



Complete Program Title: X-ray Safety Program	Risk Management Manual (RMM) Number: 701
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1 PURPOSE

- 1.1 This entry in the McMaster University Risk Management Manual specifies the X-ray Safety Program implemented by McMaster University (the University) for X-ray work in university facilities and work areas. This program is designed to incorporate best practices in the control of x-ray hazards in the workplace and to satisfy the requirements of the following legislation:
- [Ontario Regulation 861: X-Ray Safety](#), made under the [Ontario Occupational Health and Safety Act](#)
 - [Ontario Regulation 543: X-Ray Safety Code](#), made under the [Ontario Healing Arts and Radiation Protection Act](#).
- 1.2 The X-ray Safety Program incorporates best practices, in addition to legal requirements. Therefore, compliance with the program will also serve to protect the University and individuals from civil liabilities which may arise from exposure to members of the public.
- 1.3 The overall objectives of the X-ray Safety Program are:
- Prevent tissue reactions (radiation injuries).
 - Minimize the probability of stochastic effects by requiring that radiation exposures be maintained as low as reasonably achievable (ALARA).
 - Achieve compliance with Ontario legislative requirements

2 SCOPE

- 2.1 This entry applies to all activities involving the purchase, installation, operation, relocation, and decommissioning of x-ray machines at McMaster facilities, including areas off-campus where university research may be conducted.
- 2.2 This program applies to all persons working with or in proximity to x-ray machines which are owned or controlled by McMaster, including but not limited to: faculty, staff, undergraduate students, graduate students, post-doctoral fellows, visiting professors, volunteers and contractors.

3 Related Documents

[RMM 107 – Health Physics Advisory Committee Terms of Reference](#)

[Ontario Regulation 861: X-Ray Safety](#)

[Ontario Regulation 543: X-Ray Safety Code](#)

4 DEFINITIONS

- 4.1 Authorized X-ray User A person registered with the Health Physics Department who has completed required training and who is authorized to operate x-ray machines owned or controlled by the University.
- 4.2 Absorbed Dose As defined in Regulation 861/90, means the mean energy per unit mass imparted by ionizing radiation to matter.
- 4.3 Cabinet X-ray System An x-ray machine in which the source, the object being exposed to x-rays and the detection machine are enclosed in a cabinet that, independent of existing structures, provides radiation attenuation to less than 5 $\mu\text{Gy/h}$ at 5 cm from any external surface and prevents access to the x-ray beam
- 4.4 Dose Equivalent: As defined in Regulation 861/90, means the product of absorbed dose and a quality factor where the quality factor is a measure of the biological effectiveness of the radiation, and is assigned the value of 1.0 for X-rays.
- 4.5 Gray (Gy) As defined in Regulation 861/90, means a unit of absorbed dose, and is realized when one joule of energy has been imparted per kilogram of material.
- 4.6 Sievert (Sv): As defined in Regulation 861/90, means a unit of dose equivalent and for X-rays the dose equivalent measured in Sieverts is numerically equal to the absorbed dose measured in Grays.

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| 4.7 | Ensure | Take every reasonable precaution to achieve the stated objective. |
| 4.8 | X-ray Machine | As defined in Regulation 861, an electrically powered device the principal purpose of which is the production of X-rays. |
| 4.9 | X-ray Work | Work with x-ray machines that may involve setting up, maintaining, reconfiguring apparatus, changing samples, gathering data, and operating the machine in an area posted as an x-ray Area. |
| 4.10 | X-ray Worker | As defined in Regulation 861/90, means a worker who as a necessary part of the worker's employment, may be exposed to x-rays, and may receive a dose equivalent in excess of the annual limits set forth in Column 4 of the Schedule of Regulation 861/90 (e.g. 5 mSv whole-body dose). |

Acronyms:

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| 4.11 | ACL | <u>Administrative Control Level</u> . A University established limit related to the X-ray safety program. ACLs are set below corresponding Regulatory limits. |
| 4.12 | ALARA | <u>As Low As Reasonably Achievable</u> , social and economic factors being taken into account. |

