

Non-Hospital Medical and Surgical  
Facilities Accreditation Program

**ACCREDITATION STANDARDS**

X-ray and Radiation  
Safety

Copyright © 2024 by the Non-Hospital Medical and Surgical Facilities Accreditation Program and the College of Physicians and Surgeons of British Columbia.

All rights reserved. No part of this publication may be used, reproduced or transmitted, in any form or by any means electronic, mechanical, photocopying, recording or otherwise, or stored in any retrieval system or any nature, without the prior written permission of the copyright holder, application for which shall be made to:

Non-Hospital Medical and Surgical Facilities Accreditation Program  
College of Physicians and Surgeons of British Columbia  
300-669 Howe Street  
Vancouver BC V6C 0B4

The Non-Hospital Medical and Surgical Facilities Accreditation Program and the College of Physicians and Surgeons of BC has used their best efforts in preparing this publication. As websites are constantly changing, some of the website addresses in this publication may have moved or no longer exist.

## Introduction

X-rays performed in the course of health care account for the major portion of man-made radiation exposure. While X-ray imaging for diagnostic and interventional purposes can be a necessary part of health care, radiation protection is required to protect both the patient and personnel from excessive exposure to radiation.

In operating/procedure rooms where X-ray equipment is used, radiation safety planning must include considerations for the room design and layout such as:

- the shielding needs for the equipment and room
- the occupancy and designation of adjacent rooms including those above and below the room in which X-rays are performed
- the planned and existing material used to construct the walls, floor and ceiling and their thicknesses including additional materials currently being used, or planned for use, as radiation shielding barriers
- the application of the protective barriers

To ensure there is adequate shielding, shielding calculations must be performed by trained individuals with current in-depth knowledge of structural shielding design (e.g. knowledge of radiation protection requirements and radiation shielding barriers) and using the acceptable methods of performing these calculations. Shielding must be constructed to form an unbroken barrier and if lead is used, it must be adequately supported to prevent “creeping.”

The X-ray and Radiation Safety accreditation standard relating to occupational health and safety include those most critical to staff safety in the non-hospital settings; however, they do not encompass all of the requirements under the *Workers Compensation Act* of British Columbia. Medical directors are encouraged to review section 115 of the Act and the associated *Occupational Health and Safety Regulations* as well as the Health Canada Safety Code 35 *Radiation Protection in Radiology - Large Facilities* to ensure they are meeting all regulatory requirements in British Columbia. Questions specific to the Act and the associated *Occupational Health and Safety Regulations* should be directed to WorkSafeBC for interpretation, advice and direction. Questions specific to the Health Canada Safety Code 35 should be directed to the facility’s medical physicist/radiation safety officer or medical director, as appropriate, for interpretation, advice and direction.

No.	Description
<b>RDS1.0</b>	<b>X-RAY AND RADIATION SAFETY</b>
<b>RDS1.1</b>	<p><b>The safety of patients and staff is supported through an established radiation safety program.</b>  <i>Intent: A radiation safety program is in place. In facilities that have/use X-ray equipment, the medical director is responsible for ensuring that all personnel possess the appropriate education and training, and that a radiation safety program is in place and is current.</i></p>
RDS1.1.1	<p><b>M</b> X-ray equipment used in the non-hospital facility is on record with the College's Non-Hospital Medical and Surgical Facilities Accreditation Program (NHMSFAP).  <i>Guidance: The NHMSFAP is notified of all X-ray equipment (e.g. full C-Arm, mini C-Arm, other radiation emitting device) used in non-hospital facilities by submitting an X-ray Equipment Notification form and a copy of this form is on file at the facility. The College is notified when a new piece of X-ray equipment is acquired (i.e. a new X-ray equipment notification form is submitted) and when a piece of X-ray equipment is removed from service. The notification form includes facility name and address, name of owner, name of medical physicist/radiation safety officer, type of equipment, manufacturer, year of manufacture, model, device master serial number, tube 1 insert number, and tube 2 insert number, if applicable.</i></p>
RDS1.1.2	<p><b>M</b> There is a medical physicist or radiation safety officer who is responsible for overseeing all radiation protection aspects.  <i>Guidance: The medical director is ultimately responsible for the radiation safety of the facility which includes ensuring that one or more qualified individuals are designated to carry out the roles of responsible user and medical physicist/radiation safety officer.</i></p>
RDS1.1.3	<p><b>M</b> The medical physicist or radiation safety officer (RSO) is appropriately qualified.  <i>Guidance: The medical physicist is certified with the Canadian College of Physicists in Medicine. The RSO must have documented training in radiation safety which includes an understanding of the work, hazards, and control measures associated with ionizing radiation. The medical director is responsible for ensuring the medical physicist or RSO has the proper qualifications, training and knowledge, and possesses the competencies required for their role. Where there is a nationally or internationally recognized body that publishes standards and/or guidelines, the medical director must ensure that third-party course providers instruct in accordance to those standards/guidelines. The human resource file for the medical physicist or RSO includes evidence of their certification with the Canadian College of Physicists in Medicine (e.g. CV on file) or RSO education and training. This individual may be on contract with the facility (e.g. not stationed on-site).</i></p>
RDS1.1.4	<p><b>M</b> There is a responsible user who monitors and manages the radiation safety program.  <i>Guidance: The medical director is ultimately responsible for the radiation safety of the facility which includes ensuring that one or more qualified individuals are designated to carry out the roles of responsible user and medical physicist/RSO.</i></p>

