

**Chapter 246-229 WAC**  
**RADIATION PROTECTION—PARTICLE ACCELERATORS**

Last Update: 3/9/22

**WAC**

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**DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER**

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| 246-229-001 | Purpose and scope. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-001, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-001, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-010, filed 12/8/80; Order 1084, § 402-44-010, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.   |
| 246-229-010 | Registration requirements. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-010, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-010, filed 12/27/90, effective 1/31/91; Order 1084, § 402-44-020, filed 1/14/76.] Repealed by WSR 97-20-101, filed 9/29/97, effective 10/30/97. Statutory Authority: RCW 43.70.040.   |
| 246-229-020 | General requirements for the issuance of a registration for particle accelerators. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-020, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-020, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-030, filed 12/8/80; Order 1084, § 402-44-030, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080. |
| 246-229-030 | Human use of particle accelerators. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-030, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-030, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-040, filed 12/8/80; Order 1084, § 402-44-040, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.  |
| 246-229-040 | General provisions. [Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-040, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-050, filed 12/8/80; Order 1084, § 402-44-050, filed 1/14/76.] Repealed by WSR 97-20-101, filed 9/29/97, effective 10/30/97. Statutory Authority: RCW 43.70.040.   |
| 246-229-050 | Limitations. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-050, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-050, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-060, filed 12/8/80; Order 1084, § 402-44-060, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.   |
| 246-229-060 | Shielding and safety design requirements. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-060, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-060, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-070, filed 12/8/80; Order 1084, § 402-44-070, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.  |
| 246-229-070 | Particle accelerator controls and interlock systems. [Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-070, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-080, filed 12/8/80; Order 1084, § 402-44-080, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.   |
| 246-229-080 | Warning devices. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-080, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-080, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-090, filed 12/8/80; Order 1084, § 402-44-090, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.   |
| 246-229-090 | Operating procedures. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-090, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-090, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-100, filed 12/8/80; Order 1084, § 402-44-100, filed 1/14/76.] Repealed by WSR   |

02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.

246-229-100 Radiation monitoring requirements. [Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-100, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-110, filed 12/8/80; Order 1084, § 402-44-110, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.

246-229-110 Ventilation systems. [Statutory Authority: RCW 70.98.050 and 70.98.080. WSR 91-15-083 (Order 183), § 246-229-110, filed 7/23/91, effective 8/23/91. Statutory Authority: RCW 43.70.040. WSR 91-02-049 (Order 121), recodified as § 246-229-110, filed 12/27/90, effective 1/31/91. Statutory Authority: RCW 70.98.080. WSR 87-01-031 (Order 2450), § 402-44-120, filed 12/11/86. Statutory Authority: RCW 70.98.050. WSR 81-01-011 (Order 1570), § 402-44-120, filed 12/8/80; Order 1084, § 402-44-120, filed 1/14/76.] Repealed by WSR 02-14-050, filed 6/27/02, effective 7/28/02. Statutory Authority: RCW 70.98.050 and [70.98.]080.

**WAC 246-229-0001 Purpose.** The purpose of this chapter is to regulate certain sources of ionizing radiation as required by RCW 70A.388.040 and 70A.388.050. This chapter provides for the registration and use of all particle accelerators installed and/or used in Washington state.

[Statutory Authority: RCW 43.70.040 and 2020 c 20. WSR 22-07-025, § 246-229-0001, filed 3/9/22, effective 4/9/22. Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0001, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0010 Definitions.** "Department" means the department of health.

"High radiation area" means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 1 mSv (100 mrem) in one hour at 30 centimeters from any source of radiation or from any surface that the radiation penetrates. For purposes of these regulations, rooms or areas in which diagnostic X-ray systems are used for healing arts purposes are not considered high radiation areas.

"Particle accelerator" means any machine capable of accelerating electrons, protons, deuterons, or other charged particles in a vacuum and of discharging the resultant particulate or other radiation into a medium at energies usually in excess of 1 MeV.

"Qualified expert" means an individual who has demonstrated to the satisfaction of the department that he or she is knowledgeable, trained, and/or experienced to measure ionizing radiation, evaluate safety techniques, and/or advise appropriately on matters of radiation protection. The department reserves the right to recognize qualifications in specific areas of radiation protection.

"Radiation machine" means any device capable of producing ionizing radiation except those devices with radioactive materials as the only source of radiation.

"Radiation safety committee" means a registrant-appointed committee of at least three members to evaluate and approve all proposals for research, diagnostic, and therapeutic use of a particle accelerator. Committee members should include, at a minimum, persons with expertise related to the intended use of the accelerator, and a person experienced in depth dose calculations and radiation safety.

