

**641—42.19(136C) Radiation safety requirements for the use of particle accelerators for nonhuman use.**

1. This rule establishes procedures for the registration or licensing and the use of particle accelerators.
2. Unless specifically required otherwise, all registrants or licensees performing operations with a particle accelerator are subject to the requirements of 641—Chapters 38 through 40.

**42.19(1) *Registration or license requirements.*** No person shall receive, possess, use, transfer, own, or acquire a particle accelerator, except as authorized in a registration or license issued by the department and unless the following requirements are met:

- a. Each accelerator shall be registered in accordance with the requirements of 641—subrule 37.8(2).
- b. Accelerator facilities whose operations result in nuclear transformations that produce, or are likely to produce, radioactive material more than the exempt quantities and concentrations listed in Appendices D and E of 641—Chapter 39 are authorized by the issuance of a radioactive material license. Accelerator facilities that produce or are likely to produce radioactive material less than the exempt quantities and concentrations shall be authorized by registration.
- c. For accelerator facilities required to be licensed, those operations that would require personnel monitoring due to the presence of radioactive material shall be performed only by a specific licensee. Such operations would normally include installation, testing and maintenance, and routine operations.

**42.19(2) *General requirements for the issuance of a registration or license for particle accelerators.*** Along with the requirements of this chapter, an application for use of a particle accelerator will be approved only if the department determines all of the following:

- a. The applicant is qualified to use the accelerator in question for the purpose requested and in such a manner as to minimize danger to public health and safety or property;
- b. 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;
- c. The issuance of the registration or license will not be detrimental to the health and safety of the public;
- d. The applicant satisfies any applicable requirements set forth in this chapter;
- e. The applicant has appointed a radiation safety officer responsible for the day-to-day operation of the radiation safety program;
- f. The applicant and the applicant's staff have experience in the use of particle accelerators and training sufficient for application to its intended uses;
- g. The applicant has an adequate training program for operators of particle accelerators.

**42.19(3) *Personnel monitoring.*** In addition to the requirements of 641—subrule 40.4(13), personnel monitoring shall be provided to and used by all individuals entering any area for which interlocks are required unless a survey of the area has determined that radiation levels are below that of a high radiation area and at least one of the following conditions is met:

- a. Power to an accelerator cannot be activated; or
- b. An accelerated beam cannot be directed to the area.

**42.19(4) *Operations.***

a. No registrant shall permit any individual to act as an operator of a particle accelerator until all of the following conditions have been met:

- (1) The individual has been instructed in radiation safety and has demonstrated an understanding of that instruction;
  - (2) The individual has received copies of, and instruction in, this rule, the applicable requirements of the pertinent registration, and the registrant's operating and emergency procedures and has demonstrated understanding of that instruction;
  - (3) The individual has demonstrated competence to use the particle accelerator, related equipment, and survey instruments that will be employed.
- b. The radiation safety officer or radiation safety committee, if applicable, shall have the authority to terminate the operations at a particle accelerator facility if such action is deemed necessary to minimize danger to public health and safety or property.

c. Along with the audit required in 641—paragraph 37.11(2)“c,” each operator’s performance during an actual accelerator operation shall be audited by the radiation safety officer or designee at intervals not to exceed six months.

(1) If an operator has not participated in an accelerator operation for more than six months since the last audit, the individual’s performance shall be observed and recorded at the first opportunity the individual participates in an accelerator operation.

(2) Records of the audits shall be maintained by the registrant and made available for inspection by the department for three years from the date of the audit.

d. Operators of particle accelerators used for industrial radiography shall meet the requirements of subrule 42.19(2).

**42.19(5) *Shielding and safety design requirements.*** A department-qualified expert shall be consulted in the design of a particle accelerator installation and shall perform a radiation survey when the accelerator is first capable of producing radiation.

a. Each particle accelerator installation shall be provided with the primary and secondary barriers necessary to ensure compliance with 641—subrules 37.11(3) and 37.11(11).

b. In addition to the requirements of this chapter, shielded facilities or self-shielded particle accelerators shall meet all of the following requirements:

(1) Authorization, through issuance of a construction permit, shall be granted following review of the initial application, including the shielding design, physical plant and site specifications, and the applicant’s proposed equipment, uses, and workloads;

(2) For a shielded facility, the applicant shall submit an evaluation of the shielding design completed by a qualified expert. For a self-shielded particle accelerator, submission of an evaluation of a shielding design is not required if an evaluation has been performed by an appropriate regulatory authority. In such cases, the applicant may reference that evaluation. A copy of any shielding design evaluation shall be maintained by the applicant and made available to the department upon request;

(3) Authorization for installation and testing of an accelerator shall be given only after a determination of adequacy of testing protocols, testing safety procedures, staff training, and radiation detection instrumentation has been made;

(4) Operational use of an accelerator shall be authorized only after the department determines that all criteria specified in subrule 42.19(2) have been met.

**42.19(6) *Particle accelerator controls and interlock systems.*** Instrumentation, readouts, and controls on the particle accelerator control console shall be clearly identified, easily discernible, and located outside the high radiation area.

a. Each entrance into a target area or other high radiation area shall be provided with two safety interlocks that shut down the machine when the barrier is breached.

b. Each safety interlock shall be on a circuit that allows it to operate independently of all other safety interlocks.

