PART 8: RADIATION SAFETY REQUIREMENTS FOR ANALYTICAL X-RAY EQUIPMENT

RADIATION SAFETY REQUIREMENTS FOR ANALYTICAL X-RAY EQUIPMENT

8.1 Purpose and Scope.

8.1.1 Authority *[Eff 04/01/2007]*

Rules and regulations set forth herein are adopted pursuant to the provisions of sections 25-1-108, 25-1.5-101(1)(l), and 25-11-104, CRS. *[Eff 04/01/2007]*

8.1.2 Basis and Purpose. *[Eff 04/01/2007]*

A statement of basis and purpose accompanies this part and changes to this part. A copy may be obtained from the Department. *[Eff 04/01/2007]*

8.1.3 Scope. *[Eff 04/01/2007]*

This part provides special requirements for analytical x-ray equipment. *[Eff 04/01/2007]*

8.1.4 Applicability. *[Eff 04/01/2007]*

The requirements and provisions of these regulations apply to applicants, licensees and registrants within the scope of this part unless specifically exempted. The requirements of this part are in addition to, and not in substitution for, applicable requirements in other parts of these regulations. *[Eff 04/01/2007]*

8.1.5 Published Material Incorporated by Reference. *[Eff 04/01/2007]*

Published material incorporated in Part 8 by reference is available in accord with Part 1, Section 1.4. *[Eff 04/01/2007]*

8.2 Definitions.

As used in this part, these terms have the definitions set forth as follows. *[Eff 04/01/2007]*

“Analytical x-ray equipment” means equipment used for x-ray diffraction or fluorescence analysis. *[Eff 04/01/2007]*

“Analytical x-ray system” means a group of components utilizing x or gamma rays to determine the elemental composition, or to examine the microstructure of materials. *[Eff 04/01/2007]*

“Fail-safe characteristic” means a design feature which causes beam port shutters to close, or otherwise prevents emergence of the primary beam, upon the failure of a safety or warning device. *[Eff 04/01/2007]*

“Local component” means a part of an analytical x-ray system in areas that are struck by x-rays such as radiation source housings, port and shutter assemblies, collimators, sample holders, cameras, goniometers, detectors, and shielding, not including power supplies, transformers, amplifiers, readout devices, and control panels. *[Eff 04/01/2007]*

“Normal operating procedures” means a set of step-by-step instructions necessary to accomplish the analysis. These procedures shall include sample insertion and manipulation, equipment alignment, routine maintenance by the registrant, and data recording procedures, which are

related to radiation safety. *[Eff 04/01/2007]*

"Open-beam configuration" means an analytical x-ray system in which an individual could accidentally place some part of his body in the primary beam path during normal operation. *[Eff 04/01/2007]*

"Primary beam" means ionizing radiation which passes through an aperture of the source housing by a direct path from the x-ray tube or a radioactive source located in the radiation source housing. *[Eff 04/01/2007]*

General Regulatory Provisions and Specific Requirements

8.3 Equipment Requirements.

8.3.1 Safety Device. *[Eff 04/01/2007]*

8.3.1.1 A device which prevents the entry of any portion of an individual's body into the primary x-ray beam path, or which causes the beam to be shut off upon entry into its path shall be provided on all open-beam configurations. *[Eff 04/01/2007]*

8.3.1.2 A registrant or licensee may apply to the Department for an exemption from the requirement of a safety device. Such application shall include: *[Eff 04/01/2007]*

(1) A description of the various safety devices that have been evaluated; *[Eff 04/01/2007]*

(2) The reason each of these devices cannot be used; and *[Eff 04/01/2007]*

(3) A description of the alternative methods that will be employed to minimize the possibility of an accidental exposure, including procedures to assure that operators and others in the area will be informed of the absence of safety devices. *[Eff 04/01/2007]*

8.3.2 Warning Devices. *[Eff 04/01/2007]*

8.3.2.1 Open-beam configurations shall be provided with a readily discernible indication of: *[Eff 04/01/2007]*

(1) X-ray tube "on-off" status located near the radiation source housing, if the primary beam is controlled in this manner; and/or *[Eff 04/01/2007]*

(2) Shutter "open-closed" status located near each port on the radiation source housing, if the primary beam is controlled in this manner. *[Eff 04/01/2007]*

8.3.2.2 An easily visible warning light labeled with the words "X-RAY ON" , or words having a similar intent, shall be located: *[Eff 04/01/2007]*

(1) Near any switch that energizes an x-ray tube and shall be illuminated only when the tube is energized; or *[Eff 04/01/2007]*

(2) In the case of a radioactive source, near any switch that opens a housing shutter and shall be illuminated only when the shutter is open. *[Eff 04/01/2007]*