No.	Description
RDS1.1.5	<p><b>M</b> The responsible user is appropriately qualified.  <i>Guidance: The responsible user can be a medical director, licensed physician, or X-ray technologist who through their education and experience possesses qualifications for operating X-ray equipment and competency in the duties of a responsible user. The medical director is responsible for ensuring the responsible user has the proper qualifications, training and knowledge and possesses the competencies required for their role. Documentation of the responsible user's education, training and experience (e.g. certificate) is on file. The responsible user could also be the RSO.</i></p>
RDS1.1.6	<p><b>M</b> Radiation protection surveys are conducted to ensure safety when there is new X-ray equipment and when X-ray equipment is replaced.</p>
RDS1.1.7	<p><b>M</b> Radiation protection surveys are conducted by a qualified expert.  <i>Guidance: The expert is qualified by education and experience to perform advanced or complex procedures in radiation protection including the evaluation of the facility design to ensure adequate shielding is in place, inspection and performance evaluation of X-ray equipment and accessories, and the evaluation and recommendation of radiation protection programs.</i></p>
RDS1.1.8	<p><b>M</b> Radiation protection surveys are conducted once every four years.  <i>Guidance: Radiation protection surveys are conducted once every four (4) years as a minimum. They are completed sooner if new X-ray equipment is acquired, when existing X-ray equipment is used in a different space (i.e. new operating/procedure room), if the X-ray equipment is damaged or modified, when there is an indication of an unusually high exposure of a worker to ionizing radiation, and when there are renovations or damage to barriers (i.e. walls) that could impact radiation exposure to staff or the general public in or around the facility (e.g. changes to the occupancy of adjacent rooms, lead glass replacement).</i></p>
RDS1.1.9	<p><b>M</b> Radiation protection surveys are retained for a minimum period of 10 years.</p>
RDS1.1.10	<p><b>M</b> A list of authorized X-ray operators is maintained.  <i>Guidance: The responsible user maintains a list of authorized X-ray operators. This list specifies the name of the person, their qualifications (e.g. MD, CAMRT) and the X-ray equipment they are authorized to use.</i></p>
<b>RDS1.2</b>	<p><b>The radiation protection survey report provides results and recommendations based on the surveyor's findings.</b>  <i>Guidance: The survey report presents in a clear and systematic way the details and results of the measurements carried out, as well as the conclusions drawn and recommendations made by the surveyor. Any unusual findings about the equipment itself, the facility, or operating procedures, which could affect the safety of operators or other persons in the vicinity of the X-ray room, are clearly identified.</i></p>
RDS1.2.1	<p><b>M</b> The survey report includes a sketch of the facility, showing the location of the X-ray equipment within the facility as well as identifying the nature and occupancy of the areas adjoining the facility.</p>

No.	Description
RDS1.2.2	<b>M</b> The survey report includes identification of the X-ray equipment. <i>Guidance: Identification of the X-ray equipment includes the name of the manufacturer, model designation and serial number.</i>
RDS1.2.3	<b>M</b> The survey report includes observations made of the operational condition of the X-ray equipment. <i>Guidance: The operational condition (both electrical and mechanical) of the X-ray equipment at the time of the survey is documented in the radiation protection survey.</i>
RDS1.2.4	<b>M</b> The survey report includes the actual or estimated total workload of the facility.
RDS1.2.5	<b>M</b> The survey report includes the results of radiation measurements carried out under “typical” operating conditions. <i>Guidance: Radiation measurements are carried out both inside and outside the controlled area and these measurements along with the locations at which the measurements were made are documented in the radiation protection survey.</i>
RDS1.2.6	<b>M</b> The survey report includes a review of the available personal protective equipment, mobile protective barriers and other protective devices.
RDS1.2.7	<b>M</b> The survey report includes an indication of the estimate of potential exposures to personnel and the general public in or around the X-ray room.
RDS1.2.8	<b>M</b> The survey report includes the results of investigation of any unusually high exposures from previous personnel dosimetry reports and recommendations on whether other persons are to be included in the personnel dosimetry service.
RDS1.2.9	<b>M</b> The survey report includes a review of the facility’s quality assurance program to ensure it exists and is maintained, including quality control testing records.
RDS1.2.10	<b>M</b> The survey results, including conclusions drawn by the surveyor, are submitted to the owner, radiation safety officer or responsible user in a written report.
<b>RDS1.3</b>	<b>Radiation exposure to staff is monitored through the use of personal dosimeters.</b>
RDS1.3.1	<b>M</b> All operators of X-ray equipment and operating room staff have their radiation exposures monitored with the use of a personal dosimeter. <i>Guidance: All personnel in the operating room wear a personal dosimeter during procedures when X-ray is used. This includes the use of mini C-arms. Personal dosimeters are not shared among staff.</i>
RDS1.3.2	<b>M</b> Personal dosimeters are worn according to the recommendations of the dosimetry service provider. <i>Guidance: At least one (1) personal dosimeter is worn at waist level under the protective apron. If a second dosimeter is worn, for the purposes of measuring eye lens dose, the second dosimeter is worn outside of the lead thyroid collar.</i>
RDS1.3.3	<b>M</b> Personal dosimeters are stored according to the recommendations of the dosimetry service provider.

