CHAPTER 33.1-10-09
RADIATION SAFETY REQUIREMENTS FOR PARTICLE ACCELERATORS

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33.1-10-09-01. Purpose and scope.

1. This chapter establishes procedures for the registration and the use of particle accelerators.

2. In addition to the requirements of this chapter, all registrants are subject to the requirements of chapters 33.1-10-01, 33.1-10-02, 33.1-10-04.2, and 33.1-10-10.1. Registrants engaged in industrial radiographic operations are subject to the requirements of chapter 33.1-10-05.1 and registrants engaged in the healing arts are subject to the requirements of chapter 33.1-10-06 or 33.1-10-07.2, or both. Registrants whose operations result in the production of radioactive material are subject to the requirements of chapter 33.1-10-03.1.

History: Effective January 1, 2019.
General Authority: NDCC 23.1-03-04; S.L. 2017, ch. 199, § 1
Law Implemented: NDCC 23.1-03-03, 23.1-03-04; S.L. 2017, ch. 199, § 18

33.1-10-09-02. Registration procedure.

1. **Registration requirements.** No person shall receive, possess, use, transfer, own, or acquire a particle accelerator except as authorized in a registration issued pursuant to chapter 33.1-10-02.

2. **General requirements for the issuance of a registration for particle accelerators.** (Refer to chapter 33.1-10-02.) In addition to the requirements of chapter 33.1-10-02, a registration application for use of a particle accelerator will be approved only if the department determines all of the following:

   a. The applicant is qualified by reason of training and experience to use the accelerator in question for the purpose requested in accordance with this chapter and chapters 33.1-10-04.2 and 33.1-10-10.1 in such a manner as to minimize danger to public health and safety or property.

   b. The applicant's proposed or existing equipment, facilities, operating, and emergency procedures are adequate to protect health and minimize danger to public health and safety or property.

   c. 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 subsection 3.

   d. The applicant has appointed a radiation safety officer.

   e. The applicant or the applicant's staff has substantial experience in the use of particle accelerators and training sufficient for application to its intended uses.

   f. The applicant has established a radiation safety committee to approve, in advance, proposals for uses of particle accelerators, whenever deemed necessary by the department.

   g. The applicant has an adequate training program for particle accelerator operators.

3. **Human use of particle accelerators.** In addition to the requirements set forth in chapter 33.1-10-02, a registration for use of a particle accelerator in the healing arts will be issued only if all of the following are met:

   a. Whenever deemed necessary by the department, the applicant has appointed a medical committee of at least three members to evaluate all proposals for research, diagnostic, and therapeutic use of a particle accelerator. Membership of the committee should include physicians expert in internal medicine, hematology, therapeutic radiology, and a person experienced in depth dose calculations and protection against radiation.

   b. The individuals designated on the application as the users have substantial training and experience in deep therapy techniques or in the use of particle accelerators to treat humans.

   c. The individual designated on the application as the user must be a physician.

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33.1-10-09-03. Radiation safety requirements for the use of particle accelerators.

1. **General requirements.**

   a. This section establishes radiation safety requirements for the use of particle accelerators. The requirements of this section are in addition to, and not in substitution for, other applicable requirements of the chapter.

   b. The registrant shall be responsible for assuring that all requirements of this chapter are met.

2. **Limitations.**

   a. No registrant shall permit any individual to act as an operator of a particle accelerator until such individual has:

      (1) Been instructed in radiation safety and shall have demonstrated an understanding thereof.

      (2) Received copies of and instruction in this chapter and the applicable requirements of chapters 33.1-10-04.2 and 33.1-10-10.1, pertinent registration conditions and the registrant's operating and emergency procedures, and shall have demonstrated understanding thereof.

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

   b. The radiation safety committee or the radiation safety officer shall have the authority to terminate the operations at a particle accelerator facility if such action is deemed necessary to protect health and minimize danger to public health and safety or property.

3. **Shielding and safety design requirements.**

   a. A qualified expert, specifically approved by 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.

b. Each particle accelerator installation shall be provided with such primary or secondary barriers as are necessary to assure compliance with chapter 33.1-10-04.2.

4. **Particle accelerator controls and interlock systems.**

a. Instrumentation, readouts, and controls on the particle accelerator control console shall be clearly identified and easily discernible.

b. 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.

c. Each safety interlock shall be on a circuit which shall allow its operation independently of all other safety interlocks.

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

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

f. 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.

5. **Warning devices.**

a. All locations designated as high radiation areas, and entrances to such locations, shall be equipped with easily observable warning lights that operate when, and only when, radiation is being produced.

b. Except in facilities designed for human exposure, each high radiation area shall have an audible warning device which shall be activated for fifteen seconds prior to the possible creation of such high radiation area. Such warning device shall be clearly discernible in all high radiation areas and all areas immediately adjacent to the high radiation areas.

c. Barriers, temporary or otherwise, and pathways leading to high radiation areas shall be posted in accordance with chapter 33.1-10-04.2.

6. **Operating procedures.**

a. Particle accelerators, when not in operation, shall be secured to prevent unauthorized use.

b. The safety interlock system shall not be used to turn off the accelerator beam except in an emergency.

c. All safety and warning devices, including interlocks, shall be checked for proper operability at intervals not to exceed three months. Results of such tests shall be maintained at the accelerator facility for inspection by the department.

d. Electrical circuit diagrams of the accelerator and the associated interlock systems shall be kept current and maintained for inspection by the department and shall be available to the operator at each accelerator facility.

e. If, for any reason, it is necessary to intentionally bypass a safety interlock or interlocks, such action shall be:

(1) Authorized by the radiation safety committee or radiation safety officer.

(2) Recorded in a permanent log and a notice posted at the accelerator control console.

(3) Terminated as soon as possible.

f. A copy of the current operating and the emergency procedures shall be maintained at the accelerator control panel.

7. **Radiation monitoring requirements.**

a. 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 operation daily and calibrated at intervals not to exceed one year, and after each servicing and repair.

b. A radiation protection survey shall be performed and documented by a qualified expert, specifically approved by the department, when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.

c. Radiation levels in all high radiation areas 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.

d. All area monitors shall be calibrated at intervals not to exceed one year and after each servicing and repair.

e. Whenever applicable, periodic surveys shall be made to determine the amount of airborne particulate radioactivity present.

f. Whenever applicable, periodic wipe test surveys shall be made to determine the degree of contamination.

g. All surveys shall be made in accordance with the written procedures established by a qualified expert, specifically approved by the department, or the radiation safety officer of the particle accelerator facility.

h. Records of all radiation protection surveys, calibration results, instrumentation tests and wipe test results must be maintained at the accelerator facility for inspection by the department.

8. **Ventilation systems.**

a. Means 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 chapter 33.1-10-04.2, appendix B.

b. A registrant, as required by chapter 33.1-10-04.2, shall not vent, release, or otherwise discharge airborne radioactive material to an unrestricted area which exceeds the limits specified in chapter 33.1-10-04.2, appendix B, table II, except as authorized pursuant to chapter 33.1-10-04.2. For purposes of this subdivision, concentrations may be averaged over a period 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.

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