TITLE 180 CONTROL OF RADIATION

CHAPTER 9 RADIATION SAFETY REQUIREMENTS FOR NON HUMAN USE PARTICLE ACCELERATORS

001. SCOPE AND AUTHORITY. This chapter establishes procedures for the registration and use of particle accelerators for nonhuman use. Title 180 is authorized by and implement the Nebraska Radiation Control Act, Nebraska Revised Statute (Neb. Rev. Stat.) §§ 71-3501 to 71-3520. In addition to the requirements of this chapter, all registrants are subject to the requirements of 180 Nebraska Administrative Code (NAC) 1, 2, 4, 10, 15, and 18. Registrants whose operations result in the production of radioactive material must also meet the requirements of 180 NAC 3.

002. REGISTRATION REQUIREMENTS. Any person intending to receive, possess, use, transfer, own, or acquire a particle accelerator must have a registration which permits that activity.

003. GENERAL REQUIREMENTS. In addition to the requirements of 180 NAC 2 a registrant must:

(A) Appoint a radiation safety officer;
(B) Establish a radiation safety committee to approve, in advance, proposals for use of a particle accelerator. The radiation safety committee, consisting of at least three members, must oversee the use of the particle accelerator, and review the registrant's radiation safety program. Membership of the committee must include at least an authorized user, a representative of the registrant's management, and the Radiation Safety Officer;
(C) Have proposed or existing equipment, facilities, and operating and emergency procedures adequate to protect health and minimize danger to public health and safety or property as required by 180 NAC 9-004 through 009;
(D) Be qualified by training and experience to use the accelerator in question for the purpose requested as specified in this chapter, 180 NAC 4, and 180 NAC 10 in a manner as to minimize danger to public health and safety or property;
(E) Ensure operation of the particle accelerator will not be harmful to the health and safety of the public; and
(F) Ensure that the applicant, or the applicant's staff, or both, has training and experience in the use of particle accelerators as specified in 180 NAC 15-010.

004. OPERATOR QUALIFICATIONS. A person intending to operate an accelerator must meet the training requirements of 180 NAC 15-010.

005. OPERATING REQUIREMENTS. This section addresses requirements for operation of particle accelerators.

005.01 OPERATOR REQUIREMENTS. No registrant may permit any individual to act as an operator of a particle accelerator until the individual has:

(A) Been instructed in and demonstrated an understanding of radiation safety;

(B) Received copies of, instruction in, and demonstrated an understanding of the requirements of this chapter and the applicable requirements of 180 NAC 4 and 180 NAC 10, pertinent registration conditions, and the registrant's operating and emergency procedures; and

(C) Demonstrated competence to use the particle accelerator, related equipment, and survey instruments which will be used.

005.02 RADIATION SAFETY COMMITTEE. The radiation safety committee or the radiation safety officer must have the authority to terminate the operations at a particle accelerator facility if the action is necessary to minimize danger to public health and safety or property.

006. SHIELDING AND SAFETY DESIGN REQUIREMENTS. Particle accelerator facilities must meet shielding and design requirements as specified below.

006.01 DESIGN AND SURVEY. A radiological health physicist as specified in 180 NAC 15-004.02 must be consulted in the design of a particle accelerator installation and must perform a radiation survey when the accelerator is first capable of producing radiation. A copy of the survey results must be available to the Department for review.

006.02 PRIMARY AND SECONDARY BARRIERS. Each particle accelerator installation must be provided with primary and secondary barriers as are necessary to be in compliance with 180 NAC 4-005 and 013.

007. PARTICLE ACCELERATOR CONTROLS AND INTERLOCK SYSTEMS. Particle accelerator control and interlocks must meet the following requirements.

007.01 CONTROL CONSOLE. Instrumentation, readouts and controls on the particle accelerator control console must be clearly identified and easily discernible.

007.02 ENTRANCE. Each entrance into a target room or other high radiation area must be provided with a safety interlock(s) that shuts down the machine under conditions of barrier penetration.

007.03 MANUAL RESET. When a safety interlock system has been tripped, it must only be possible to resume operation of the accelerator by manually resetting controls at the position where the safety interlock has been tripped, and lastly at the main control console.

007.04 INDEPENDENT CIRCUIT. Each safety interlock must be on a circuit which must allow its operation independently of all other safety interlocks.

007.05 DESIGN. All safety interlocks must be designed so that any defect or component failure in the safety interlock system prevents operation of the accelerator.