No.	Description
RDS1.3.4	<p><b>M</b> Personal dosimeters are submitted to the dosimetry service provider for analysis.  <i>Guidance: Personal dosimeters are submitted for analysis in accordance with the frequency specified by the dosimetry service provider. <b>Note:</b> It is the responsibility of the dosimetry service provider to submit the results to the National Dose Registry (Health Canada).</i></p>
RDS1.3.5	<p><b>M</b> Results of personal dosimeters are reviewed and monitored by a radiation safety officer or designate on a regular basis.  <i>Guidance: The radiation safety program policy and procedures outline who is responsible for reviewing and monitoring the personal dosimeter results. The results (report) are signed and dated by the reviewer. An investigation is initiated when a high reading is reported and includes documentation of the action(s) taken to improve techniques and protective measures.</i></p>
RDS1.3.6	<p><b>M</b> Dosimetry monitoring reports are retained for the period the worker is employed plus 10 years.</p>
RDS1.3.7	<p><b>M</b> Dosimeter results are made available to staff.  <i>Guidance: Results are posted or circulated to staff (i.e. communication book/board, staff meeting minutes, health and safety committee meeting minutes).</i></p>
<b>RDS1.4</b>	<p><b>Procedures are in place to protect female patients of childbearing age.</b>  <i>Intent: Only essential investigations are taken in the case of pregnant or suspected pregnant women. Care is taken to protect the fetus from radiation when the X-ray examination of a pregnant woman is unavoidable. This includes keeping the exposure to the absolute minimum, the use of shielding of the abdominal area and the use of a well-collimated X-ray beam.</i></p>
RDS1.4.1	<p><b>M</b> Before performing X-ray examinations on females of child bearing age (11 to 55 years), the patient is asked whether there is any chance that they may be pregnant.  <i>Guidance: If a patient's pregnancy status is uncertain, additional precautionary measures must be taken prior to imaging. These precautions may include obtaining and documenting last menstrual period or conducting and recording the results of a pregnancy test. This may be performed as part of the admission assessment and is documented in the patient's medical record. The physician is notified when a patient has declared that she could be pregnant and/or results of a pregnancy test are positive.</i></p>
<b>RDS1.5</b>	<p><b>Radiation warning signage is clearly visible to alert patients, staff and visitors of the risks associated with radiation.</b></p>
RDS1.5.1	<p><b>M</b> Warning signs are posted at all entrances to the operating room when X-ray equipment is in use.  <i>Guidance: Warning signs must be posted when X-ray equipment is in use. The warning signs are posted at eye-level at all entrances to the operating room. Warning signs are removed when the procedure is completed.</i></p>
RDS1.5.2	<p><b>M</b> The warning sign(s) incorporate the X-ray warning symbol.  <i>Guidance: Refer to Health Canada Safety Code 35 Appendix VI for acceptable X-ray warning symbols: <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php#app6">http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php#app6</a>. The X-ray warning symbol must be displayed in two contrasting colours, be legible for a distance and bear the words "CAUTION: X-RAYS-ATTENTION: RAYONS X."</i></p>