8.3.2.3 Warning devices shall be labeled so that their purpose is easily identified. On equipment installed after October 1, 1978, warning devices shall have fail-safe characteristics. *[Eff*

04/01/2007]

8.3.3 Ports. *[Eff 04/01/2007]*

Unused ports on radiation source housings shall be secured in the closed position, in a manner which will prevent casual opening. *[Eff 04/01/2007]*

8.3.4 Labeling. *[Eff 04/01/2007]*

All analytical x-ray equipment shall be labeled with a readily discernible sign or signs bearing the radiation symbol and the words: *[Eff 04/01/2007]*

8.3.4.1 “CAUTION - HIGH INTENSITY X-RAY BEAM” , or words having a similar intent, on the x-ray source housing; and *[Eff 04/01/2007]*

8.3.4.2 “CAUTION - RADIATION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED” , or words having a similar intent, near any switch that energizes an x-ray tube if the radiation source is an x-ray tube; or *[Eff 04/01/2007]*

8.3.4.3 “CAUTION - RADIOACTIVE MATERIAL” , or words having a similar intent, on the source housing in accordance with 4.30 of these regulations if the radiation source is a radionuclide. *[Eff 04/01/2007]*

8.3.5 Shutters. *[Eff 04/01/2007]*

On open-beam configurations installed after October 1, 1978, each port on the radiation source housing shall be equipped with a shutter that cannot be opened unless a collimator or a coupling has been connected to the port. *[Eff 04/01/2007]*

8.3.6 Radiation Source Housing. *[Eff 04/01/2007]*

Each radiation source housing shall be subject to the following requirements: *[Eff 04/01/2007]*

8.3.6.1 Each x-ray tube housing shall be equipped with an interlock that shuts off the tube if it is removed from the radiation source housing, or if the housing is disassembled. *[Eff 04/01/2007]*

8.3.6.2 Each radioactive source housing, or port cover or each x-ray tube housing shall be so constructed that, with all shutters closed, the radiation measured at a distance of 5 centimeters from its surface is not capable of producing a dose in excess of 0.025 mSv (2.5 millirem) in one hour. For systems utilizing x-ray tubes, this limit shall be met at any specified tube rating. *[Eff 04/01/2007]*

8.3.7 Generator Cabinet. *[Eff 04/01/2007]*

Each x-ray generator shall be supplied with a protective cabinet which limits leakage radiation measured at a distance of 5 centimeters from its surface such that it is not capable of p roducing a dose in excess of 2.5 μSv (0.25 millirem) in one hour. *[Eff 04/01/2007]*

8.4 Area Requirements.

8.4.1 Radiation Levels. *[Eff 04/01/2007]*

The local components of an analytical x-ray system shall be located and arranged and shall include sufficient shielding, or access control such that no radiation levels exist in any area

surrounding the local component group which could result in a dose to an individual present therein in excess of the dose limits given in 4.14 of these regulations. For systems utilizing x-ray tubes, these levels shall be met at any specified tube rating. *[Eff 04/01/2007]*

8.4.2 Surveys. *[Eff 04/01/2007]*

8.4.2.1 Radiation surveys, as required by 4.17 of these regulations, of all analytical x-ray systems sufficient to show compliance with 8.4.1 shall be performed: *[Eff 04/01/2007]*

(1) Upon installation of the equipment, and at least once every 12 months thereafter; *[Eff 04/01/2007]*

(2) Following any change in the initial arrangement, number, or type of local components in the system; *[Eff 04/01/2007]*

(3) Following any maintenance requiring disassembly, or removal of a local component in the system; *[Eff 04/01/2007]*

(4) During the performance of maintenance and alignment procedures if the procedures require the presence of a primary x-ray beam when any local component in the system is disassembled, or removed; *[Eff 04/01/2007]*

(5) Any time a visual inspection of the local components in the system reveals an abnormal condition; and *[Eff 04/01/2007]*

(6) Whenever personnel monitoring devices show a significant increase over the previous monitoring period, or the readings are approaching the limits specified in 4.6 of these regulations. *[Eff 04/01/2007]*

8.4.2.2 Radiation survey measurements shall not be required if a registrant or licensee can demonstrate compliance with 8.4.1 to the satisfaction of the Department. *[Eff 04/01/2007]*

8.4.3 Posting. *[Eff 04/01/2007]*

Each area or room containing analytical x-ray equipment shall be conspicuously posted with a sign, or signs bearing the radiation symbol and the words “CAUTION - X-RAY EQUIPMENT” or words having a similar intent in accordance with 4.28 of these regulations. *[Eff 04/01/2007]*