007.06 CUTOFF SWITCH. A scram button or other emergency power cutoff switch must be located and easily identifiable in all high radiation areas. The cutoff switch must include a manual reset so that the accelerator cannot be restarted from the accelerator control console without resetting the cutoff switch.

008. WARNING DEVICES. Particle accelerators must be equipped with warning devices as required below.

008.01 LOCATION. Each location designated as a high radiation area, and each entrance to that location, must be equipped with easily observable warning lights that operate when, and only when, radiation is being produced.

008.02 AUDIBLE WARNING DEVICE. Each high radiation area must have an audible warning device which must be activated for 15 seconds prior to the possible creation of a high radiation area. The warning device must be clearly discernible in all high radiation areas and all radiation areas.

008.03 BARRIERS. Barriers, temporary or otherwise, and pathways leading to high radiation areas must be identified as required by 180 NAC 4-033.

009. SAFETY SYSTEMS. The safety systems described below must be in place.

009.01 UNAUTHORIZED USE. When not in operation, a particle accelerator must be secured to prevent unauthorized use.

009.02 SAFETY INTERLOCK SYSTEM. The safety interlock system must not be used to turn off the accelerator beam except in an emergency.

009.03 SAFETY AND WARNING DEVICES. All safety and warning devices, including interlocks, must be checked for proper operation at intervals not to exceed six months. Results of these checks must be maintained at the accelerator facility for inspection by the Department.

009.04 ELECTRICAL CIRCUIT DIAGRAMS. Electrical circuit diagrams of the accelerator and the associated interlock system must be kept current and maintained for inspection by the Department and must be available to the operator at each accelerator facility.

009.05 SAFETY INTERLOCK BYPASS. If it is necessary to intentionally bypass a safety interlock, the action must be:

(A) Authorized by the radiation safety committee, radiation safety officer, or both;
(B) Recorded in a permanent log and a notice posted at the accelerator control console, and;
(C) Terminated as soon as possible.

009.06 OPERATING AND EMERGENCY PROCEDURES. A copy of the current operating and emergency procedures must be maintained at the accelerator control panel.

010. RADIATION MONITORING REQUIREMENTS. Radiation must be monitored as described below.

010.01 MONITORING EQUIPMENT. There must be available at each particle accelerator facility appropriate portable monitoring equipment that is operable and has been appropriately calibrated for the radiation being produced at the facility. The equipment must be tested for proper operation daily and calibrated at intervals not to exceed one year and after each servicing and repair.

010.02 RADIATION PROTECTION SURVEY. A radiation protection survey must be performed and documented by a radiological health physicist as set out in 180 NAC 15-004.02 when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.

010.03 RADIATION LEVELS. Radiation levels in all high radiation areas must be continuously monitored. The monitoring devices must be electronically independent of the accelerator control and safety interlock systems and capable of providing a readout at the control panel.

010.04 AREA MONITORS. All area monitors must be calibrated at intervals not to exceed one year and after each servicing and repair.

010.05 PERIODIC AIR SURVEYS. Whenever applicable, periodic surveys must be made to determine the amount of airborne particulate radioactivity present.

010.06 PERIODIC SMEAR SURVEYS. Whenever applicable, periodic smear surveys must be made to determine the degree of contamination.

010.07 WRITTEN PROCEDURES FOR SURVEYS. All surveys must be made following the written procedures established by a radiological health physicist as set out in 15-004.02 or by the radiation safety officer.

010.08 RECORDS. Records of all radiation protection surveys, calibration and instrumentation tests must be maintained at the accelerator facility for inspection by the Department.

011. VENTILATION SYSTEMS. Ventilation systems must control airborne radioactive material.

011.01 AIRBORNE RADIOACTIVE MATERIAL. Ventilation systems must 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 the limits specified in 180 NAC 4, Appendix 4-B, Table I.

011.02 RELEASES. A registrant, as required by 180 NAC 4-014, must not vent, release or otherwise discharge airborne radioactive material to an unrestricted area which exceed the limits specified in 180 NAC 4, Appendix 4-B, Table II, except as authorized in 180 NAC 4-014 or 040. For purposes of 180 NAC 9-011, concentrations may be averaged over a period of not greater than one year. Every reasonable effort should be made to maintain releases of radioactive material to unrestricted areas as far below these limits as is reasonably achievable.