No.	Description
<b>RDS1.6</b>	<b>Perioperative staff are aware of the risks of ionizing radiation and manage risks appropriately.</b> <i>Intent: Perioperative staff are to be knowledgeable of the hazards of ionizing radiation. Direct radiation exposure of staff by the primary beam and deliberate irradiation of an individual for training purposes or equipment evaluation is not permitted.</i>
RDS1.6.1	<b>M</b> Only essential individuals are present in the operating room when irradiation is carried out.
RDS1.6.2	<b>M</b> The doors to the operating room remain closed when X-ray equipment is in use.
<b>RDS1.7</b>	<b>Personal protective equipment provides protection to patients, staff and visitors.</b>
RDS1.7.1	<b>M</b> All protective equipment (e.g. apron, gonad shields, gloves) provides attenuation equivalent to at least 0.5mm of lead at 150 kVp.
RDS1.7.2	<b>M</b> The lead equivalency thickness of the protective material used is clearly marked on all protective equipment and apparel.
RDS1.7.3	<b>M</b> The attenuation value is marked on all protective screens and shields.
RDS1.7.4	<b>M</b> Protective equipment is stored and maintained according to manufacturers' recommendations. <i>Guidance: All protective equipment is stored flat or on hangers designed for lead storage. The protective equipment is not folded or bent.</i>
RDS1.7.5	<b>M</b> Protective equipment is cleaned and disinfected after each patient use in accordance with manufacturer's instructions for use.
<b>RDS1.8</b>	<b>Mechanisms are in place to prevent unnecessary radiation to patients.</b>
RDS1.8.1	<b>M</b> Shielding is used, where appropriate, to limit the exposure of body tissues and when clinical objectives will not be compromised. <i>Intent: It is particularly important to protect sensitive body tissues and children. Shielding should be placed over the patient's thyroid and ovaries or testes (i.e. gonads) when these body parts are near the source of radiation. Appropriate use of specific gonad shielding is advised when: the gonads lie within, or are in close proximity to, the X-ray beam; the patient is of reproductive age (11 - 55 years); and clinical objective will not be compromised. Gonad shields are of sufficient size and shape to exclude the gonads completely from primary beam irradiation. The Operating Room Nurses Association of Canada further specifies that shielding should be used to protect reproductive organs during X-ray of the abdomen, hips and upper legs; the thyroid/sternum during X-ray of the head, neck and upper extremities; pediatric long bones whenever possible, and eyes if the radiation or procedure is near the face, head and neck.</i>
RDS1.8.2	<b>M</b> The X-ray beam is collimated to restrict the beam to the area of procedural interest.
<b>RDS1.9</b>	<b>Mobile X-ray equipment is safely operated.</b> <i>Intent: Radiation protection practices are in place to protect the operator and any other individuals in the vicinity of the patient. Every effort should be made to prevent the X-ray beam from irradiating any other person in the vicinity of the patient. The operator is not to stand in the direction of the X-ray beam and is a sufficient distance from the X-ray tube.</i>

No.	Description
RDS1.9.1	<p><b>M</b> X-ray equipment is operated by appropriately qualified personnel.  <i>Guidance: X-ray equipment (i.e. full C-Arm) is operated by technologists certified with the Canadian Association of Medical Radiation Technologists (CAMRT). Physicians do not operate conventional or full-size X-ray equipment (i.e. full C-Arm). Mini C-Arms may be operated by a physician provided they have documented training in the safe operation of the mini C-arm equipment being used, the manufacturer-specified quality assurance procedures, radiation protection procedures and measures and techniques to optimize image quality, and documentation on this training is on file. In addition, their competency must be assessed by a CAMRT certified medical radiation technologist and documentation of the competency assessment is on file. Competency of the X-ray equipment operators is assessed at a frequency defined by the responsible user.</i></p>
RDS1.9.2	<p><b>M</b> All individuals required to be immediately adjacent to the patient during the procedure wear protective aprons.  <i>Guidance: All personnel in the operating room wear protective equipment (i.e. apron) during procedures when X-ray is used. The protective apron includes thyroid collar, vest/jacket and apron/skirt. This includes the use of mini C-arms. Lead shields or curtains mounted on the mobile X-ray unit are <b>not a sufficient substitute</b> for the wearing of personal protective clothing such as lead aprons.</i></p>
RDS1.9.3	<p><b>B</b> Lead glasses are used.  <i>Guidance: Recent studies have shown the lens of the eye to be more radiosensitive than previously thought. A risk assessment of staff should be conducted to determine if eye exposure levels approach established dose limits for staff involved in radioscopic procedures. Radioscopic equipment is X-ray equipment that implements a technique in which continuous or periodic sequences of X-ray patterns are produced and simultaneously and continuously displayed in the form of visible images. Fluoroscopic equipment is another commonly used term and includes radio fluoroscopy, fluoroscopy, and C-Arm equipment.</i></p>
RDS1.9.4	<p><b>M</b> Equipment-mounted and mobile shields are used when personnel are required to remain near the patient or sterile field when the X-ray equipment is activated.  <i>Guidance: Equipment-mounted and mobile shields include suspended personal radiation protection systems, mobile hanging shields, under-table skirts, table-mounted side shields, rolling shields and sterile drape shields. These are used in addition to personnel shielding (i.e. lead apron).</i></p>
RDS1.9.5	<p><b>M</b> Before activating the X-ray equipment, the radiation equipment operator alerts the personnel in the operating room.  <i>Guidance: Alerting personnel allows them to take protective measures to be as great a distance away from the radiation source as possible and as the patient condition and patient positioning allows.</i></p>
<b>RDS1.10</b>	<b>Procedures are in place to minimize radiation exposure to patients during radioscopic procedures.</b>
RDS1.10.1	<b>M</b> During exposures, the operator has a clear line of sight to the output display at all times.
<b>RDS1.11</b>	<b>Mechanisms are in place to manage patient radiation dose.</b>

