

Chapter 246-226 WAC
RADIATION PROTECTION—COMPUTED TOMOGRAPHY

NEW SECTION

WAC 246-226-001 Authority. The requirements of this chapter are adopted pursuant to the provisions of chapter 70.98 RCW, Nuclear energy and radiation.

NEW SECTION

WAC 246-226-005 Purpose and scope. This chapter establishes CT X-ray system requirements for the intentional exposure of humans of ionizing radiation for diagnostic imaging.

NEW SECTION

WAC 246-226-007 Relationship to other regulations. In addition to the requirements established in this chapter, registrants shall also comply with applicable portions of the following rules:

- (1) Applicable requirements established in chapter 246-220 WAC, Radiation protection—General provisions;
- (2) Applicable requirements established in chapter 246-221 WAC, Radiation protection standards;
- (3) Applicable requirements established in chapter 246-222 WAC, Radiation protection—Worker rights;
- (4) Applicable requirements established in chapter 246-224 WAC, Radiation protection—Radiation machine assembly and registration;
- (5) Applicable requirements established in chapter 246-225 WAC, Radiation protection—X-rays in the healing arts; and
- (6) Applicable fees established in chapter 246-254 WAC, Radiation protection—Fees.

NEW SECTION

WAC 246-226-010 Definitions, abbreviations, and acronyms. The definitions, abbreviations, and acronyms in this section and in WAC 246-220-010, Definitions, abbreviations, and acronyms, apply throughout this chapter unless the context clearly indicates otherwise.

- (1) "Computed tomography (CT)" means a radiologic imaging procedure or system that uses computer processing to generate an image of tissues using thin slices sent through the patient's body to detectors on the other side.

(2) "CT conditions of operation" means all selectable parameters governing the operation of a CT X-ray system including nominal tomographic section thickness, filtration, and the technique factors as defined in this section.

(3) "Computed tomography dose index (CTDI)" means the integral of the dose profile along a line perpendicular to the tomographic plan divided by the product of the nominal tomographic section thickness and the number of tomograms produced in a single scan that is:

Where:

Z = Position along a line perpendicular to the tomographic plane;

D(z) = Dose at position z;

T = Nominal tomographic section thickness;

N = Number of tomograms produced in a single scan.

And:

The dose profile is centered around $z=0$ and that, for a multiple tomogram system, the scan increment between adjacent scans is nT .

(4) "CTDI_{vol}" means a weighted average measurement based on a reference phantom dosimetry measurement, expressed in milliGray. Not applicable to helical scan acquisition.

(5) "CT dosimetry phantom" means an object used to determine the dose delivered by a CT X-ray system.

(6) "Computed tomography number (CTN)" means the number used to represent the X-ray attenuation associated with each elemental area of the CT image:

Where:

(7) "CT procedure" means an activity directed at or performed on an individual necessary to make a diagnosis using a CT X-ray system including, but not limited to, setting, modifying, or applying parameters or protocols.

(8) "CT X-ray system" means a gantry-style...

(9) "Department" means the Washington state department of health.

(10) "Dose profile" means the dose as a function of position along a line.

(11) "Dose length product (DLP)" means the product of the CTDI_{vol} and the scan length of a group of scans. This number can be calculated over the entire CT procedure to give an estimate of the total dose. The value is expressed in milliGray centimeters.

(12) "Filtration" means material placed in the beam to preferentially absorb low energy photons that contribute nothing to the image, and yet otherwise would increase patient exposure.

(13) "Health scanning mode" means...

(14) "Kilowatts" means peak power, which is the highest rated kilovoltage of a CT X-ray system multiplied by the maximum rated amperage multiplied by the power factor.

(15) "Lead CT technologist" means...

(16) "Lead interpreting CT physician" means a physician licensed under RCW 18.71.021, License required, or RCW 18.57.031, License required designated by the registrant to perform the duties under WAC 246-226-070(8), Staffing requirements.

(17) "Multiple tomogram system" means a computed tomography X-ray system that produces more than one tomogram from X-ray transmission data during a single scan.

