c) For all other equipment, peak tube potential in kV,

and either tube current in mA and exposure time in seconds or the product of tube current and exposure time in mAs.

(2) "Test" means a procedure for determining the characteristics or condition of a source of radiation, or circumstances relative thereto.

(3) "Therapeutic type tube housing" means:

(a) For x-ray therapy equipment not capable of operating at 500 kVp or above, an x-ray tube housing so constructed that the leakage radiation averaged over any 100 cm^2 area at a distance of 1 meter from the source does not exceed 1 roentgen per hour when the tube is operated at its leakage technique factors.

(b) For x-ray therapy equipment capable of operation at 500 kVp or above, an x-ray tube housing so constructed that the leakage radiation averaged over any 100 cm^2 area at a distance of 1 meter from the source does not exceed 0.1% of the useful beam dose rate at 1 meter from the source for any of its operating conditions.

(4) "Thermoluminescent dosimeter" or "TLD" means a device used for radiation monitoring which measures integrated dose by the principle of thermoluminescence.

(5) "These rules" means all parts.

(6) "Tube" means an x-ray tube, unless otherwise specified.

(7) "Tube housing assembly" means the tube housing with tube installed. It includes high-voltage or filament transformers and other appropriate elements when they are contained within the tube housing.

(8) "Tube rating chart" means the set of curves which specify the rated limits of operation of the tube in terms of the technique factors.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5020. Definitions U and V.

Rule 20. (1) "Unrefined and unprocessed ore" means ore in its natural form before any processing, such as grinding, roasting, beneficiating or refining.

(2) "Unrestricted area" or "uncontrolled area" means an area access to which is not controlled by a licensee or registrant for purposes of protection of individuals from exposure to radiation or radioactive materials, or an area used for residential quarters.

(3) "Useful beam" means the radiation which passes through the tube housing port and the aperture of the beam-limiting device when the exposure switch or timer is activated.

(4) "Variable-aperture beam-limiting device" means a beam-limiting device which has capacity for stepless adjustment of the x-ray field size at a given source-image receptor distance.

(5) "Visible area" means that portion of the input surface of the image receptor over which incident x-ray photons produce a visible image.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5021. Definitions X-ray.

Rule 21. (1) "X-ray apparatus" means any source of x-ray and its high voltage supply.

(2) "X-ray control" means a device which controls input power to the x-ray high-voltage generator or the x-ray tube or both. It includes equipment which controls the technique factors of any x-ray exposure.

(3) "X-ray equipment" means an x-ray system, subsystem or component thereof.

(4) "X-ray field" means that area of the intersection of the useful beam and any 1 of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the exposure rate is 1/4 of the maximum in the intersection.

(5) "X-ray high-voltage generator" means a device which transforms electrical energy from the potential supplied by the x-ray control to the tube operating potential. The device may include means for transforming alternating current to direct current, filament transformers for the x-ray tubes, high-voltage switches, electrical protective devices and other appropriate elements.

(6) "X-ray system" means an assemblage of components for the controlled production of x-rays. It includes minimally an x-ray high-voltage generator, an x-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components which function with the system are considered integral parts of the system.

(7) "X-ray subsystem" means any combination of 2 or more components of an x-ray system for which there are requirements specified in these rules.

(8) "X-ray tube" means any electron tube which is designed for the conversion of electrical energy into x-ray energy.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5025. Prefixes.

Rule 25. The following prefixes are used in these rules to mean the numbers indicated:

Symb	Prefi	Quanti	Symb	Prefi	Quanti

ol	x	ty	ol	x	ty
d	deci	$(=10^{-1})$	da	deka	(=10)
c	centi	$(=10^{-2})$	h	hect	$(=10^{2})$
m	milli	$(=10^{-3})$	k	o	$(=10^{3})$
μ	micr	$(=10^{-6})$	M	kilo	$(=10^{6})$
p	o	$(=10^{-9})$	G	meg	$(=10^{9})$
f	nano	$(=10^{-12})$	T	a	$(=10^{12})$
a	pico			giga	
	femt	$(=10^{-15})$		tera	
	o				
	atto	$(=10^{-18})$			

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

EXEMPTIONS

R 325.5031. Departmental action.

