

3701:1-66-17 Industrial particle accelerator.

As used in this rule a particle accelerator means a group or system of components which produce particles that are used to determine or alter properties of materials being measured, modified or analyzed, and does not include industrial analytical equipment to which rule 3701:1-66-13 of the Administrative Code applies, such as but not limited to, electron microscopes, gauging units, x-ray diffraction and spectrometer devices, and does not apply to radiation-generating equipment that is used in health care for therapeutic applications. In addition to the applicable rules adopted pursuant to Chapter 3748. of the Revised Code and rules 3701:1-66-01 and 3701:1-66-04 of the Administrative Code, handlers of particle accelerators shall comply with the following:

- (A) Particle accelerators shall meet the following equipment standards:
- (1) A device or provision shall be provided to prevent the entry of workers into an area where high radiation is present and that causes the source of radiation to be shut off upon entry by workers into an area where high radiation is present.
 - (2) All safety instrumentation, readouts, and controls on the particle accelerator control console are clearly identified and easily discernible.
 - (3) Each safety interlock is on a circuit which allows it to operate independently of all other safety interlocks.
 - (4) All safety systems or interlocks shall be designed so that any defect or component failure in the safety interlock system prevents production of radiation by the accelerator.
 - (5) A safety interlock system shall be provided. When tripped, the safety interlock system shall only allow production of radiation by the particle accelerator to be resumed by manually resetting controls at the position where the safety interlock has been tripped, or at the control console if it is in clear view of the position where the safety interlock has been tripped.
 - (6) Each area where high radiation may be present has an audible and visual warning device which shall be activated for at least fifteen seconds prior to the possible creation of a high radiation area. Such warning devices shall be clearly discernible in all high radiation areas.
 - (7) Each particle accelerator shall bear a warning label on the control console which cautions individuals that radiation is produced when it is energized, and any other warning label required by rules adopted pursuant to chapter 3748. of the Revised Code.
- (B) For a particle accelerator installed after the effective date of this rule, handlers shall comply with the following structural shielding requirements:
- (1) Utilize an independent health physicist approved by the registrant, and who is not involved with daily operations, to perform required shielding audits and radiation surveys as follows:
 - (a) Perform and approve the design of the particle accelerator installation; and
 - (b) Perform a radiation survey when the particle accelerator is first capable of producing radiation.

- (2) Provide each industrial particle accelerator installation with such shielding as is necessary to assure compliance with the general radiation protection rules adopted pursuant to Chapter 3748. of the Revised Code.
- (C) Handlers of particle accelerators shall comply with the following radiation safety requirements:
- (1) The particle accelerator shall be secured when not in operation to prevent unauthorized use.
 - (2) The safety interlock system shall not be used to turn off the particle accelerator beam, except in an emergency or testing of the safety interlock system.
 - (3) Handlers shall provide a particle accelerator handbook that describes the electrical circuits and the associated interlock systems, and shall be kept current as to any changes in the system.
 - (4) A copy of the current operating and the emergency procedures shall be maintained at the particle accelerator control console.
 - (5) Handlers shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by general radiation protection rules adopted pursuant to Chapter 3748. of the Revised Code. Instrumentation required by this rule shall have a range such that two millirem per hour (0.02 millisievert) to one hundred millirem per hour (one millisievert) can be measured.
 - (6) Records of instrument calibrations required by this paragraph shall be maintained for three years after the calibration date and be available for inspection. Each radiation survey instrument shall be calibrated:
 - (a) For the type of radiation to be monitored;
 - (b) At intervals not to exceed twelve months and after each instrument servicing other than battery replacement;
 - (c) Such that accuracy within plus or minus twenty per cent can be demonstrated;
 - (d) At two points located approximately one third and two thirds of full-scale on each scale for linear scale instruments, or as described in the corresponding instrument manual;
 - (e) At midrange of each decade, and at two points of at least one decade for logarithmic scale instruments, or as described in the corresponding instrument manual; and
 - (f) At appropriate points for digital instruments.