8.5 Operating Requirements.

8.5.1 Procedures. *[Eff 04/01/2007]*

Normal operating procedures shall be written and available to all analytical x-ray equipment workers. No individual shall be permitted to operate analytical x-ray equipment in any manner other than that specified in the procedures unless such individual has obtained written approval of the radiation safety officer. *[Eff 04/01/2007]*

8.5.2 Bypassing. *[Eff 04/01/2007]*

No individual shall bypass a safety device or interlock, unless such individual has obtained the written approval of the radiation safety officer. Such approval shall be for a specified period of time. When a safety device or interlock has been bypassed, a readily discernible sign bearing the words “SAFETY DEVICE NOT WORKING” , or words having a similar intent, shall be placed on the radiation source housing. *[Eff 04/01/2007]*

8.5.3 Repair or Modification of X-Ray Tube Systems. *[Eff 04/01/2007]*

Except as specified in 8.5.2, no operation involving removal of covers, shielding materials, or tube housings, or modifications to shutters, collimators, or beam stops shall be performed without ascertaining that the tube is off and will remain off until safe conditions have been restored. The main switch, rather than interlocks, shall be used for routine shutdown in preparation for repairs. *[Eff 04/01/2007]*

8.5.4 Radioactive Source Replacement, Testing, or Repair. *[Eff 04/01/2007]*

Radioactive source housings shall be opened for source replacement, leak testing, or other maintenance or repair procedures only by individuals authorized to specifically conduct such procedures under a license issued by the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State.

8.6 Personnel Requirements.

8.6.1 Instruction. *[Eff 04/01/2007]*

No individual shall be permitted to operate or maintain analytical x-ray equipment unless such individual has received instruction in and demonstrated competence as to: *[Eff 04/01/2007]*

8.6.1.1 Identification of radiation hazards associated with the use of the equipment; *[Eff 04/01/2007]*

8.6.1.2 Significance of the various radiation warning, safety devices, and interlocks incorporated into the equipment, or the reasons they have not been installed on certain pieces of equipment and the extra precautions required in such cases; *[Eff 04/01/2007]*

8.6.1.3 Proper operating procedures for the equipment; *[Eff 04/01/2007]*

8.6.1.4 Recognition of symptoms of an acute localized exposure; and *[Eff 04/01/2007]*

8.6.1.5 Proper procedures for reporting an actual or suspected exposure. *[Eff 04/01/2007]*

8.6.2 Personnel Monitoring. *[Eff 04/01/2007]*

8.6.2.1 Finger or wrist dosimetric devices shall be provided to and shall be used by: *[Eff 04/01/2007]*

(1) Analytical x-ray equipment workers using systems having an open-beam configuration and not equipped with a safety device; and *[Eff 04/01/2007]*

(2) Personnel maintaining analytical x-ray equipment if the maintenance procedures require the presence of a primary x-ray beam when any local component in the analytical x-ray system is disassembled or removed. *[Eff 04/01/2007]*

8.6.2.2 Reported dose values shall not be used for the purpose of determining compliance with 4.6 of these regulations unless evaluated by a qualified expert. *[Eff 04/01/2007]*

PART 9: RADIATION SAFETY REQUIREMENTS FOR PARTICLE ACCELERATORS NOT USED IN THE HEALING ARTS

RADIATION SAFETY REQUIREMENTS FOR PARTICLE ACCELERATORS NOT USED IN THE HEALING ARTS

9.1 Purpose and Scope.

9.1.1 Authority. *[Eff 04/01/2007]*

Rules and regulations set forth herein are adopted pursuant to the provisions of sections 25-1-108, 25-1.5-101(1)(l), and 25-11-104, CRS. *[Eff 04/01/2007]*

9.1.2 Basis and Purpose. *[Eff 04/01/2007]*

A statement of basis and purpose accompanies this part and changes to this part. A copy may be obtained from the Department. *[Eff 04/01/2007]*

9.1.3 Scope. *[Eff 04/01/2007]*

This part establishes procedures for the registration and the use of particle accelerators not used in the healing arts. *[Eff 04/01/2007]*

9.1.4 Applicability. *[Eff 04/01/2007]*

In addition to the requirements of this part, all registrants are subject to the applicable requirements of Parts 1, 2, 4, and 10. Registrants engaged in industrial radiographic operations are subject to the applicable requirements of Part 5. Registrants engaged in the healing arts are subject to the requirements of Part 20. Registrants whose operations result in the production of radioactive material are subject to the applicable requirements of Part 3. *[Eff 04/01/2007]*

9.1.5 Published Material Incorporated by Reference. *[Eff 04/01/2007]*

Published material incorporated in Part 9 by reference is available in accord with Part 1, Section 1.4. *[Eff 04/01/2007]*