Rule 31. Upon application therefore or upon its own initiative, the department may grant such exemptions or exceptions from the requirements of these rules as it determines are authorized by law and will not result in undue hazard to public health and safety or property.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5033. Nuclear regulatory commission contractors.

Rule 33. An NRC contractor or subcontractor of the following categories operating in this state is exempt from these rules to the extent that the contractor or subcontractor under his contract receives, acquires, possesses, uses or transfers sources of radiation:

(a) A prime contractor performing work for the NRC at United States government-owned or controlled sites.

(b) A prime contractor performing research in, or development, manufacture, storage, testing or transportation of, atomic weapons or components thereof.

(c) A prime contractor using or operating nuclear reactors or other nuclear devices in a United States government-owned vehicle or vessel.

(d) Any other prime contractor or subcontractor when the state and the NRC jointly determine that, under the terms of the contract or subcontract, there is adequate assurance that the work thereunder can be accomplished without undue risk to the public health and safety and that the exemption of such contractor or subcontractor is otherwise appropriate.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

RECORDS, INSPECTIONS, TESTS AND ENFORCEMENT

R 325.5041. Records.

Rule 41. A licensee or registrant shall keep records showing the receipt, transfer and disposal of all sources of radiation. Additional record requirements are specified elsewhere in these rules.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5042. Inspections.

Rule 42. (1) Under authority of section 13517(1) of the act, the department may enter at all reasonable times upon private or public property to conduct compliance investigations.

(2) Under authority of section 13517(2) of the act, the department may obtain a warrant if necessary for search of property or seizure of sources of radiation or evidence of a violation of the act or any rule or license.

(3) A licensee or registrant shall make available to the department for inspection, all records maintained pursuant to these rules.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5043. Impounding.

Rule 43. Sources of radiation are subject to impounding pursuant to section 5 of the act.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5044. Tests.

Rule 44. A licensee or registrant shall perform upon instructions from the department and shall permit the department to perform such reasonable tests as the department deems appropriate or necessary including tests of:

(a) Sources of radiation.

(b) Facilities wherein sources of radiation are used or stored.

(c) Radiation detection and monitoring instruments.

(d) Other equipment and devices used in connection with utilization or storage of licensed or registered sources of radiation.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5045. Additional requirements.

Rule 45. The department, by rule or order, may impose upon a licensee or registrant requirements in addition to those set forth in these rules that it deems appropriate or necessary to minimize danger to public health and safety or property.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5046. Violations.

Rule 46. (1) Under authority of section 9 of the act the department may seek a court order enjoining violation of or directing compliance with the act or any rule or order issued thereunder.

(2) Under authority of section 10 of the act, a person who performs any act for which licensing or registration is required pursuant to these rules when that person is not licensed, registered, or exempted, is guilty of a misdemeanor and may be fined, imprisoned or both. This provision shall not be effective until 90 days after the effective date of these rules.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5047. Communications.

Rule 47. Communications and reports concerning these rules, and applications filed thereunder, should be addressed to the Michigan Department of Public Health, Division of Radiological Health, 3423 North Logan Street, P.O. Box 30195, Lansing, Michigan 48909.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.

R 325.5049. Rescission.

Rule 49. The rules of the department entitled "Use of Radioactive Isotopes, X-radiation and All Other Forms of Ionizing Radiation," being R 325.1301 to R 325.1326 of the Michigan Administrative Code and appearing on pages 3173 to 3203 of the 1964-65 Annual Supplements to the Code, are rescinded.

History: 1954 ACS 85, Eff. Dec. 3, 1975; 1954 ACS 98 Eff. Mar 9, 1979.