(18) "Noise" means the standard deviation of the fluctuations in CTN expressed as a percentage of the attenuation coefficient of water. Its estimate (S_n) is calculated using the following expression:

Where:

(19) "Nominal tomographic section thickness" means the full width at half-maximum of the sensitivity profile taken at the center of the cross-sectional volume over which X-ray transmission data are collected.

(20) "Operator" means a health professional licensed under RCW 18.71.021, License required, or RCW 18.57.031, License required, or chapter 18.84 RCW, Radiologic technologists, whose scope of practice includes CT diagnostics which includes choosing the appropriate scan protocol, appropriately adjusting technical parameters when necessary, and administering the CT procedure.

(21) "Parameter" means...

(22) "Positron emission tomography (PET)" means an imaging technique that uses positron-emitting radionuclides to produce three-dimensional images of functional processes in the body.

(23) "PET/CT" means a PET used in conjunction with a CT X-ray system.

(24) "Protocol" means the set of parameters affecting CT dose and image quality.

(25) "Qualified medical physicist" means a physicist who meets the requirements of WAC 246-226-070, Staffing requirements.

(26) "Reference plane" means a plane which is displaced from and parallel to the tomographic plane.

(27) "Registrant" means the owner or controller of the radiation machine who is responsible for the safe operation of the radiation machine.

(28) "Scan" means the complete process of collecting X-ray transmission data for the production of a tomogram. Data can be collected simultaneously during a single scan for the production of one or more tomograms.

(29) "Scan increment" means the amount of relative displacement of the patient with respect to the CT X-ray system between successive scans measured along the direction of such displacement.

(30) "Sensitivity profile" means the relative response of the CT X-ray system as a function of position along a line perpendicular to the tomographic plane.

(31) "Single photon emission computed tomography (SPECT)" means...

(32) "SPECT/CT" means single photon emission CT used in conjunction with a CT X-ray system.

(33) "Technical factor" means...

(34) "Technical parameters" means...

(35) "Technique factor" means peak tube potential in kV and either:

(a) Tube current in mA and exposure time in seconds; or

(b) The product of tube current and exposure time resulting in mAs.

(36) "Tomogram" means...

(37) "Tomographic plane" means the geometric plan which the manufacturer identified as corresponding to the output tomogram.

(38) "Tomographic section" means the volume of an object whose X-ray attenuation properties are imaged in a tomogram.

NEW SECTION

WAC 246-226-020 Equipment requirements. The CT X-ray system must:

(1) Meet the requirements of 21 C.F.R. Sec. 1020.33, Computed tomography (CT) equipment, at the time of installation and while the CT X-ray system is registered with the department under chapter 246-224 WAC, Radiation protection—Radiation machine assembly and registration; and

(2) Be equipped:

(a) With a visible signal that indicates when the X-ray exposure is occurring;

(b) So that the operator can terminate an X-ray exposure of greater than one-half second duration at any time during the X-ray exposure;

(c) With an emergency button or switch that is labeled to clearly indicate its function;

(d) So that the CT conditions of operation used during a CT procedure are:

(i) Displayed prior to beginning a scan;

(ii) Visible by the operator from any location scanning can be initiated; and

(iii) Permanent markings may be used on equipment with fixed conditions of operation.

(e) So that radiation leaked from the tube port does not exceed limits adopted in general requirements for diagnostic X-ray system, WAC 246-225-040 (3) and (4), when data are not being collected for image production.

(f) So that the accuracy of the laser or optical positioning system is within 5 millimeters on axial position (z-axis).

(g) With an X-ray production indicator of at least one-half second at or near the gantry that is visible from any point outside the gantry opening.

(h) So that premature termination of the X-ray exposure by the operator requires resetting of the CT conditions of operation prior to initiating another scan.

NEW SECTION

WAC 246-226-030 Facility design requirements. (1) For the purposes of this section, the terms below are defined as follows:

(a) "Fixed CT X-ray system" means a CT X-ray system that is permanently mounted and part of the building in which it is used.

(b) "Mobile CT X-ray system" means a CT X-ray system that is permanently mounted in a vehicle or trailer.

(c) "Portable CT X-ray system" means a CT X-ray system that is not permanently mounted in a building, vehicle, or trailer and is movable between rooms.