9.2 Definitions.

Reserved. *[Eff 04/01/2007]*

REGISTRATION PROCEDURE

9.3 Registration.

9.3.1 No person shall receive, possess, use, transfer, own, or acquire a particle accelerator except as authorized in a registration issued pursuant to Part 2. *[Eff 04/01/2007]*

9.3.2 General Requirements for the Issuance of a Registration for a Particle Accelerator. *[Eff 04/01/2007]*

In addition to the requirements of Part 2, a registration application for use of a particle accelerator will be approved only if the Department determines that: *[Eff 04/01/2007]*

9.3.2.1 The applicant is qualified by reason of training and experience to use the accelerator in question for the purpose requested in accordance with this part and Parts 4 and 10 in such a manner as to minimize danger to public health and safety or property; *[Eff 04/01/2007]*

9.3.2.2 The applicant's proposed or existing equipment, facilities, and operating and emergency procedures are adequate to protect health and minimize danger to public health and safety or property; *[Eff 04/01/2007]*

9.3.2.3 The issuance of the registration will not be inimical to the health and safety of the public, and the applicant satisfies any applicable special requirement in 9.4; *[Eff 04/01/2007]*

9.3.2.4 The applicant has appointed a Radiation Safety Officer; *[Eff 04/01/2007]*

9.3.2.5 The applicant and the applicant's staff have substantial experience in the use of particle accelerators and training sufficient for application to their intended uses; *[Eff 04/01/2007]*

9.3.2.6 The applicant has established a radiation safety committee to approve, in advance, proposals for uses of particle accelerators, whenever deemed necessary by the Department; and *[Eff 04/01/2007]*

9.3.2.7 The applicant has an adequate training program for operators of particle accelerators. *[Eff 04/01/2007]*

RADIATION SAFETY REQUIREMENTS FOR THE USE OF PARTICLE ACCELERATORS

9.4 Use.

A registrant shall use the accelerator in accordance with the manufacturer's radiation safety and operating instructions. *[Eff 04/01/2007]*

9.5 Limitations.

9.5.1 No registrant shall permit any individual to act as an operator of a particle accelerator until such individual has: *[Eff 04/01/2007]*

9.5.1.1 Been instructed in radiation safety and shall have demonstrated an understanding thereof; *[Eff 04/01/2007]*

9.5.1.2 Received copies of and instruction in this part and the applicable requirements of Parts 4 and 10, pertinent registration conditions and the registrant's operating and emergency procedures, and shall have demonstrated understanding thereof; and *[Eff 04/01/2007]*

9.5.1.3 Demonstrated competence to use the particle accelerator, related equipment, and survey instruments which will be employed. *[Eff 04/01/2007]*

9.6 Shielding and Safety Design Requirements.

9.6.1 A qualified expert, registered with the Department, shall be consulted in the design of a particle accelerator installation and called upon to perform a radiation survey when the accelerator is first capable of producing radiation. For the purpose of this section, a qualified expert shall: *[Eff 04/01/2007]*

9.6.1.1 Be certified by the American Board of Radiology in: *[Eff 04/01/2007]*

9.6.1.1.1 Radiological Physics; or *[Eff 04/01/2007]*

9.6.1.1.2 Therapeutic Radiological Physics; or *[Eff 04/01/2007]*

9.6.1.2 Be certified by the American Board of Medical Physics in Radiological Oncology Physics; or *[Eff 04/01/2007]*

9.6.1.3 Be certified by the American Board of Health Physics; or *[Eff 04/01/2007]*

9.6.1.4 Hold a master's or doctor's degree in physics, biophysics, radiological physics, or health physics or medical physics, and have completed one year of documented full time training in radiation protection and also one year of documented full time work experience under the supervision of a qualified expert meeting the criteria in this section. *[Eff 04/01/2007]*

9.6.2 Each particle accelerator installation shall be provided with such primary and secondary barriers as are necessary to assure compliance with 4.6 and 4.14. *[Eff 04/01/2007]*

9.7 Particle Accelerator Controls and Interlock Systems.

9.7.1 Instrumentation, readouts, and controls on the particle accelerator control console shall be clearly identified and easily discernible. *[Eff 04/01/2007]*

9.7.2 Each entrance into a target room or other high radiation area shall be provided with a safety interlock that shuts down the machine under conditions of barrier penetration. *[Eff 04/01/2007]*

9.7.3 Each safety interlock shall be on a circuit which shall allow it to operate independently of all other safety interlocks. *[Eff 04/01/2007]*

9.7.4 All safety interlocks shall be designed so that any defect or component failure in the safety interlock system prevents operation of the accelerator. *[Eff 04/01/2007]*

9.7.5 When a safety interlock system has been tripped, it shall only be possible to resume operation of the accelerator after the condition causing the interrupt has been corrected. *[Eff 04/01/2007]*