No.	Description
RDS1.11.1	<b>M</b> Patient radiation dose is measured in the form of dose-area product (DAP) or reference point air kerma (Kar). <i>Guidance: All new X-ray equipment, purchased after 2016, must be able to record reference point air kerma. For X-ray equipment that is unable to record patient dose, the kVp, mAs and SID of each exposure is recorded.</i>
RDS1.11.2	<b>M</b> Patient radiation dose is recorded in the patient's medical record. <i>Guidance: In the event of an excessive radiation dose, procedures for the management and investigation of an excessive patient radiation dose are initiated and the details of the communication with the physician and patient regarding the excessive dose and the nature of problems and associated risks is also documented in the patient's medical record.</i>
<b>RDS1.12</b>	<b>Image capture and storage is performed when X-ray is used for guidance or other interventional purposes.</b>
RDS1.12.1	<b>M</b> There is capture and storage of a minimum of one image per case.
<b>RDS1.13</b>	<b>The patient's medical record provides an accurate and comprehensive account of the X-ray examination details.</b>
RDS1.13.1	<b>M</b> The X-ray procedure patient dose is documented in the patient's medical record. <i>Guidance: For radioscopic procedures, it is strongly recommended that all available dose measures are recorded. Reference point air kerma (Kar) and DAP values are more valuable measures in terms of dose and should be recorded over fluoroscopy time. For radiographic procedures, DAP values are recorded when available. Patient dose is also documented for all pediatric patients (i.e. pediatric dental).</i>
RDS1.13.2	<b>M</b> The pregnancy status of female patients of childbearing age (11 to 55 years) is documented in the patient's medical record.
RDS1.13.3	<b>M</b> The protective apparel used and the area(s) protected are documented in the patient's medical record.
<b>RDS1.14</b>	<b>All new, used, and refurbished medical X-ray equipment conforms to Health Canada regulatory requirements.</b> <i>Intent: Whenever possible, existing medical X-ray equipment is upgraded to incorporate as many as possible of the safety and performance features required of new medical X-ray equipment, as specified in the radiation emitting devices (RED) regulations in effect at that time. It is noted that it is a requirement of the Radiation Emitting Devices Act that replacements for any component or subassembly of an X-ray machine, for which a construction or performance standard has been specified in the regulations applicable to the class of X-ray equipment, comply with the standards in effect at the time of replacement.</i>
RDS1.14.1	<b>M</b> At time of purchase, all new, used, and refurbished medical X-ray equipment conforms to RED regulations. <i>Guidance: As part of acceptance testing procedures there is verification of compliance to RED regulations for diagnostic X-ray equipment (Part XII). <b>Note:</b> Only a few of many important regulations are outlined in the descriptors below.</i>
RDS1.14.2	<b>M</b> The X-ray system has an irradiation switch that requires continuous pressure by the operator for the entire period of any irradiation and enables the operator to terminate the recording of serial X-ray images at any time.
RDS1.14.3	<b>M</b> The X-ray system has a visual indicator that continuously displays the X-ray tube voltage and the X-ray tube current.
RDS1.14.4	<b>M</b> The X-ray system has a high-level irradiation control that is activated by separate means and that requires the continuous pressure by the operator to emit X-rays.

No.	Description
RDS1.14.5	<b>M</b> The X-ray system has an audible signal that is emitted when the high-level irradiation control is in use.
RDS1.14.6	<b>M</b> The X-ray system has a device that limits the focal spot to skin distance. <i>Guidance: The focal spot to skin distance is not less than 30 cm for mobile equipment. In the case of small-format, low-intensity radioscopic equipment, the minimum focal spot to skin distance is the distance at which the equipment is capable of delivering an air kerma rate of 50 mGy/min.</i>
RDS1.14.7	<b>M</b> The X-ray system has a laser image hold system which keeps on display the last X-ray image obtained.
<b>RDS1.15</b>	<b>Standard protocols result in images appropriate for their intended use in clinical decision-making.</b>
RDS1.15.1	<b>M</b> Protocol information includes the radiation technique. <i>Intent: Loading factors and techniques (e.g. tube voltage, current and filtration) are documented for all examinations in a technique chart or separate imaging protocol. Techniques preprogrammed into the X-ray system are not an acceptable substitute.</i>
RDS1.15.2	<b>M</b> Protocol information includes the equipment/supplies needed.
RDS1.15.3	<b>M</b> Protocol information includes a description of patient positioning. <i>Intent: At a minimum, a description of patient positioning for interventional and specialized procedures is provided.</i>
RDS1.15.4	<b>M</b> Protocols are readily available to staff performing the examination.
RDS1.15.5	<b>M</b> Technique charts are available and reflective of the equipment used.
<b>RDS1.16</b>	<b>Acceptance testing is performed after purchase and prior to clinical use of X-ray systems.</b> <i>Guidance: The acceptance testing report confirms evaluation of each of the following items.</i>
RDS1.16.1	<b>M</b> Acceptance testing includes visual and functional testing of the mechanical properties.
RDS1.16.2	<b>M</b> Acceptance testing includes visual and functional testing of the safety systems.
RDS1.16.3	<b>M</b> Testing includes evaluation of the accuracy of loading factors. <i>Guidance: Testing is performed on the kVp accuracy (e.g. X-ray tube voltage), current time product mAs, and timer accuracy (loading time).</i>
RDS1.16.4	<b>M</b> Testing includes evaluation of the radiation output reproducibility.
RDS1.16.5	<b>M</b> Testing includes evaluation of the radiation output linearity.
RDS1.16.6	<b>M</b> Testing includes evaluation of the (HVL) X-ray beam filtration.
RDS1.16.7	<b>M</b> Testing includes evaluation of the X-ray field and light field alignment.
RDS1.16.8	<b>M</b> Testing includes evaluation of the X-ray beam collimation.
RDS1.16.9	<b>M</b> Testing includes evaluation of the accuracy of the dose area product value.