"Radiation safety officer" means a knowledgeable and responsible person assigned by the registrant who provides radiation protection expertise to facilities and users of radiation machines.

"Radioactive material" means any material that emits radiation energy spontaneously. A machine that emits X-rays is not considered a radioactive material.

"Registrant" means an owner or controller of a radiation machine who is responsible for the safe operation of the radiation machine.

"Restricted area" means any area with limited access for the purposes of protecting individuals from undue risks of radiation exposure. A restricted area cannot be a residential area; a building may contain both restricted areas and residential areas.

"Unrestricted area" means any area freely available to the public, workers, or other persons; and where a person may receive less than 1 mSv (100 mrem) per year or be subject to any dose rate less than 20 µSv/hr (2 mrem/hr).

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0010, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0020 How do I get approval for particle accelerator installation and use?**

(1) Anyone installing or using particle accelerators in Washington state must get department approval by registering with the department according to chapter 246-224 WAC, Radiation protection—Radiation machine assembly and registration, prior to installation or use of the particle accelerator.

(2) A registrant must submit the following information:

(a) A membership list showing the establishment of a radiation safety committee;

(b) An identified radiation safety officer;

(c) A qualified expert's radiation shielding and safety plan review for approval according to chapter 246-225 WAC, Radiation protection—X rays in the healing arts; and

(d) Operating and emergency procedures.

(3) If the particle accelerator is intended for human use:

(a) The designated user must be a physician with training and experience in deep therapy techniques or in the use of particle accelerators to treat humans; and

(b) The registrant must appoint a radiation safety committee.

(4) To submit registration and questions, contact the department by phone or mail at:

Washington State Health Department

Division of Radiation Protection

Attn: X-Ray Registration

P.O. Box 47827

Olympia, WA 98504-7827

360-236-3230 or 1-800-299-XRAY

(5) A facility may not operate a particle accelerator:

(a) Without approval from the department; and

(b) If any applicable requirement in this chapter is not met.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0020, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0030 What are the training requirements for particle accelerator use?** (1) The registrant must:

(a) Ensure training for operators to use the particle accelerator that meets the requirements of subsection (2) of this section; and  
(b) Maintain training records that demonstrate compliance with the requirements of subsection (2) of this section for two years after the last employment or operation date for the operator.

(2) At a minimum, operators must:

(a) Demonstrate radiation safety expertise and other skills required by the facility training program;

(b) Understand applicable requirements and the registrant's operating and emergency procedures; and

(c) Demonstrate competence to use the particle accelerator, related equipment, and survey instruments, which are required by the operator's assignment.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0030, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0040 Are there other requirements that apply to the use of particle accelerators?** (1) Registrants must meet the radiation standards of chapter 246-220 WAC, Radiation protection—General provisions; chapter 246-221 WAC, Radiation protection standards; and chapter 246-222 WAC, Radiation protection—Worker rights; for public, operator, and user protection.

(2) Depending on the installation, type of machine, and intended use, registrants may also need to meet:

(a) Industrial radiographic operations, chapters 246-243 and 246-227 WAC;

(b) X-ray in the healing arts, chapter 246-225 WAC; and

(c) Medical therapy, chapter 246-240 WAC.

(3) Registrants using particle accelerators to produce radioactive material must meet the requirements of chapter 246-232 WAC, Radioactive material—Licensing applicability; and chapter 246-235 WAC, Radioactive materials—Specific licenses.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0040, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0050 Who is authorized to terminate a registrant's use of a particle accelerator?** The radiation safety committee, the radiation safety officer of the facility, and the department are authorized to terminate the particle accelerator operations at a facility if the action is determined necessary to protect health and minimize danger to public health and safety or property.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0050, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0060 What are the minimum requirements for particle accelerator installation?** (1) Shielding and safety design. The installation must include:

(a) Primary and secondary radiation barriers to comply with the radiation protection standards of WAC 246-221-010 and 246-221-060.

(b) If necessary, a ventilation system designed to limit exposure to airborne radioactive materials as follows:

(i) For restricted areas, limits are specified in WAC 246-221-040;

(ii) For unrestricted areas, limits are specified in WAC 246-221-070; and/or

(iii) For unrestricted areas, the facility must prohibit releases, venting, or otherwise discharging airborne radioactive material which exceeds the limits of WAC 246-247-040 or 246-221-290 Appendix A - Table II, unless authorized in WAC 246-221-180 or 246-221-070(2). To calculate, concentrations may be averaged over a period not greater than one year. Every reasonable effort should be made to prohibit releases of radioactive material to unrestricted areas.