(2) A facility must be designed and constructed:

(a) To provide for two-way aural communication between the patient and the operator at the control panel;

(b) To allow the operator to continuously observe the patient from the control panel during irradiation using windows, mirrors, closed-circuit television, or an equivalent method; and

(c) With an alternate viewing system when the primary viewing system is electronic.

(3) Prior to CT X-ray system installation, the registrant shall conduct a visual inspection to verify shielding is installed consistent with the department approved shielding plan. For CT X-ray system installations completed before **(insert effective date of the chapter)**, the physical survey must be conducted by **(two years after effective date of the chapter)**.

(4) For fixed or mobile CT X-ray system:

(a) Installed after (effective date of the rule), the operator's booth and surrounding occupied areas must be designed and constructed in accordance with the *National Council on Radiation Protection and Measurements Report #147* (2004);

(b) Protective barriers must be provided in the ceiling, floor, and walls of the CT X-ray system enclosure to ensure exposure does not exceed dose limits established in chapter 246-221 WAC, Radiation protection standards; and

(c) The control panel must be shielded by a protective barrier that cannot be removed from a protective position between the operator and the radiation source during CT X-ray system operation.

(5) A portable CT X-ray system must meet the requirements of this section except, to meet the requirement of subsection (2)(c) of this section, it may be equipped with a shield adequate to protect the operator and surrounding areas to ensure exposure does not exceed dose limits established in chapter 246-221 WAC, Radiation protection standards.

(6) The registrant shall complete a radiation protection survey of the room and surrounding areas prior to CT X-ray system use. For CT X-ray systems placed or installed before **(insert effective date of the chapter)**, the radiation protection survey must be conducted by **(two years after effective date of the chapter)**.

(7) The registrant shall submit a revised radiation shielding plan for department review in accordance with WAC 246-225-030, General requirements—Plan review, after replacement of the CT X-ray system, or any change in the CT X-ray system room's construction or surrounding room's construction.

NEW SECTION

WAC 246-226-040 Operating procedures and conditions of operation. (1) The registrant shall:

(a) Establish a procedure to record and retrieve $CTDI_{vol}$, DLP and, when available on the CT X-ray system, size specific dose estimate (SSDE) from every CT procedure performed; and

(b) Send each CT procedure and protocol page that lists the technical factors electronically to the picture archiving and communications system (PACS).

(2) The registrant shall provide estimated patient dose within ten business days of a patient request.

(3) **Effective (insert date six months after the effective date of these rules)**, the registrant shall establish CT procedures for each CT X-ray system in consultation with a qualified medical physicist and the lead interpreting CT physician, or lead CT technologist to ensure they are correct for the intended dose and image quality as follows:

(a) Display pediatric CT protocols on each CT X-ray system used for pediatric patients.

(b) Establish procedural, software, and engineering measures such as password protection that prohibit anyone from changing protocols or parameters without approval from the lead CT technologist or the lead interpreting CT physician. Documentation of protocol or parameter changes must be maintained consistent with the requirements of WAC 246-226-100, Required records and reports.

(4) The registrant may not allow the CT manufacturer's technical or applications representatives to make protocol changes or other software changes or upgrades that would impact radiation dose or image quality without the approval of the lead interpreting CT physician, the lead CT technologist, or the qualified medical physicist.

(5) **Effective (insert date twelve months after the effective date of these rules)**, the registrant shall review CT protocols in consultation with a qualified medical physicist and the lead interpreting CT physician, or lead CT technologist to ensure they are correct for the intended dose and image quality as follows:

(a) Review all CT protocols upon installation of a CT X-ray system;

(b) Annually review the following protocols:

(i) Pediatric head;

(ii) Pediatric abdomen;

(iii) Adult head;

(iv) Adult abdomen;

(v) High resolution chest;

(vi) Brain perfusion; and

(vii) New or changed protocols since the last review.

(c) If the facility does not perform the exams listed in (i) through (vi) of this subsection, the most frequently performed or highest dose protocols shall be substituted so that a total of at least six protocols are reviewed annually.