5 RESPONSIBILITIES

5.1 The Health Physics Advisory Committee (HPAC)

The HPAC receives its authority from the President and Vice Chancellor of McMaster University. The complete terms of reference of the HPAC are documented in [McMaster RMM 107, Health Physics Advisory Committee](#). With respect to the X-ray Safety Program, the HPAC is charged with the following responsibilities:

- Informing the President and senior management of the hazards related to the use of x-ray machines and to regulate their use as requested by the President.
- Establishing and continually reviewing an adequate radiation safety program at McMaster University.
- Maintaining the University's compliance with radiation protection regulations promulgated by federal, provincial and local authorities.
- Granting authorizations and restricting use of x-ray machines;
- Issuing x-ray permits

Note: The HPAC has no authority or mandate with respect to patient safety in medical diagnostic or therapeutic procedures.

5.2 The Health Physics Department

Under the direction of the Senior Health Physicist, the Health Physics Department is responsible for

- Facilitating the implementation of this X-ray Safety Program.
- Obtaining and maintaining registrations for x-ray machines as required by the Ontario Ministry of Labour or the Ontario Ministry of Health and Long-Term Care.
- Providing services that may be required to meet the objectives of this program including, but not limited to:
 - (a) registration and authorization of workers
 - (b) x-ray safety training programs
 - (c) consultation and advice on X-ray safety
 - (d) administration of the dosimetry program
 - (e) commissioning, inspecting, monitoring and decommissioning x-ray facilities
 - (f) calibration and short term loan of radiation protection instruments
 - (g) maintaining an inventory of x-ray machines, including inactive machines
 - (h) maintaining x-ray safety records
 - (i) preparing and maintaining policies and procedures related to the X-Ray Safety Program
 - (j) prescribing medical examinations under the direction of the HPAC's Medical Consultant
 - (k) Issuing stop-work orders
 - (l) Maintaining a list of all designated x-ray workers

5.3 Project Supervisor

The Project Supervisor is the person who is responsible for an X-ray source and/or the workspace in which it is located. They will typically be identified as the Permit Holder for the x-ray permit issued by HPAC, and as the owner of the x-ray machine on applications to the provincial regulator. The Project Supervisor must hold one of the following positions at the University:

- a) A faculty member at McMaster University,
- b) A manager or senior manager in a University department, or
- c) A senior representative of an external agency or corporation performing work at McMaster University under a contractual agreement.

Each Project Supervisor in control of an x-ray machine is responsible for the following:

- Notifying Health Physics of:
 - a) The intent to purchase or acquire an x-ray machine,
 - b) The installation of an x-ray machine, or
 - c) The intent to relocate, transfer or decommission an x-ray machine.
- Providing adequate facilities, equipment, instruments, supervision and written instructions to control radiation hazards and to comply with the X-Ray Safety Program
- Requiring that work with x-ray machines is conducted in a safe manner and in accordance with this program and the permit granted by the HPAC. In particular, ensuring:
 - a) Work is conducted only by authorized persons who have completed required training;
 - b) Work is conducted only in the manner specified in the project application and in the approved permit;
 - c) All required protective equipment and devices are used as specified in the project application and in the approved permit;
- Implementing all required x-ray safety procedures within the facilities under their control.
- Directing all persons working in the facility to incorporate ALARA considerations in all radiological work, and monitoring staff for compliance.
- Immediately terminating unsafe work and ensuring that unsafe acts and conditions are reported to Health Physics.
- Acting as the X-ray Supervisor or appointing an X-ray Supervisor in writing.

5.4 Radiation Protection Officer

The Radiation Protection Officer (RPO) designation is only required for x-ray machines that are used on humans and are registered with the Ministry of Health and Long-Term Care. An RPO is required for each x-ray machine that meets this description and must be:

- A legally qualified medical practitioner,
- A member of the Royal College of Dental Surgeons of Ontario,
- A member of the College of Chiropractors of Ontario, or
- A member of the College of Chiropractors of Ontario.

The RPO may only be responsible for x-ray machines that are commensurate with their qualifications (i.e., a member of the Royal College of Dental Surgeons may only be an RPO for dental x-ray equipment)

The RPO is responsible for:

- Ensuring that every x-ray machine is maintained in safe operating condition,
- Ensuring that every person who operates the x-ray machine is qualified, and
- Establishing and maintaining procedures and tests for the x-ray machine.