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

d. 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 safety interlock has been tripped and, subsequently, at the main control console.

e. 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.

**42.19(7) *Warning devices.*** Each location designated as a high radiation area, and each entrance to such location, shall be equipped with easily observable warning lights that operate only when radiation is being produced.

a. Each high radiation area shall have an audible warning device that shall be activated for 15 seconds prior to the possible creation of high radiation in the area. Such warning device shall be clearly discernible in all high radiation areas.

b. Barriers, temporary or otherwise, and pathways leading to high radiation areas shall be posted in accordance with 641—subrule 37.11(20).

**42.19(8) *Operating and emergency 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 operation at intervals not to exceed three months. Records of such tests shall be maintained at the accelerator facility and made available for inspection by the department for three years.

d. All incidents in which the interlock system fails to operate properly or where the operation is terminated by the interlock system shall be investigated and reported to the radiation safety officer or the radiation safety committee, if applicable. Documentation shall be maintained and made available for inspection by the department for three years.

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 officer and the radiation safety committee, if applicable;
- (2) Recorded in a permanent log and a notice posted at the accelerator control console; and
- (3) Terminated as soon as possible.

f. The registrant's operating and emergency procedures shall include all of the following:

- (1) Operation and safety instructions on the accelerator(s) to be used;
- (2) Methods for controlling access to restricted areas;
- (3) Methods and occasions for locking and securing sources of radiation;
- (4) Use of personnel monitoring equipment;
- (5) The procedure for notifying proper personnel in the event of an accident;
- (6) Maintenance of records;
- (7) Inspections and maintenance of the accelerator;
- (8) Steps to be taken in the case of an emergency.

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

**42.19(9) *Radiation monitoring requirements.*** A radiation protection survey shall be performed and documented by a qualified expert when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.

a. Accelerator facilities shall survey with a radiation detection instrument at intervals not to exceed every 12 months. Records of this survey shall be maintained and made available for inspection by the department for three years.

b. Accelerator facilities registered or licensed pursuant to this chapter shall survey for removable contamination at intervals not to exceed six months.

c. Each time removable shields on self-shielded particle accelerators are opened, a visual survey of the shielding must be performed to observe physical damage.

(1) In addition, when these shields are returned to the closed position, a physical radiation survey shall be conducted upon initial reactivating of the accelerator.

(2) Records of this survey shall be maintained and made available for inspection by the department review for three years.

d. Accelerator facilities registered or licensed pursuant to this chapter shall perform a survey with a radiation detection instrument and surveys for removable contamination before maintenance or servicing of its particle accelerator(s) or associated equipment located in the high radiation areas.

e. 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.

f. Upon installation, all area monitoring equipment shall be tested to ensure proper operation under operating conditions of the particle accelerator. All area monitors shall be calibrated at intervals not to exceed one year and after each servicing and repair.

g. Whenever applicable, accelerator facilities registered or licensed pursuant to this chapter shall perform surveys at intervals not to exceed six months to determine the amount of airborne particulate radioactivity present.

h. All surveys shall be made in accordance with the written procedures established by the radiation safety officer or a qualified expert.

i. Records of all radiation protection surveys, calibrations, and instrumentation tests shall be maintained at the accelerator facility for and made available for inspection by the department.

**42.19(10) Radiation safety officer (RSO).**

a. Each registrant shall appoint a radiation safety officer who meets the following requirements:

(1) Possesses a high school diploma or a certificate of high school equivalency based on the GED test;

(2) Documents at least two years of radiation protection experience.

b. The specific duties of the RSO include but are not limited to the following:

(1) Establishing, reviewing, and overseeing operating, emergency, and ALARA procedures to ensure that the procedures are current and are in compliance with these rules;

(2) Overseeing and approving all phases of the training program for accelerator operators to ensure appropriate and effective radiation protection practices are taught;

(3) Ensuring that required radiation surveys are performed and documented in accordance with these rules, including any corrective measures when levels of radiation exceed established limits;

(4) Ensuring that personnel monitoring devices are calibrated and used properly by occupationally exposed personnel, that records are kept of the monitoring results, and that timely notifications are made as required by rules 641—37.11(136C) and 641—37.14(136C);

(5) Ensuring that any required interlock switches and warning signals are functioning and that radiation signs, ropes, and barriers are properly posted and positioned;

(6) Investigating and reporting to the department each known or suspected case of radiation exposure to an individual or radiation level detected in excess of limits established by these rules; additionally, investigating and reporting each theft or loss of source(s) of radiation to determine the cause of such events and to take steps to prevent its recurrence;

(7) Ensuring that the licensee's radiation safety program is implemented in accordance with approved procedures, including adequate training and experience as required by this chapter.

(8) Assuming control and having the authority to institute corrective actions, including shutdown of operations when necessary, in emergency situations or unsafe conditions;

(9) Maintaining records as required by this chapter;

(10) Ensuring the proper storing, labeling, and use of the accelerator;

(11) Ensuring that proper inspection and maintenance programs are performed as required by this chapter;

(12) Ensuring that personnel are complying with these rules as well as the operating and emergency procedures.

[ARC 0182D, IAB 4/1/26, effective 7/1/26]