No.	Description
RDS1.16.10	<b>M</b> Testing includes evaluation of the radioscopic timer and chronometer.
RDS1.16.11	<b>M</b> Testing includes evaluation of the grid performance.
RDS1.16.12	<b>M</b> Testing includes evaluation of the uniformity and artifacts.
RDS1.16.13	<b>M</b> Testing includes evaluation of the high contrast resolution (special resolution).
RDS1.16.14	<b>M</b> Testing includes evaluation of the low contrast detectability (contrast detectability).
RDS1.16.15	<b>M</b> Testing includes evaluation of the maximum air kerma rate.
RDS1.16.16	<b>M</b> Testing includes evaluation of the typical image receptor air kerma rate.
RDS1.16.17	<b>M</b> Testing includes evaluation of the automatic intensity control.
RDS1.16.18	<b>M</b> Testing includes phantom dose measurements (phantom entrance dose rate).
<b>RDS1.17</b>	<b>Daily quality control procedures are established and used to monitor performance of X-ray systems.</b>
RDS1.17.1	<b>M</b> Daily testing includes performing equipment warm-up as per the manufacturer's recommendations. <i>Guidance: On each procedural day where the use of X-ray equipment is planned, daily testing is performed before the start of the case in which the X-ray equipment will be used and documented in a log.</i>
RDS1.17.2	<b>M</b> Daily testing includes visual inspection of X-ray system cleanliness. <i>Intent: X-ray system procedures often use radio-opaque contrast media. The image intensifier or digital detector housing is checked for any such material which might produce artifacts on the images. Imaging systems are inspected for dust and dirt on or near the image reception area where they may negatively affect image quality. Daily testing is performed before the start of the case in which the X-ray equipment will be used and documented in a log.</i>
<b>RDS1.18</b>	<b>Annual quality control procedures are established and used to monitor performance of X-ray systems.</b> <i>Guidance: Quality control procedures can be completed by the vendor, medical physicist or biomedical engineer. The annual testing report confirms evaluation of each of the following items.</i>
RDS1.18.1	<b>M</b> Annual testing includes an evaluation of the accuracy of loading factors.
RDS1.18.2	<b>M</b> Annual testing includes an evaluation of the radiation output reproducibility.
RDS1.18.3	<b>M</b> Annual testing includes an evaluation of the radiation output linearity. <i>Guidance: Output with mAs.</i>
RDS1.18.4	<b>M</b> Annual testing includes an evaluation of the X-ray beam filtration.
RDS1.18.5	<b>M</b> Annual testing includes an evaluation of the X-ray field and light field alignment. <i>Guidance: Congruency of X-ray beam and light field edges.</i>

No.	Description
RDS1.18.6	<b>M</b> Annual testing includes an evaluation of the X-ray beam collimation. <i>Guidance: Congruency of X-ray beam and light field centres.</i>
RDS1.18.7	<b>M</b> Annual testing includes an evaluation of the accuracy of the dose area product and reference point air kerma measurements. <i>Guidance: All available measures of dose are assessed and calibrated annually.</i>
RDS1.18.8	<b>M</b> Annual testing includes an evaluation of the grid performance. <i>Guidance: Check uniformity and movement of grid.</i>
RDS1.18.9	<b>M</b> Annual testing includes an evaluation of the high contrast resolution (special resolution). <i>Guidance: Line-pair or Leeds phantom.</i>
RDS1.18.10	<b>M</b> Annual testing includes an evaluation of the maximum air kerma rate. <i>Guidance: The maximum air kerma rate must be less than the value listed in the Radiation Emitting Devices Act subsection 28(1) at the reference point defined by subsection 28(2).</i>
RDS1.18.11	<b>M</b> Annual testing includes an evaluation of the automatic intensity control. <i>Guidance: Tracking of detector dose with phantom thickness.</i>
RDS1.18.12	<b>M</b> Annual testing includes an evaluation of the phantom dose measurements. <i>Guidance: Measure the entrance dose to a phantom for common procedures.</i>
RDS1.18.13	<b>M</b> Lead protective apparel testing is conducted and documented annually or when damage is suspected. <i>Guidance: Protective apparel testing may be performed by a third party (e.g. hospital radiology department). Lead protective apparel is decommissioned and properly disposed of when holes or cracks exceed the maximum aggregate area as published by the BC Centre for Disease Control. Documentation of annual testing of the lead protective apparel testing is on file.</i>
RDS1.18.14	<b>M</b> Lead protective apparel is identified with a unique identification number. <i>Guidance: The unique identification number allows for tracking of the condition, annual testing and decommissioning of lead protective apparel.</i>
<b>RDS1.19</b>	<b>Policies and procedures contain all the information necessary for the safety of patients, staff and visitors.</b> <i>Intent: Policies and procedures ensure that activities/procedures are performed consistently and accurately by all personnel within the non-hospital facility.</i>