5.5 X-Ray Supervisors

The X-ray Supervisor must be competent and experienced in the use and operation of the x-ray machine and is responsible to exercise control over the machine. The X-ray Supervisor may be the Project Supervisor in control of an X-ray source or a person appointed in writing by the Project Supervisor.

The X-ray Supervisor is responsible for the following:

- Requiring that work with x-ray machines is conducted in a safe manner and in accordance with this program. In particular, ensuring that:
 - (a) Health Physics is informed of any changes to the x-ray machine with respect to experimental apparatus, location and orientation of X-ray machine, interlocks or other safety components.
 - (b) work is conducted only by authorized users who have completed required training
 - (c) all required protective equipment and devices are properly used
- Maintaining a current list of all authorized users for each x-ray machine
- Immediately informing Health Physics of any incident that could have resulted in exposure to the primary beam or exposures exceeding any dose limits listed in Table 1 or 2.
- Providing machine-specific operational training to all authorized users and maintaining training records
- Ensuring that the machine is maintained and tested as specified by the manufacturer and/or the Radiation Protection Officer

5.6 Authorized X-ray Users

Each Authorized X-ray User is responsible for:

- Complying with the requirements of the HPAC and the X-ray Safety Program.
- Taking all reasonable and necessary precautions to ensure that work is conducted in a safe manner.

- Following all procedures, posted instructions and established practices designed to achieve safety in x-ray work
- Seeking assistance from supervision or Health Physics when unsure of how to proceed safely with a task
- Using prescribed personnel protective equipment, devices and dosimeters
- Immediately alerting supervision and Health Physics to any unsafe condition or act

5.7 Departmental Chairs, Directors or Equivalent Senior Managers

Departmental Chairs, Directors or Equivalent Senior Managers are responsible for the following:

- Ensuring that Health Physics is notified of:
 - a) The intent to purchase or acquire an x-ray machine,
 - b) The installation of an x-ray machine, and
 - c) The decommissioning of an x-ray machine.
- Determining overall staffing and budget levels for compliance with x-ray requirements.
- Ensuring that the cost of disposal is included in the project or department budgets.

5.8 The Vice-President, Research

The Vice-President, Research is responsible for:

- Determining overall staffing and budget levels for the Health Physics Department;
- Monitoring, in conjunction with the HPAC, the performance of the Health Physics Department to ensure the adequate implementation of the X-ray Safety Program at the University;
- Providing funding for the operation of this X-ray Safety Program at levels approved through the normal budgetary process of the University.

5.9 Facility Services

Facility Services is responsible for:

- Maintaining facilities and laboratories in campus buildings, and

- Supporting the decommissioning of x-ray devices.

5.10 **McMaster University Security Services**

McMaster University Security Services is responsible for:

- Providing consultation and advice regarding security of x-ray facilities,
- Conducting regular security patrols of campus buildings, commensurate with risk,
- Providing continual dispatch service and alerting the on-call Health Physics staff member to any reported or suspected radiation emergency or incident.

5.11 **University Health and Safety**

University Health and Safety (UHS) provides safety and risk management specialists committed to achieve standards in the areas of environmental and occupational health, safety, loss prevention and mitigation. UHS is the primary representative for all interactions with the Ministry of Labour, Immigration, Training and Skills Development (MLITSD) of Ontario. They shall be notified of any x-ray audits by the MLITSD, regulatory actions received and included on any formal correspondence with the MLITSD.

5.12 **Joint Health and Safety Committee:**

The Joint Health and Safety Committee (JHSC) is responsible for identifying, evaluating and making recommendations concerning workplace health and safety programs. The applicable JHSC shall be informed of any MLITSD activities related to x-ray safety. A designated certified worker member and a management member are to be notified and accompany any MLITSD inspector conducting inspections in the workplace.

5.13 **Hamilton Health Sciences**

Under the agreement between the University and Hamilton Health Sciences (HHS) regarding use and occupancy of the Health Science Centre (HSC), HHS is responsible for:

- Maintaining facilities and laboratories in the HSC.