9.7.6 A scram button or other emergency power cutoff switch shall be located and easily identifiable in all high radiation areas. Such a cutoff switch shall include a manual reset so that the accelerator cannot be restarted from the accelerator control console without resetting the cutoff switch. *[Eff 04/01/2007]*

9.8 Warning Devices.

9.8.1 Each location designated as high radiation area, and each entrance to such location, shall be equipped with easily observable warning lights that operate when, and only when, radiation is being produced. *[Eff 04/01/2007]*

9.8.2 Except in facilities designed for human exposure, each high radiation area shall have an audible warning device which shall be activated for fifteen (15) seconds prior to the possible creation of such high radiation area. Such warning device shall be clearly discernible in all high radiation areas. *[Eff 04/01/2007]*

9.8.3 Barriers, temporary or otherwise, and pathways leading to high radiation areas shall be posted in accordance with 4.28. *[Eff 04/01/2007]*

9.9 Operating Procedures.

9.9.1 Each particle accelerator, when not in operation, shall be secured to prevent unauthorized use. *[Eff 04/01/2007]*

9.9.2 The safety interlock system shall not be used to turn off the accelerator beam except in an emergency. *[Eff 04/01/2007]*

9.9.3 Safety Checks. *[Eff 04/01/2007]*

9.9.3.1 All safety and warning devices, including interlocks, shall be checked for proper operation at intervals not to exceed three months. Safety checks shall assure, as appropriate, proper operation of: *[Eff 04/01/2007]*

(1) Electrical interlocks at each room entrance; *[Eff 04/01/2007]*

(2) Timer, dose terminator, emergency off and door interlocks; *[Eff 04/01/2007]*

(3) Beam condition indicator lights on the accelerator unit, on the control panel, and in the facility; *[Eff 04/01/2007]*

(4) Viewing systems; *[Eff 04/01/2007]*

(5) Doors from inside and outside the accelerator room; and *[Eff 04/01/2007]*

(6) Electrically assisted room doors with the accelerator unit electrical power turned off. *[Eff 04/01/2007]*

9.9.3.2 A registrant shall promptly repair any system identified in 9.9.3.1 that is not operating properly. The accelerator shall not be used until all repairs are completed. *[Eff 04/01/2007]*

9.9.3.3 Records. *[Eff 04/01/2007]*

(1) A registrant shall maintain a record of the results of each safety check required by 9.9.3.1 for three (3) years at the accelerator facility for inspection by the Department. *[Eff 04/01/2007]*

(2) The record shall include: *[Eff 04/01/2007]*

(a) The date of the safety check; *[Eff 04/01/2007]*

(b) The manufacturer's name, model number, and serial number for the accelerator; *[Eff 04/01/2007]*

(c) The manufacturer's name, model number, serial number and calibration date of the instrument used to conduct any measurements; *[Eff 04/01/2007]*

(d) Notations indicating the operability of each entrance door interlock, each electrical or mechanical stop, each beam condition indicator light, the viewing system, and doors: and *[Eff 04/01/2007]*

(e) The signature of the individual who performed the periodic spot checks. *[Eff 04/01/2007]*

9.9.3.4 If the result of the safety checks required in 9.9.3.1 indicate the malfunction of any system specified in 9.9.3.1, the registrant shall lock the control console in the “off” position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system. *[Eff 04/01/2007]*

9.9.4 Electrical circuit diagrams of the accelerator and the associated safety interlock systems shall be kept current and maintained for inspection by the Department and shall be available to the operator at each accelerator facility. *[Eff 04/01/2007]*

9.9.5 If, for any reason, it is necessary to intentionally bypass a safety interlock or interlocks, such action

shall be: *[Eff 04/01/2007]*

9.9.5.1 Authorized by the Radiation Safety Officer; *[Eff 04/01/2007]*

9.9.5.2 Recorded in a permanent log and a notice posted at the accelerator control console; and *[Eff 04/01/2007]*

9.9.5.3 Terminated as soon as possible. *[Eff 04/01/2007]*

9.9.6 Safety Instructions. *[Eff 04/01/2007]*

9.9.6.1 A copy of the current operating and the emergency procedures shall be maintained at the accelerator control panel. These instructions shall inform the operator of: *[Eff 04/01/2007]*

(1) The procedure to be followed if the operator is unable to turn the accelerator off with controls at the control panel or any other abnormal operation occurs; and *[Eff 04/01/2007]*

(2) The names and telephone numbers of the authorized users and Radiation Safety Officer to be immediately contacted if the accelerator or console operates abnormally; and *[Eff 04/01/2007]*

9.9.6.2 A registrant shall provide instruction in the topics identified in 9.9.6.1 to each individual who operates an accelerator and shall provide appropriate refresher training to each individual operator at intervals not to exceed one year. *[Eff 04/01/2007]*