- (7) The handler shall assure that each particle accelerator location is supplied the following:
 - (a) At least one operable survey instrument for every type of radiation produced by the particle accelerator incidental to or as a direct result of its operations;
 - (b) A whole body personnel monitor, such as a thermoluminescent dosimeter or film badge, assigned to each radiation worker; and
 - (c) Appropriate barriers, such as ropes and tapes and signs, around areas or equipment where radiation is above background levels but is not greater than two millirem (0.020 millisievert) per hour at the barrier.
- (D) Handlers of particle accelerators shall comply with the following quality assurance requirements:
 - (1) Each portable radiation survey instrument shall be checked once per day, when used. Operability of an instrument may be determined by ensuring that it is correctly energized.
 - (2) Any safety equipment described in paragraph (A) of this rule shall be checked for proper operation at the beginning of each day of use. In the event the safety equipment is operating improperly, it immediately shall be repaired or replaced and never bypassed so as to enable radiation production.
 - (3) A radiation protection survey shall be performed and documented by a health physicist approved by the registrant when changes such as permanent shielding, operation, equipment, or occupancy of adjacent areas have been made that could produce a greater radiation hazard than before.
 - (4) In a facility where there is a potential for nuclear activation, radiation levels in all high radiation areas shall be continuously monitored. The monitoring devices shall be electrically independent of the particle accelerator control and safety interlock systems and capable of providing a readout at the control console. If an individual is to enter the target area after the beam is shut off, the individual must monitor the area for residual radiation.
 - (5) No individual shall act as a particle accelerator operator unless that individual has received instruction in, and has demonstrated an understanding of:
 - (a) The subjects outlined in appendix A of this rule;
 - (b) The requirements of this rule and the applicable requirements of general radiation protection rules adopted pursuant to Chapter 3748. of the Revised Code; and
 - (c) The registrant's operating and emergency procedures for each particle accelerator.

- (6) No individual shall act as a particle accelerator operator until the registrant has documented that the individual has demonstrated competency in the use of the particle accelerator, related equipment, and radiation survey instruments that will be used to monitor the particle accelerator at that facility. The particle accelerator operator shall have immediate access to copies of the document required by paragraph (D)(5)(c) of this rule.

- (E) The director may, upon application thereof or upon his or her own initiative, grant a variance to the requirements of this rule as he or she determines is authorized by law, provided that the registrant shows to the satisfaction of the director that there is good cause for the variance, and that the variance will not result in any undue hazard or effect on the public health and safety or environment. The terms, conditions, and expiration of the variance shall be set forth in writing by the director. Failure to comply with the terms of the variance may result in immediate revocation of the variance.

Effective date: February 15, 2001

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Certified by:

/S/

Jodi Govern, Xecretary
Public Health Council

1-31-01

Date

Promulgated under: Chapter 119.

Rule authorized by: Section 3748.04

Rule amplifies: Sections 3748.01 to 3748.02, to 3748.04 to 3748.07, 3748.12 to 3748.15,
3748.17 to 3748.20, 3748.22 and 3748.99

Prior effective date:

To be enacted

Appendix A

- I. Fundamentals of radiation safety
 - A. Characteristics of radiation
 - B. Units of radiation dose
 - C. Significance of radiation dose
 - 1. Fundamentals of radiation dose
 - 2. Radiation protection standards
 - 3. Biological effects of radiation
 - D. Levels of radiation from particle accelerator sources
 - E. Methods of controlling radiation dose
 - 1. Exposure time
 - 2. Working distance
 - 3. Shielding
- II. Use of radiation detection instruments
 - A. Instrument operation
 - B. Calibration
 - C. Limitations on detection
 - D. Monitoring procedures
- III. Personnel monitoring equipment (dosimetry)
 - A. Procedures for issuance, wearing, and exchange of dosimetry
 - BB. Typical exposures expected
 - C. Methods to keep exposures ALARA
- IV. Applicable requirements of Ohio Administrative Code
- V. Registrant's policies and procedures
 - A. Safe operating procedures
 - B. Emergency procedures
 - C. Interlock testing procedures
 - D. Specific concerns relating to the accelerator
- VI. Operation and control of accelerator