6 X-RAY SAFETY PROCEDURES

6.1 X-ray Permit and Registration

- 6.1.1 No person shall acquire, possess, transfer, ship, use, dispose or abandon an x-ray device at McMaster University except as authorized by a permit issued under the authority of the Health Physics Advisory Committee (HPAC). Approval is required for each x-ray machine.
- 6.1.2 Persons seeking approval for an x-ray machine shall apply in writing by completing the X-ray Permit Application Form supplied by Health Physics and providing any additional information as requested.
- 6.1.4 Health Physics shall submit the registration application to the appropriate regulatory body on behalf of the Project Supervisor. No permit shall be issued until registration with the province is complete.
- X-ray machines not used on humans are registered with the Ontario Ministry of Labour
 - X-ray machines used on humans are registered with the Ontario Ministry of Health and Long-Term Care
- 6.1.5 For a machine that will be used on humans and is to be registered with the Ministry of Health, Project Supervisors must designate a Radiation Protection Officer who meets the qualifications specified in section 5.4. Note that the McMaster Health Physics Department is unable to provide staff to fulfill this requirement.
- 6.1.6 For new machines that are used on humans, the Project Supervisor must submit the results of tests conducted to verify whether or not the x-ray machine complies with the provisions of the [Radiation Emitting Devices Act](#) to Health Physics. Health Physics must submit these results to the Ministry of Health and Long-Term Care within 60 days of the installation of a new x-ray machine.
- 6.1.7 Permits shall be issued with an expiry date determined at the discretion of the HPAC. The maximum term shall be five years. Prior to expiry, Project Supervisors shall notify Health Physics of the intent to continue work.
- 6.1.8 Approved installations of x-ray machines shall not be altered except with the written approval of Health Physics. This includes changes to:
- The installation or use of the x-ray source
 - Any shielding changes for the x-ray source or facility
 - Changes to the x-ray target or other components

6.2 User Authorization and X-ray Worker Designation

- 6.2.1 No person shall perform work with x-ray machines unless that person is approved by Health Physics as an Authorized X-ray User.

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- 6.2.2 X-ray Supervisors shall maintain a list of Authorized X-ray Users for each x-ray machine for which they are responsible.
- 6.2.3 X-ray Users will only be designated as X-Ray Workers (as defined in regulation 861) if they may receive an annual whole-body dose of more than 5 mSv from their work.
- 6.2.4 Machines registered with the Ministry of Health for use on humans must only be operated by:
- An individual who meets the requirements for designation as a Radiation Protection Officer
 - A member of the College of Medical Radiation and Imaging Technologists on Ontario
 - A member of the College of Dental Hygienists of Ontario
 - An individual working under the supervision of one of the above
- 6.2.5 No person shall operate an x-ray machine for the irradiation of a human being unless the irradiation has been prescribed by:
- An individual who meets the requirements for designation as a Radiation Protection Officer
 - A member of the College of Nurses of Ontario who holds an extended certificate under the Nursing Act

6.3 Training

- 6.3.1 All Authorized X-ray Users shall receive both radiation safety training and operational training prior to operating an x-ray machine.
- 6.3.2 Radiation safety training will be developed and conducted by Health Physics. This training shall address the following:
- Properties and interactions of radiation
 - Risks and Hazards of X-Radiation
 - Measurement of radiation
 - Pregnancy and radiation
 - Meaning of designation as an X-ray Worker
 - The X-Ray Safety Program
 - Radiation protection legislation
- 6.3.3 Operational training specific to each x-ray machine shall be provided by the X-Ray Supervisor. Safety aspects of the work shall be incorporated in all task specific training provided by x-ray Supervisors.
- 6.3.4 Individuals external to McMaster may be trained and designated as authorized users provided their work is governed by an agreement which ensures that they comply

with the x-ray safety program and they perform the work under the responsibility of the Project Supervisor

- 6.3.5 Contractors, maintenance support staff and others performing work in an x-ray area shall have their work reviewed by the X-ray Supervisor for the purpose of determining training requirements. Where there is a reasonable probability that these individuals may encounter x-ray fields in the course of their work, Health Physics shall be consulted prior to commencing the work.