(2) Controls, instrumentation, and readouts. All controls, instrumentation, and readouts must be clearly identified and functional on the particle accelerator control console.

(3) Safety interlocks. All entrances into a target room or other high radiation area must have interlocks that shut down the machine if a door is opened (e.g., barrier penetrated) during irradiation.

(a) Manual reset. If the interlock engages (shuts the machine off), the machine must stay off until manually reset at the console.

(b) Independent function. Each safety interlock must function independently of any other safety interlocks.

(c) Failsafe. All safety interlocks must ensure that any defect or component failure in the interlock system prevents operation of the accelerator.

(4) Emergency power cutoff switch system. An identifiable "scram" button or emergency power cutoff switch which stops irradiation must exist in all high radiation areas. If the switch is engaged (shuts off the machine), the system must prohibit the accelerator from restarting until the switch in the room is reset and the main console restarted manually. Use of this system is limited to emergency situations.

(5) High radiation area warning devices. For areas designated as high radiation areas, the registrant must:

(a) Identify barriers (including temporary) for and pathways to high radiation areas according to WAC 246-221-120, Caution signs and labels.

(b) Except inside treatment rooms in facilities designed for human exposure, install easily observable warning lights at area entrances that activate when radiation is being produced.

(c) Except in facilities designed for human exposure, install an audible warning device which activates for fifteen seconds prior to accelerator use in all high radiation areas. Instruct all personnel in the area as to the signal's meaning.

(d) Except in facilities designed for human exposure, install continuous radiation detection monitoring equipment. The equipment must be electrically independent of the accelerator control and interlock systems and be calibrated every six months at a minimum. The equipment must provide:

(i) A remote and local readout; and

(ii) Visual and/or audible alarms at the control panel, entrances to high radiation areas, and other appropriate locations.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0060, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0070 What are the minimum requirements for operating and emergency procedure documentation?** At a minimum, the procedures must include instruction on:

- (1) Securing the accelerator to prevent unauthorized use.
- (2) Operating the accelerator.
- (3) Responding to an emergency involving the accelerator.
- (4) Performing safety and warning device (including interlocks) checks at least every three months.
- (5) Performing radiation surveys.
- (6) Performing monitoring equipment calibration (if applicable).
- (7) Recordkeeping and/or documentation.
- (8) Bypassing safety interlocks.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0070, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0080 What are the requirements for bypassing safety interlocks?** Bypassing a safety interlock or interlocks is allowed only if:

- (1) Authorized by the radiation safety committee and/or radiation safety officer;
- (2) Recorded in a permanent log and a notice posted at the accelerator control console; and
- (3) The bypass procedure is terminated as soon as possible.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0080, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0090 What are the minimum requirements for particle accelerator use?** The minimum requirements for the registrant to use a particle accelerator are to:

- (1) Register the accelerator with the department;
- (2) Submit plan review/shielding design to the department and receive written approval;
- (3) Train operators and users;
- (4) Complete a qualified expert's radiation protection survey of the room/area initially and after any changes in shielding, equipment, or occupancy of adjacent areas;
- (5) Provide appropriate portable radiation monitoring equipment that is operable and tested daily, and calibrated every six months, or after any service/repair;
- (6) Develop operating and emergency procedures and keep a copy of the current procedures at the accelerator control panel; and
- (7) If applicable, provide the means and guidance to determine airborne particulate radioactivity present in areas of airborne hazards, and/or particulate radiation contamination (smear surveys) in target and other pertinent areas.

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0090, filed 6/27/02, effective 7/28/02.]

**WAC 246-229-0100 What are the recordkeeping requirements for particle accelerator use?**

| <b>Records</b>                                | <b>Retention time</b>                    |
|---|--|
| Operator training and qualifications          | Two years past last employment/operation |
| Safety and warning device checks              | Two years                                |
| Area radiation monitors                       | Two years (if necessary)                 |
| Instrumentation tests                         | Two years                                |
| Smear results                                 | Two years (if necessary)                 |
| Qualified expert radiation protection surveys | Life of the accelerator                  |
| Electrical circuit diagrams                   | Life of the accelerator                  |
| Permanent log of bypassing interlocks         | Life of the accelerator                  |

[Statutory Authority: RCW 70.98.050 and [70.98.]080. WSR 02-14-050, § 246-229-0100, filed 6/27/02, effective 7/28/02.]