(d) As part of the review, the registrant shall:

(i) Compare current protocols to the dose assessments that were made during the last annual performance evaluation required in WAC 246-226-090, Performance evaluation;

(ii) Determine whether the protocols from each CT procedure are appropriate, can be modified to lower the $CTDI_{vol}$ without an unacceptable sacrifice to image quality, or can be eliminated;

(iii) Establish protocols that maintain image quality at the desired noise level within dose levels established in WAC 246-226-050, Dose limits.

(iv) Establish guidelines of variability that establish parameter and protocol limits.

(6) The registrant shall limit the use of the CT X-ray system to those permitted by the established guidelines of variability.

(7) The operator may adjust parameters or protocols for a CT procedure as long as they remain within the approved limits established in the guidelines of variability.

(8) The operator shall check the display panel before and after performing each scan to make sure the amount of radiation delivered is

appropriate for the CT procedure and individual patient. This may be accomplished by reviewing dose indicator devices if available or dose indices such as the technique factors. Dose indicators or indices outside of expected values shall be documented and reviewed by the lead interpreting CT physician or qualified medical physicist.

(9) Each registrant shall create a written policy establishing procedures for retaking CT procedures including, but not limited to, how many scans are authorized for a patient and who can authorize additional retakes. The policy must be approved by the lead interpreting CT physician.

(10) If staff routinely working with or around radiation sources hold patients during CT procedures, personnel exposure may not exceed the dose limits established in chapter 246-221 WAC, Radiation protection standards. The registrant may not require staff to hold patients during CT procedures.

(11) When a patient must be held in position for a CT procedure, mechanical supporting or restraining devices must be used unless contraindicated. If the patient must be held by an individual, the individual shall:

(a) Wear protective gloves and a protective apron of 0.5 millimeter minimum lead equivalent;

(b) Be positioned so that no part of his or her body will be struck by the useful beam; and

(c) Be positioned so that his or her body is as far as possible from the edge of the useful beam.

(12) Only individuals whose presence is necessary are allowed in a CT X-ray system room during exposure. Each individual, except the patient, shall be protected by at least 0.5 millimeter lead equivalent apron or a whole body protective barrier.

NEW SECTION

WAC 246-226-050 Dose limits. The $CTDI_{vol}$ for the following CT procedure on phantoms may not exceed the dose limits shown below.

CT Procedure	Phantom Size	Dose Limit: $CTDI_{vol}$ (mGy)
Adult head	16 cm	80
Adult abdomen	32 cm	30
Pediatric head (one year old)	16 cm	40
Pediatric abdomen (40 pounds)	16 cm	20

NEW SECTION

WAC 246-226-060 CT events. (1) The purpose of this section is to improve patient safety by supporting health care providers and facilities in their efforts to reduce the incidence of medical errors

that contribute to deterministic injurious health effects. This rule does not relieve the department of its statutory obligation to enforce this and other radiation protection laws.

(2) The registrant shall initiate an investigation within twenty-four hours and complete the investigation within ten business days when:

(a) $CTDI_{vol}$ exceeds 600 mGy for a pediatric procedure or 1500 mGy for an adult procedure; or

(b) Any ionizing radiation exposure from a CT procedure results in unanticipated hair loss, erythema, or functional damage to an organ or physiological system.

(3) The registrant shall report an event when subsection (2)(b) of this section is confirmed or skin or organ dose is estimated to exceed 2000 mGy.

(4) The registrant shall, within five business days of determining an event occurred, notify the department and the referring physician of the person subject to the effect by phone. The registrant shall provide the notification when it is caused by either:

(a) Repeating a CT procedure on the same patient over the same area within twenty-four hours, unless otherwise ordered by a physician or radiologist; or

(b) A single CT procedure of a patient that resulted in an effect.

(5) The notification must include the following:

(a) The name of the medical facility;

(b) The date the event was discovered;

(c) The type of effect observed;

(d) The cause of the effect; and

(e) Any additional contextual information the medical facility chooses to provide.