6.4 Dosimetry

- 6.4.1 Whole-body dosimeters shall be prescribed for all authorized users, excluding those working exclusively with a cabinet x-ray systems.
- 6.4.2 In the case of cabinet x-ray systems, an area dosimeter shall be placed in the location where the highest personal dose is expected (typically the control console)
- 6.4.3 Extremity dosimeters shall be provided to authorized users who may conduct live alignments or work with open beams of X-rays.
- 6.4.4 Electronic Personal Dosimeters (EPDs) shall be used by any person who may be exposed to radiation fields in excess of 100 $\mu\text{Gy/hr}$ during x-ray work.
- 6.4.5 Health physics shall review all dosimetry results.
- 6.4.5 Dosimetry results should be provided to authorized users in writing annually. Area dosimetry results shall be provided to the X-ray Supervisor. Additional dosimetry results shall be provided by Health Physics upon request.

6.5 Dose Limits

- 6.5.1 All doses shall be maintained As Low As Reasonably Achievable, social and economic factors taken into consideration (ALARA).
- 6.5.2 Regardless of dose level established through any ALARA optimization, all doses shall be maintained less than the applicable Regulatory Dose Limits reproduced in Tables 1 and 2.
- 6.5.3 All work shall be conducted such that no person exceeds the applicable Administrative Control Levels (ACLs) in Tables 1 and 2 without the prior written authorization of the HPAC.
- 6.5.4 Where an X-Ray Worker has received a dose in excess of the Administrative Control Levels in Table 1 or 2, an investigation shall be carried out under the direction of Health Physics. A verbal report shall be made immediately to the HPAC Chair, with a written report following within 10 days. The final report shall be presented to HPAC when complete and shall include the findings of the investigation and the corrective actions taken.
- 6.5.5 Where an X-ray Worker has received a dose exceeding the applicable "Regulatory Dose Limits" in Table 1 or 2, the Senior Health Physicist shall be notified

immediately. The Senior Health Physicist shall then immediately and in writing notify the MLITSD or the Ministry of Health and Long-Term Care, as appropriate, the Co-Chairs of the Joint Health and Safety Committee for the area, and the HPAC Chair. The final report shall be shared with these groups when complete and shall include the findings of the investigation and the corrective actions taken.

6.6 Pregnancy

6.6.1 When an X-ray User becomes aware that she is pregnant she can choose to inform the Senior Health Physicist.

6.6.2 Upon notification, Health Physics shall review the duties of the user to ensure to ensure that the radiation exposures are maintained within the dose limits in Table 1. The X-ray Supervisor is responsible for arranging any accommodation identified by this review that will not occasion costs or business inconvenience constituting undue hardship to the University.

6.7 Safety Systems

6.7.1 Any open beam x-ray system (e.g. non-cabinet x-ray machines) shall include the following safety measures:

- The control panel of the x-ray machine shall have a plainly visible warning light to indicate when x-rays are being produced
- The x-ray machine shall be contained in an enclosure
- No person shall be permitted in the enclosure while x-rays are being produced
- The enclosure shall be provided with:
 - Reliable locks or interlocks to prevent any person from entering the enclosure during an exposure and, where an exposure is terminated by an interlock, it shall only be possible to restart the exposure from the control panel, and
 - Conspicuous warning lights near each entrance to the enclosure that indicate when x-rays are being produced.
- If the enclosure is designed so that the operator cannot readily determine whether it is unoccupied, it shall be provided with:
 - Audible or visible pre-exposure warning signals within the enclosure that shall be actuated for not less than ten or more than thirty seconds immediately before the initiation of an x-ray exposure.
 - Audible or visible warning signals within the enclosure that shall be actuated during the x-ray exposure, and
 - A suitable exit to enable a person to leave the enclosure without delay and without having to pass through the primary x-ray beam or an effective means, within the enclosure, that:

- Prevents or interrupts an x-ray exposure
 - Cannot be reset from outside the enclosure, and
 - Can be reached without having to pass through the primary x-ray beam.
- 6.7.2 Cabinet systems that are intended to allow the entry of a person shall be treated as if they are an enclosure where the operator cannot readily determine whether the enclosure is unoccupied, and shall be provided with the same safety systems described above.
- 6.7.3 Cabinet systems shall have a warning device that indicates when x-rays are being produced mounted on or near the cabinet in such a way as to be conspicuous from any position from which the cabinet can be opened.
- 6.7.4 Access doors and sample ports shall be interlocked with the x-ray source or a shielded shutter and, when activated, operation can only be resumed from the control panel after the interlock has been reset.
- 6.7.5 Every point of access to an area or room where an x-ray machine is located shall be posted with an x-ray warning sign. This sign shall include:
- A warning sign with the words “Caution – X-rays” or equivalent, and
 - Emergency contact information including the on-call Health Physicist through McMaster Security (905) 522-4135.

6.8 Safety System Tests

- 6.8.1 X-ray Supervisors are responsible ensuring that safety systems are tested each month and for maintaining records documenting the results. This includes:
- X-ray on lights or other beam/shutter indicator lights
 - Door locks and/or beam interlocks
- 6.8.2 Machines used on humans and registered with the Ministry of Health must also undergo image quality tests on every operational day. Such tests will be appropriate for the x-ray machine in question and must be approved by the Radiation Protection Officer for that machine.

6.9 Conduct of Work

- 6.9.1 Day to day safety and control of the x-ray machine shall be maintained by the Authorized X-ray User, as outlined in Section 5.
- 6.9.2 All x-ray work shall be carefully planned and executed and shall incorporate steps to control exposure to the primary X-ray beam and any leakage and scatter. The work shall be conducted according to procedures that address the X-ray safety aspects of the work.

6.9.3 Each lab shall maintain ready access to suitable calibrated radiation survey meters required to assess conditions, if specified to do so by Health Physics.

6.9.4 Work shall comply with detailed X-ray Safety Procedures where they exist or, subject to approval by HPAC, with alternate documented procedures that provide an equivalent level of safety and assurance of regulatory compliance.

6.10 Decommissioning

6.10.1 Health Physics is to be notified by the Project Supervisor when an X-ray facility or X-ray machine is no longer to be used. The option of storage or decommissioning may be determined at a later date.

6.10.2 Decommissioning shall include:

- Securing the x-machine against unauthorized use
- Removing the x-ray facility or machine from the active list
- Removal of all signs and postings

6.10.3 Once an X-ray machine has been placed on the inactive list it shall not be returned to use until written notification is given to Health Physics by the Project Supervisor and a successful commissioning survey has been conducted by Health Physics.

6.10.4 A record of decommissioning shall be maintained by Health Physics

6.11 Security Requirements

6.11.1 X-ray machines shall be maintained secure at all times such that access is restricted to Authorized X-ray Users. This may generally be achieved by:

- Keeping the lab locked when an Authorized X-ray User is not in attendance;
- Maintaining key control over the operation of the x-ray machine
- Ensuring that only Authorized X-ray Users who have received operational training for the x-ray machine have access to this key.

6.11.2 All entrance doors to a room containing an x-ray machine should be kept closed during x-ray exposure and must not be left unattended.

6.12 Emergency Procedures

6.12.1 All emergencies shall be responded to promptly under the guidance of Health Physics.

6.12.2 The Senior Health Physicist or another Health Physics staff member competent to respond shall be maintained on call at all times. A contact procedure shall be maintained with the Security Services Dispatcher.

6.12.3 Any suspected physical injury caused by X-ray machine use should be examined by the Medical Consultant to the HPAC.

6.12.4 Health Physics shall respond to any fire involving an x-ray machine to provide radiological safety supervision as required

6.12.5 Any suspected theft or loss of an x-ray machine shall be reported immediately to McMaster University Security Services or Health Physics. Health Physics, Security personnel and the Project Supervisor shall respond immediately to a conduct a search for the machine.