9.9.6.3 A registrant shall maintain a record of each individual receiving instructions required by 9.9.6.2, a description of the instruction, the date of instruction, and the name of the individual who gave the instruction for three (3) years. *[Eff 04/01/2007]*

9.10 Radiation Monitoring Requirements.

9.10.1 There shall be available at each particle accelerator facility appropriate portable monitoring equipment which is operable and has been appropriately calibrated for the radiations being produced at the facility. Such equipment shall be tested for proper functioning prior to each day of accelerator operation and calibrated at intervals not to exceed one year and after each servicing and repair. *[Eff 04/01/2007]*

9.10.2 A radiation protection survey shall be performed and documented by a qualified expert, acceptable to the Department, when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas. *[Eff 04/01/2007]*

9.10.2.1 A registrant shall maintain a record of the radiation measurements made following installation of the accelerator for the duration of the registration and when subsequent changes occur that could potentially affect the radiation levels in adjacent areas. *[Eff 04/01/2007]*

9.10.2.2 The record required by 9.10.2.1 shall include: *[Eff 04/01/2007]*

(1) The date of the measurements; *[Eff 04/01/2007]*

(2) The manufacturer's name, model number and serial number of the accelerator; *[Eff 04/01/2007]*

(3) A description of the accelerator configuration including whether there were any test objects in the accelerator beam; *[Eff 04/01/2007]*

(4) The instrument used to measure radiation levels; *[Eff 04/01/2007]*

(5) A plan of the areas surrounding the accelerator that were surveyed; *[Eff 04/01/2007]*

(6) The measured dose rate at several points in each area expressed in microsievert (millirem) per hour; *[Eff 04/01/2007]*

(7) The calculated maximum level of radiation over a period of one week for each restricted and unrestricted area; and *[Eff 04/01/2007]*

(8) The signature of the Radiation Safety Officer. *[Eff 04/01/2007]*

9.10.3 The radiation levels in all high radiation areas not in the exposure room shall be continuously monitored. The monitoring devices shall be electrically independent of the accelerator control and safety interlock systems and capable of providing a readout at the control panel. *[Eff 04/01/2007]*

9.10.4 All area monitors shall be calibrated at intervals not to exceed one year and after each servicing and repair. *[Eff 04/01/2007]*

9.10.5 Whenever applicable, periodic surveys shall be made to determine the amount of airborne particulate radioactivity present. *[Eff 04/01/2007]*

9.10.6 All surveys shall be made in accordance with the written procedures established by a qualified expert, registered with the Department, or the Radiation Safety Officer. *[Eff 04/01/2007]*

9.10.7 Records of all radiation protection surveys, calibrations, and instrumentation tests shall be maintained for three (3) years at the accelerator facility for inspection by the Department. *[Eff 04/01/2007]*

9.11 Ventilation Systems.

9.11.1 Ventilation systems shall be provided to ensure that personnel entering any area where airborne radioactivity may be produced will not be exposed to airborne radioactive material in excess of those limits specified in Part 4, Appendix 4B, Table 4B1. *[Eff 04/01/2007]*

9.11.2 A registrant shall not vent, release, or otherwise discharge airborne radioactive material to an unrestricted area which exceeds the limits specified in Part 4, Appendix 4B, Table 4B2, except as authorized pursuant to 4.33. For purposes of 9.11.1, concentrations may be averaged over a period not greater than one year. Every effort should be made to maintain releases of radioactive material to unrestricted areas as far below these limits as is reasonably achievable. *[Eff 04/01/2007]*

PART 10: NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS: INSPECTIONS

NOTICES, INSTRUCTIONS, AND REPORTS TO WORKERS: INSPECTIONS

10.1 Purpose and Scope.

10.1.1 Authority.

Rules and regulations set forth herein are adopted pursuant to the provisions of Sections 25-1-

108, 25-1.5-101(1)(k) and (1)(l), and 25-11-104, and 24-60-2205, CRS.

10.1.2 Basis and Purpose.

A statement of basis and purpose of these regulations is incorporated as part of these regulations; a copy may be obtained from the Department.

10.1.3 Scope.

This part establishes requirements for notices, instructions, and reports by licensees or registrants to individuals engaged in activities under a license or registration and options available to such individuals in connection with Department inspections of licensees or registrants to ascertain compliance with the provisions of the Act and regulations, orders, and licenses issued thereunder regarding radiological working conditions.

10.1.4 Applicability

The regulations in this part apply to all persons who receive, possess, use, own, transfer or dispose sources of radiation registered with or licensed by the Department pursuant to Part 2 and/or Part 3 of these regulations.