No.	Description
RDS1.19.1	<p><b>M</b> There is policy and procedures for the safe use of X-ray equipment.  <i>Guidance: The policy and procedures outline the safe use of X-ray equipment including practices for keeping exposure to X-rays as low as reasonably achievable (ALARA), safe operation of the equipment, education and training of perioperative staff in proper radiation protection practices, correct use of any personal protective equipment including protection of patients of childbearing age (11 to 55 years), and dosimetry requirements. They are developed and revised/updated by personnel directly involved in X-ray operation in collaboration with the medical physicist or radiation safety officer, as appropriate, and approved by the medical director. The policy and procedures are reviewed annually and revised as necessary to ensure currency with standards, applicable regulations and professional guidelines.</i></p>
RDS1.19.2	<p><b>M</b> There is policy and procedures for the medical physicist/radiation safety officer responsibilities.  <i>Guidance: The policy and procedures outline the responsibilities of the medical physicist or radiation safety officer which include: assessing the radiation safety of an installation at the time of planning and/or construction of the facility, or when modifications are planned and/or are being made to an existing facility; ensuring that radiation protection inspections are scheduled and performed; establishing safe working conditions according to the recommendations of Health Canada Safety Codes and the statutory requirements of federal or provincial legislation, where applicable; reviewing radiation safety procedures periodically and updating them to ensure optimum patient and operator safety; instructing X-ray equipment operators and other personnel participating in X-ray procedures in proper radiation protection practices; carrying out routine checks of equipment and facility safety features and radiation surveys; ensuring that appropriate radiation survey instruments are available, in good working condition, and properly calibrated, keeping records of radiation protection surveys including summaries of corrective measures recommended and/or instituted; declaring who is to be considered an occupationally exposed person (e.g. personnel who may receive a radiation dose in excess of 1/20th of the recommended dose limit for a radiation worker); organizing participation in a personnel radiation monitoring service, such as that provided by the National Dosimetry Services, Health Canada; ensuring that all occupationally exposed persons wear personal dosimeters during radiological procedures or when occupational exposures are likely; reviewing, managing and maintaining records of occupational exposures received by personnel; investigating each known or suspected case of excessive or abnormal exposure to patients and staff to determine the cause and to take remedial steps to prevent its recurrence; and participating in the establishment of diagnostic reference levels. Diagnostic reference levels represent a range of acceptable radiation doses (upper and lower limits usually measured in air kerma product) for patients for a given examination.</i></p>

No.	Description
RDS1.19.3	<p><b>M</b> There is policy and procedures for the “responsible user” responsibilities.  <i>Guidance: The policy and procedures outline the responsibilities of the responsible user which include: ensuring that the X-ray equipment, image processing equipment (applicable to flat plate equipment only), and ancillary/auxiliary equipment function correctly; ensuring that the equipment is maintained properly by implementing and maintaining an effective imaging quality assurance program for the facility, including quality control testing, establishing diagnostic reference levels and record keeping; ensuring that equipment is used correctly, and maintained properly, by competent personnel who are properly trained in the safe operation of the equipment; ensuring that inexperienced personnel (i.e. physician being trained to operate a mini C-arm) operate the equipment only under the direct supervision of a Canadian Association of Medical Radiation Technologists (CAMRT) certified and experienced X-ray equipment operator until competence in a given clinical procedure is achieved; establishing documented safe operating procedures for the equipment and ensuring that operating staff are adequately instructed; disseminating documented rules of radiation safety and ensuring that staff members are made aware of them through training; ensuring an investigation is completed of any known or suspected exposures received by personnel that are unusually higher than the usual dose received by that individual, or in excess of 1/20th of the dose limit for radiation workers; ensuring that radiation levels in controlled and uncontrolled areas are below the maximum permissible limits such that the annual dose limits to radiation workers and the public will not be exceeded; and ensuring that an effective communication system is maintained between X-ray equipment operators, physicians and medical physicists/radiation safety officers to discuss all matters related to radiation protection of patients and workers.</i></p>
RDS1.19.4	<p><b>M</b> There is policy and procedures for the management and investigation of an excessive radiation dose from any X-ray procedure.  <i>Guidance: The policy and procedures outline when notification and guidance to medical practitioners and patients is required in the event of an excessive patient radiation dose. The policy and procedures also outline the investigation of any unusually high radiation doses (e.g. dose indicator values) by a medical physicist as necessary. Cases of excessive radiation dose should include a decision to consult with the patient and medical practitioner to provide guidance so that a possible effect is conservatively and proactively treated.</i></p>
RDS1.19.5	<p><b>M</b> There is policy and procedures for the investigation of high personal dosimeter results.  <i>Guidance: The policy and procedures outline who is responsible for reviewing and monitoring the personal dosimeter results and investigating a high reading including documentation of the action(s) taken to improve techniques and protective measures. Incidents that require reporting to regulatory authorities (e.g. WorkSafeBC, the College) are reported when required.</i></p>