(6) For each event, the registrant shall conduct a root cause analysis in consultation with a qualified medical physicist, the lead interpreting CT physician, lead CT technologist, and the operator who performed the CT procedure. The root cause analysis must:

(a) Follow the procedures and methods of:

(i) The joint commission;

(ii) The department of veterans affairs national center for patient safety; or

(iii) Another nationally recognized root cause analysis methodology the department has found acceptable for computed tomography.

(b) Include the following information:

(i) The findings regarding the root cause of the event;

(ii) The number and types of health professionals present at the time the reported event occurred;

(iii) A corrective action plan consistent with the findings of the root cause analysis and including:

(A) How each finding will be addressed and corrected;

(B) When each correction will be completed;

(C) Who is responsible to make the corrections;

(D) What action will be taken to prevent the event from reoccurring; and

(iv) A monitoring schedule to assess the effectiveness of the corrective action plan, including who is responsible for the monitoring schedule.

(c) If the registrant determines there is no need to create a corrective action plan for a particular event, include a written explanation of the reasons for not creating a corrective action plan.

(7) The root cause analysis may not include any identifying information for any health care professional, facility employee, or patient involved.

(8) The department shall arrange for a joint review of the root cause analysis within forty-five days of receiving notification of the event.

(9) After joint review of the root cause analysis, the registrant shall make appropriate modifications to prevent future effects and document the changes made within sixty days of the joint review.

(10) The department may not retain the root cause analysis. All records retained by the department are subject to public disclosure under chapter 42.56 RCW, Public Records Act.

(11) Notification and reporting under this rule does not remove a registrant's responsibility to report a licensed practitioner's unprofessional conduct to the department, as defined under RCW 18.130.180, Unprofessional conduct.

(12) A registrant is exempt from the requirements of this section when the registrant is subject to RCW 70.41.200, Quality improvement and medical malpractice prevention program—Quality improvement committee—Sanction and grievance procedures—Information collection, reporting, and sharing, and includes CT events as part of the required coordinated quality improvement program.

(13) A registrant is exempt from the requirements of this section when the registrant includes CT events as part of a department approved coordinated quality improvement program under chapter 246-50 WAC, Coordinated quality improvement program.

NEW SECTION

WAC 246-226-070 Staffing requirements. (1) Each registrant with a CT X-ray system shall employ or contract with a physician licensed under RCW 18.71.021, License required, or RCW 18.57.031, License required; or a radiologic technologist licensed under chapter 18.84 RCW, Radiologic technologists to perform CT procedures. Nothing in this chapter prohibits the registrant from requiring the employed or contracted radiological technologist licensed under chapter 18.84 RCW, Radiologic technologists to hold an American Registry of Radiologic Technologists (ARRT) CT certification prior to performing CT procedures.

(2) Each registrant with a CT X-ray system shall employ or contract with a qualified medical physicist to perform the activities of the qualified medical physicist specified in this chapter.

(3) Prior to employing or contracting with a qualified medical physicist, the registrant shall verify the qualified medical physicist meets (a), (b), or (c) of this subsection:

(a) Holds a valid certificate in:

(i) Diagnostic radiological physics or radiological physics from the American Board of Radiology;