General Regulatory Provisions and Specific Requirements

10.2 Posting of Notices to Workers.

10.2.1 Each licensee or registrant shall post current copies of the following documents:

10.2.1.1 The regulations in this part and in Part 4 of these regulations;

10.2.1.2 The license, certificate of registration, conditions, or documents incorporated into the license by reference and amendments thereto;

10.2.1.3 The operating procedures applicable to activities under the license or registration; and

10.2.1.4 Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to Part 1 of these regulations, and any response from the licensee or registrant.

10.2.2 If posting of a document specified in 10.2.1.1, 10.2.1.2, or 10.2.1.3 is not practicable, the licensee or registrant may post a notice which describes the document and states where it may be examined.

10.2.3 Department Form R-15 *Notice to Employees* shall be posted by each licensee or registrant as required by these regulations.

10.2.4 Department documents posted pursuant to 10.2.1.4 shall be posted within 5 working days after receipt of the documents from the Department; the licensee's or registrant's response, if any, shall be posted within 5 working days after dispatch from the licensee or registrant. Such documents shall remain posted for a minimum of 5 working days or until action correcting the violation has been completed, whichever is later.

10.2.5 Documents, notices, or forms posted pursuant to 10.2 shall appear in a sufficient number of places to permit individuals engaged in work under the license or registration to observe them on the way to or from any particular work location to which the document applies, shall be conspicuous, and shall be replaced if defaced or altered.

10.3 Instructions to Workers.

10.3.1 All individuals who in the course of employment are likely to receive in a year an occupational dose (see also 10.3.2) in excess of 1 millisievert (100 mrem) shall be:

10.3.1.1 Kept informed of the storage, transfer, or use of sources of radiation;

10.3.1.2 Instructed in the health protection problems associated with exposure to radiation and/or radioactive material to the individual and potential offspring, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed;

10.3.1.3 Instructed in, and required to observe, to the extent within the worker's control, the applicable provisions of these regulations and licenses for the protection of personnel from exposures to radiation or radioactive material;

10.3.1.4 Instructed of their responsibility to report promptly to the licensee or registrant any condition which may constitute, lead to, or cause a violation of the Act, these regulations, and licenses or registrations, or unnecessary exposure to radiation and/or radioactive material;

10.3.1.5 Instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation and/or radioactive material; and

10.3.1.6 Advised as to the radiation exposure reports which workers shall be furnished pursuant to 10.4.

10.3.2 In determining those individuals subject to the requirements of 10.3.1, licensees and registrants must take into consideration:

10.3.2.1 Assigned activities during normal and abnormal situations involving exposure to radiation and/or radioactive material which can reasonably be expected to occur during the life of a licensed or registered facility; and

10.3.2.2 The result of instruction for maintaining exposures ALARA pursuant to 4.5.2.

10.3.3 The extent of these instructions shall be commensurate with potential radiological health protection problems present in the work place.

10.4 Notification and Reports to Individuals.

10.4.1 Radiation exposure data for an individual and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual shall be reported to the individual as specified in 10.4. The information reported shall include data and results obtained pursuant to these regulations, orders, or license or registration conditions, as shown in records maintained by the licensee or registrant pursuant to 4.46 of these regulations. Each notification and report shall:

10.4.1.1 Be in writing;

10.4.1.2 Include appropriate identifying data such as the name of the licensee or registrant, the name of the individual, and the individual's identification number, preferably social security number;

10.4.1.3 Include the individual's exposure information; and

10.4.1.4 Contain the following statement:

> "This report is furnished to you under the provisions of Colorado Rules and Regulations Pertaining to Radiation Control, Part 10. You should preserve this report for further reference."

10.4.2 Each licensee or registrant shall advise each worker annually of the worker's dose as shown in records maintained by the licensee or registrant pursuant to 4.46 of these regulations.

10.4.3 Each licensee or registrant shall furnish a report of the worker's exposure to sources of radiation at the request of a worker formerly engaged in activities controlled by the licensee or registrant. The report shall include the dose record for each year the worker was required to be monitored pursuant to 4.18 of these regulations. Such report shall be furnished within 30 days from the date of the request or within 30 days after the dose of the individual has been determined by the licensee or registrant, whichever is later. The report shall cover the period of time the worker's activities involved exposure to sources of radiation and shall include the dates and locations of work under the license or registration in which the worker participated.

10.4.4 When a licensee or registrant is required pursuant to 4.53 of these regulations to report to the Department any exposure of an individual to sources of radiation, the licensee or the registrant shall also provide the individual a report on the exposure data included therein. Such reports shall be transmitted at a time not later than the transmittal to the Department.