No.	Description
RDS1.19.6	<p><b>M</b> There is policy and procedures for radiation protection of pregnant personnel.  <i>Guidance: The policy and procedures outline personnel responsibility for declaring a known or suspected pregnancy, radiation protection techniques (i.e. maternity or double-thickness apron) and dosimetry monitoring. Refer to Occupational Health and Safety Regulation (WorkSafeBC), section 7.21 Reproductive hazards and Health Canada Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities, section 2.0 Procedures for minimizing radiation exposure to personnel.</i></p>
RDS1.19.7	<p><b>M</b> There is policy and procedures for radiation protection of pregnant or potentially pregnant patients.  <i>Guidance: The policy and procedures outline assessment of a patient's pregnancy status at time of admission to the facility (i.e. last menstrual period, pregnancy testing), notification of surgeon in the event of pregnancy or suspected pregnant patient, and decision-making criteria on whether or not to proceed with a surgical procedure involving X-ray examination.</i></p>

## References

- Association of periOperative Registered Nurses (AORN). Guidelines for perioperative practice 2018 edition. Denver, CO: AORN; 2018. Guideline for radiation safety; p. 331-63.
- BC Centre for Disease Control. RIN #14: Radiation protection during orthopaedic procedures with mini c-arm units [Internet]. Vancouver: BC Centre for Disease Control; 2004? [cited 2019 May 8]. 2 p.
- BC Centre for Disease Control. RIN #21: guideline for wearing radiation monitoring devices [personal dosimeters] [Internet]. Vancouver: BC Centre for Disease Control; 2014 [cited 2019 May 8]. 1 p.
- College of Physicians and Surgeons of Alberta. Non-hospital surgical facility: standards & guidelines – March 2016, v23 [Internet]. Edmonton, AB: College of Physicians and Surgeons of Alberta; 2016 [cited 2019 May 8]. 62 p.
- College of Physicians and Surgeons of Ontario. Out-of-hospital premises inspection program (OHPIP) - program standards [Internet]. Toronto: College of Physicians and Surgeons of Ontario; 2013 [revised 2017 Oct; cited 2019 May 8]. 44 p.
- Diagnostic Accreditation Program; College of Physicians and Surgeons of British Columbia. Diagnostic accreditation program – accreditation standards 2014: diagnostic imaging, version 1.3 [Internet]. Vancouver: Diagnostic Accreditation Program; 2016. [cited 2019 May 8]. 245 p.
- Health Canada. Safety code 35: safety procedures for the installation, use and control of X-ray equipment in large medical radiological facilities [Internet]. Ottawa: Minister of Health; 2008 [cited 2019 May 8]. 88 p.
- Health Canada. X-ray equipment in medical diagnosis part A: recommended safety procedures for installation and use – safety code 20A [Internet]. Ottawa: Minister of Health; 1999 [cited 2019 May 8]. 51 p.
- Operating Room Nurses Association of Canada (ORNAC). The ORNAC standards, guidelines, and position statements for perioperative registered nurses. 13th ed. Toronto: CSA Group; 2017. 469 p.
- WorkSafe BC. Occupational health and safety regulation. Part 7: noise, vibration, radiation and temperature – division 3: radiation exposure [Internet]. Richmond, BC: WorkSafe BC; 2005. [cited 2019 May 8].

## Revision history

Date	Revisions
July 4, 2019	<ul style="list-style-type: none"> <li>• Required elements of the radiation protection survey report have been specified.</li> <li>• New descriptor for the cleaning and disinfection of protective equipment.</li> <li>• Required safety and performance features for X-ray equipment have been specified.</li> <li>• Required elements for X-ray procedure protocols have been specified.</li> <li>• Required elements of acceptance testing have been specified.</li> <li>• Quality control requirements have been specified.</li> <li>• Several new policies and procedures.</li> <li>• Substantial format changes and guidance added.</li> </ul>