6.13 Inspections and Enforcement

6.13.1 Health Physics shall conduct inspections of X-ray facilities and machines to assess general safety, compliance, security, and radiological conditions of facilities. These inspections shall occur as follows:

- Commissioning inspections, including a radiation survey, are to be conducted before or during the first use of the x-ray machine by authorized x-ray users. This includes situations where an x-ray machine is relocated or has been otherwise modified.
- Operational inspections will be conducted annually.

6.13.2 A summary of inspection findings shall be provided to the HPAC in an annual report.

6.13.1 Authorization to use X-ray machines at McMaster University shall be considered a privilege as opposed to a right. Health Physics may impose any restriction on an x-ray machine or authorized x-ray user.

6.13.3 All persons shall comply with orders given by Health Physics pending review by the HPAC at its next scheduled meeting.

6.13.4 The HPAC may take any action it deems appropriate, up to and including permanent cancellation of approvals for an X-ray facility or machine or permanent revocation of an X-ray user's authorization.

6.14 Reporting

6.14.1 An annual X-ray Safety and Compliance Summary shall be prepared and presented to the HPAC, Senior Management, The Central Joint Health and Safety Committee and the McMaster University Board of Governors. At a minimum, this report should include:

- A list of all x-ray machines at McMaster University
- A summary of Health Physics inspection findings
- Details on any provincial inspections that may have been performed

6.14.2 The Joint Health and Safety Committees shall be kept informed of any provincial inspections that take place, and shall be provided with copies of the inspection reports and other relevant documents.

7 RECORDS

7.1 The following documents and records are to be kept within the x-ray room or facility:

- A list of current authorized users for each x-ray machine,
- Results of the monthly safety system tests and any image quality tests, and
- Manufacturers operating instructions or other standard operating procedures

7.2 Operational training records are kept by the X-ray Supervisor.

7.3 Radiation safety training records are kept by Health Physics.

7.2 Records may be kept in electronic or hardcopy form.

7.3 All records required by the X-ray Safety Program shall be retained for a period of at least six (6) years.

8 EXCEPTIONS

8.1 All exceptions to this program must be applied for in writing and require the written approval of the Health Physics Advisory Committee.

6.2 The Senior Health Physicist may temporarily approve exceptions, pending the next scheduled meeting of the HPAC.

6.3 Exceptions that are contrary to provincial regulations shall not be granted without the written approval of the Ontario MLITSD or the Ontario Ministry of Health and Long-Term Care

Appendix A: Dose Limits

Table 1 : Dose Limits for X-ray Workers

Dose	Period of Time	Regulatory Dose Limit (mSv)	Administrative Control Level (mSv)
Effective Dose	one-year dosimetry period	50	10
	quarterly dosimetry period	NA	2
Lens of eye ¹	one-year dosimetry period	150	N/A
Dose to the abdomen of a pregnant X-ray worker	during the pregnancy	5	2
	quarterly dosimetry period	N/A	1
Equivalent Dose to the Skin (1 cm ² or more)	one-year dosimetry period	500	100
	quarterly dosimetry period	NA	50
Equivalent Dose to the Hands	one-year dosimetry period	500	100
	quarterly dosimetry period	NA	50

¹ Doses are not normally measured separately for the lens of the eye. Lens of the eye doses may be estimated and managed through the use of whole body dosimeters on the trunk (gamma and neutron) or estimated through lens of the eye exposure monitoring Hp(3) by an external Dosimetry Service Provider.

Table 2 : Limits for Non-X-ray Workers

Dose	Period of Time	Regulatory Dose Limit (mSv)	Administrative Control Level (mSv)
Effective Dose	one-year dosimetry period	5	2.5
	quarterly dosimetry period	NA	1
Lens of eye ¹	one-year dosimetry period	15	N/A
Equivalent Dose to the Skin (1 cm ² or more)	one-year dosimetry period	50	15
	quarterly dosimetry period	NA	10
Equivalent Dose to the Hands	one-year dosimetry period	50	25
	quarterly dosimetry period	NA	10

¹ Doses are not normally measured separately for the lens of the eye. Lens of the eye doses may be estimated and managed through the use of whole body dosimeters on the trunk (gamma and neutron) or estimated through lens of the eye exposure monitoring Hp(3) by an external Dosimetry Service Provider.