10.4.5 At the request of a worker who is terminating employment with the licensee or registrant in work involving exposure to radiation or radioactive material during the current year, each licensee or registrant shall provide at termination to each such worker, or to the worker's designee, a written report regarding the radiation dose received by that worker from operations of the licensee or registrant during the current year. If the most recent individual monitoring results are not available at that time, a written estimate of the dose shall be provided together with a clear indication that this is an estimate.

10.5 Presence of Representatives of Licensees or Registrants and Workers During Inspections.

10.5.1 Each licensee or registrant shall afford to the Department at all reasonable times opportunity to inspect materials, machines, activities, facilities, premises, and records pursuant to these regulations.

10.5.2 During an inspection, Department inspectors may consult privately with workers as specified in 10.6. The licensee or registrant may accompany Department inspectors during other phases of an inspection.

10.5.3 If, at the time of inspection, an individual has been authorized by the workers to represent them during Department inspections, the licensee or registrant shall notify the inspectors of such authorization and shall give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions.

10.5.4 Each workers' representative shall be routinely engaged in work under control of the licensee or registrant and shall have received instructions as specified in 10.3.

10.5.5 Different representatives of licensees or registrants and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one workers' representative at a time may accompany the inspectors.

10.5.6 With the approval of the licensee or registrant and the workers' representative, an individual who is not routinely engaged in work under control of the licensee or registrant, for example, a

consultant to the licensee or registrant or to the workers' representative, shall be afforded the opportunity to accompany Department inspectors during the inspection of physical working conditions.

10.5.7 Notwithstanding the other provisions of 10.5, Department inspectors are authorized to refuse to permit accompaniment by any individual who deliberately interferes with a fair and orderly inspection. With regard to any area containing proprietary information, the workers' representative for that area shall be an individual previously authorized by the licensee or registrant to enter that area.

10.6 Consultation with Workers During Inspections.

10.6.1 Department inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of these regulations and licenses or registrations to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection.

10.6.2 During the course of an inspection, any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which the worker has reason to believe may have contributed to or cause any violation of the Act, these regulations, or license or registration condition, or any unnecessary exposure of an individual to sources of radiation under the licensee's or registrant's control. Any such notice in writing shall comply with the requirements of 10.7.1.

10.6.3 The provisions of 10.6.2 shall not be interpreted as authorization to disregard instructions pursuant to 10.3.

10.7 Requests by Workers for Inspections.

10.7.1 Any worker or representative of workers believing that a violation of the Act, these regulations, or license or registration conditions exists or has occurred in work under a license or registration with regard to radiological working conditions in which the worker is engaged may request an inspection by giving notice of the alleged violation to the Department. Any such complaint shall be in writing, shall set forth the specific grounds for the notice, and shall be signed by the worker or representative of the workers. A copy shall be provided to the licensee or registrant by the Department no later than at the time of inspection except that, upon the request of the worker giving such notice, such worker's name and the name of individuals referred to therein shall not appear in such copy or on any record published, released, or made available by the Department except for good cause shown.

10.7.2 If, upon receipt of such notice, the Department determines that the complaint meets the requirements set forth in 10.7.1, and that there are reasonable grounds to believe that the alleged violation exists or has occurred, an inspection shall be made as soon as practicable to determine if such alleged violation exists or has occurred. Inspection pursuant to 10.7 need not be limited to matters referred to in the complaint.

10.7.3 No licensee, registrant, or contractor or subcontractor of a licensee or registrant shall discharge or in any manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under these regulations or has testified, or is about to testify in any such proceeding, or because of the exercise by such worker on behalf of such worker or others of any option afforded by this part.

10.8 Inspections Not Warranted; Informal Review.

10.8.1 If the Department determines, with respect to a complaint under 10.7, that an inspection is not

warranted because there are no reasonable grounds to believe that a violation exists or has occurred, the Department shall notify the complainant in writing of such determination. The complainant may obtain review of such determination by submitting a written statement of position with the Department. The Department will provide the licensee or registrant with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant and the name of individuals referred to therein. The licensee or registrant may submit an opposing written statement of position with the Department. The Department will provide the complainant with a copy of such statement by certified mail.

10.8.1.1 Upon the request of the complainant, the Department may hold an informal conference in which the complainant and the licensee or registrant may each orally present its views. An informal conference may also be held at the request of the licensee or registrant, but disclosure of the identity of the complainant or individuals referred to in the complaint will be made only following receipt of written authorization from the complainant.

10.8.1.2 After considering all written and oral views presented, the Department shall affirm, modify, or reverse the determination and furnish the complainant and the licensee or registrant a written notification of the decision and the reason therefor.

10.8.2 If the Department determines that an inspection is not warranted because the requirements of 10.7.1 have not been met, the complainant shall be notified in writing of such determination. Such determination shall be without prejudice to the filing of a new complaint meeting the requirements of 10.7.1.