(ii) Diagnostic imaging physics from the American Board of Medical Physics; or

- (iii) Diagnostic radiology physics from the Canadian College of Physicists in Medicine.
- (b) Has the following experience and education requirements:
- (i) Hold a graduate degree from an accredited institution in medical physics, radiological physics, physics, or another relevant physical science or engineering discipline; including formal course work in the biological sciences with at least:
- (A) One course in biology or radiation biology; and
- (B) One course in anatomy, physiology, or similar topics related to the practice of medical physics.
- (ii) Three years of documented successful experience in a clinical CT environment; and
- (c) Effective **(insert effective date of chapter)**, has conducted surveys of at least three CT X-ray systems between January 1, 2007, and January 1, 2010, and meets the continuing experience requirements of this chapter. After **(insert effective date of chapter)**, a medical physicist qualified under this subsection who has not maintained continuing education and experience requirements of this section shall meet the requirements of (a) or (b) of this subsection.
- (4) Prior to employing or contracting with a qualified medical physicist, the registrant shall verify that the qualified medical physicist has evaluated at least two CT X-ray systems in accordance with this chapter in the preceding two years. This requirement is waived if it has been less than two years since the qualified medical physicist met the requirements of subsection (3) of this section.
- (5) Prior to employing or contracting with a qualified medical physicist, the registrant shall verify that the qualified medical physicist has earned at least fifteen continuing medical education units, of which at least one must be pertinent to CT, in the preceding three years. At least half of the continuing education units must be:
- (a) Attendance-based learning at courses accredited by the Accreditation Council for Continuing Medical Education;
- (b) Continuing medical education activities in journals;
- (c) Continuing medical education enduring materials;
- (d) Presentations at conferences;
- (e) Publications in peer-reviewed journals; or
- (f) Test item writing.
- (6) This requirement is waived if it has been less than three years since the qualified medical physicist met the requirements of subsection (3) of this section.
- (7) Before employing or contracting with a person who failed to maintain the continuing experience requirements of this section, the registrant shall verify the qualified medical physicist has evaluated five CT X-ray systems in accordance with this chapter under the direct supervision of a qualified medical physicist in the preceding two years.
- (8) The registrant shall appoint a lead interpreting CT physician to:
- (a) Develop, implement, and enforce policies, procedures, and registrant requirements that address:
- (i) Radiation protection, the hazards of radiation exposure to both patients and facility personnel, and appropriate monitoring;
- (ii) Identification of pregnant or potentially pregnant patients; and
- (iii) Safety issues, including contrast use and sedation, and reduce exposure as much as reasonably possible for pediatric patients;

- (b) Ensure that a physician is present and immediately available when contrast is administered to a patient; and
- (c) Be responsible for:
 - (i) Implementing the quality control program required in WAC 246-226-080, Quality control program;
 - (ii) Ensuring compliance with the recommendations of the qualified medical physicist; and
 - (iii) The oversight of all CT-related materials, including clinical and phantom images, quality control data, and other information required by this chapter.
- (9) The registrant shall appoint a lead CT technologist to...

NEW SECTION

- WAC 246-226-080 Quality control program.** (1) The registrant shall establish, document, and implement a quality control program in consultation with the qualified medical physicist before using a CT X-ray system. The quality control program must include, but is not limited to, the following:
- (a) Daily measurement of water CTN and standard deviation;
 - (b) Daily artifact evaluation;
 - (c) For registrants using hardcopy for primary interpretation, weekly wet laser printer quality control;
 - (d) Monthly visual checklist;
 - (e) For registrants using hardcopy for primary interpretation, monthly dry laser printer quality control; and
 - (f) Monthly display monitors quality control.
- (2) The registrant shall modify the quality control program and document the changes in consultation with the qualified medical physicist if the results of an evaluation included in the quality control program do not meet the requirements of this chapter.

NEW SECTION

- WAC 246-226-090 Performance evaluation.** The registrant shall employ or contract with a qualified medical physicist to conduct a performance evaluation to assess the quality and safety of the CT X-ray system and its operation that meets the following requirements:
- (1) A performance evaluation must be conducted:
 - (a) Within thirty days of installation if the CT X-ray system passes all manufacture installation tests;
 - (b) Annually following the initial evaluation; and
 - (c) After any change, replacement, or reconfiguration of components which, in the opinion of the qualified medical physicist, could cause a change in the radiation output or image quality.
 - (2) A performance evaluation must evaluate:
 - (a) Alignment light accuracy;
 - (b) Slice localization from scanned projection radiograph;
 - (c) Table increment and travel accuracy;
 - (d) Slice thickness accuracy;
 - (e) Image quality, including the following:

- (i) High-contrast resolution;
- (ii) Low-contrast resolution;
- (iii) Image uniformity;
- (iv) Noise;
- (v) Artifact evaluation; and
- (vi) Spatial resolution.
- (f) Gray level performance of CT acquisition display monitors;
- (g) CTN uniformity, accuracy, and linearity;
- (h) Dosimetry;
 - (i) Safety, including the following:
 - (i) Visual inspection;
 - (ii) Audible and visual signals; and
 - (iii) Posting requirements.
 - (j) The ongoing quality control program, including evaluation results and corrective actions;
 - (k) Protocols;
 - (l) Radiation output by:
 - (i) Using a calibrated dosimetry system that:
 - (A) Has been calibrated within the preceding twenty-four months; and
 - (B) Is traceable to a national standard.
 - (ii) Using a CT dosimetry phantom that:
 - (A) Is a right circular cylinder of polymethyl methacrylate of density 1.19 plus or minus 0.01 grams per cubic centimeter;
 - (B) Is at least 14 centimeters in length;
 - (C) Is 32.0 centimeters in diameter for evaluating CT X-ray systems designed to image any section of the body;
 - (D) Is 16.0 centimeters for systems designed to image the head, or for whole body CT X-ray systems operated in the health scanning mode; and
 - (E) Provides for the placement of a dosimeter along the axis of rotation and along a line parallel to the axis of rotation 1.0 centimeters from the outer surface and within the phantom. The qualified medical physicist may place additional dosimeters or alignment devices at other locations.
 - (iii) Accounting for any effects on the doses measured due to the removal of phantom material to accommodate dosimeters through appropriate corrections to the reported data or included in the statement of maximum deviation for the values obtained using the phantom;
 - (iv) Performing all dose assessments with the CT dosimetry phantom placed on the patient support device without additional attenuation materials present;
 - (v) Measuring the $CTDI_{vol}$ by orienting the CT dosimetry phantom so that the measurement point 1.0 centimeter from the peripheral outer surface of the phantom and the measurement point along the axial line of the phantom is in the same angular position within the gantry as the point of maximum surface $CTDI_{vol}$ identified. The CT conditions of operation must correspond to typical values used for the average patient protocol. For the purpose of determining the $CTDI_{vol}$, the manufacturer's nominal tomographic section thickness for that particular CT X-ray system may be used.
 - (m) Accuracy of the displayed dose on the CT X-ray system console and verify the displayed dose is within twenty percent of the measured doses.
- (3) Performance evaluation report:

(a) The qualified medical physicist shall prepare a performance evaluation report that includes the following:

(i) A summary of the performance evaluation required under this section.

(ii) Recommendations for improvements, if any.

(iii) Type of radiation detection instrument or system used, including the date of the last calibration.

(b) The qualified medical physicist shall provide the performance evaluation report to the registrant within thirty days.

NEW SECTION

WAC 246-226-100 Required records and reports. (1) The registrant shall maintain written information regarding the operation and calibration of the CT X-ray system including, but not limited to, the following:

(a) Dates of the latest calibration and where the results are located; and

(b) Quality control program results of at least the most recent quality control evaluation, and all additional schedules of evaluation established by the qualified medical physicist appropriate for the CT X-ray system.

(2) A registrant shall maintain the following documents for the times specified and make them available for review by the department upon request:

(a) The most recent physical survey required under WAC 246-226-030, Facility design requirements must be retained for as long as the CT X-ray system is in use.

(b) Written approval of the most recent annual review for each CT X-ray system with date and signature of the registrant, qualified medical physicist, and lead interpreting CT physician, and make it available for inspection by the department.

(c) Records documenting the qualifications of all personnel who worked at the facility as a physician licensed under RCW 18.71.021, License required, or RCW 18.57.031, License required; or a radiologic technologist licensed under chapter 18.84 RCW, Radiologic technologists, employed or contracted qualified medical physicist, or lead interpreting CT physician for three years. Records of personnel no longer employed by the CT facility must be retained until the next inspection following the employee's termination has been completed and the department has determined that the facility is in compliance with the staffing requirements of WAC 246-226-070, Staffing requirements;

(d) All root cause analyses required under WAC 246-226-060, CT events, must be retained for at least five years.

NEW SECTION

WAC 246-226-110 Exemptions. (1) Registrants exclusively using low power CT X-ray systems (5 kW or less) or conebeam CT X-ray systems are exempt from the requirements of this chapter.

(2) Registrants using CT simulators exclusively for treatment planning purposes in conjunction with a megavoltage radiation therapy unit are exempt from the requirements of this chapter, except that the registrant shall comply with WAC 246-226-090, Performance evaluation, as appropriate.