Ionizing & Non-Ionizing Radiation Safety – Know the Laws of Your Province

What employers must do to protect workers from harmful radiation.

Exposure to hazardous levels of radiation can cause cancer and other health problems. Equipment that emits dangerous radiation may be found not only at health care facilities but also industrial sites. Employers are legally required to take measures to protect exposed workers. The requirements are typically contained in the OHS regulations. However, several jurisdictions have also adopted separate radiation safety laws imposing more stringent requirements. Here's a rundown of the radiation safety laws in all 9 provinces and the federal jurisdiction.

Ionizing & Non-Ionizing Radiation Requirements

FEDERAL (*COHS Regs*, Sec. 26.1)

Employer must: (a) If a device capable of emitting ionizing or non-ionizing radiation is used in the workplace, implement the appropriate ANSI or National Health and Welfare Safety Code listed in Section 10.26(2) of the Regulation, depending on whether it's a microwave or demonstration-type discharge

device, medical, dental, veterinary or industrial x-ray, ultrasound, MRI, short-wave diathermy equipment, laser or dielectric (RF) heater; (b) Ensure employee exposure to nuclear energy doesn't exceed radiation dose limits set out in *Radiation Protection Regulations*; and (c) Ensure that no employee other than a nuclear energy worker is exposed to radon at average concentrations, over a year, that exceed 800 Bq/m3

ALBERTA

***OHS Code* (Sec. 291):** Employer must, if workers may be exposed to ionizing radiation at a work site: (a) Develop and implement safe work practices and procedures for approaching and dealing with the radiation source; (b) If practicable, involve workers in the development and implementation of those practices and procedures; and (c) Inform workers of the potential hazards of ionizing radiation and the radiation source

***Radiation Protection Act*:** Employer that's the owner of radiation equipment must: (a) Take all reasonable precautions to protect persons from radiation injury; (b) Ensure workers likely to be exposed are informed of the potential hazards of radiation and necessary safety precautions to be taken; (c) Ensure that installation, maintenance, repair, testing, use or operation of radiation equipment is done by a competent worker or a worker under a competent worker's direct supervision; (d) Implement a code of practice that provides information to workers and others on the safe operation of radiation facilities, radiation equipment or radiation sources; (e) Ensure that radiation equipment is safely maintained; (f) Ensure that exposure to ionizing and non-ionizing radiation is kept as low as reasonably achievable and doesn't exceed the maximum exposure limits listed in the regs; (g) Give the government notice of and investigate overexposures or incidents with potential of causing overexposure; and (h) If

applicable, comply with specific requirements for diagnostic x ray equipment

***Radiation Protection Regs*:** Employer that's the owner of radiation equipment must: (a) Monitor worker ionizing radiation exposure; (b) Retain records of monitoring for at least 5 years and make them accessible to workers and OHS officials; (c) Reassess the job duties of workers exposed to radiation who tell you they're pregnant to ensure their exposure remains below the dose limits listed in Table 1 of Schedule 1 of the regs; and (d) Ensure that users of ionizing radiation equipment are competent and at least 18 years of age

BRITISH COLUMBIA (*OHS Regs*, Part 7)

Employer must: (a) Limit worker's exposure to ionizing radiation to: (i) annual effective dose of 20 mSv; and (ii) annual equivalent dose of: (x) 150 mSv to the lens of the eye, (y) 500 mSv to the skin, averaged over any 1 cmý area at a nominal depth of 7 mg/cmý, regardless of the area exposed, or (z) 500 mSv to the hands and feet; (c) If worker tells you she's pregnant, limit her effective dose of ionizing radiation to: (i) 4 mSv, or (ii) the dose limit specified for pregnant workers under the *Nuclear Safety and Control Act* (Canada), whichever is lower; (c) Ensure worker exposure to non-ionizing radiation doesn't exceed the exposure limits listed in Sec. 7.19(a) of the Reg.; (d) Create, implement, post or otherwise make available an exposure control plan if a worker exceeds or may exceed an ionizing radiation or non-ionizing radiation action level; (e) Ensure that every worker who exceeds, or may exceed, the action level, ionizing radiation is fully informed of any potential reproductive hazards; (f) If requested by a worker who's pregnant or trying to get pregnant, make counselling available on the reproductive hazards of exposure to ionizing radiation; (g) Ensure that a worker who exceeds or may exceed the action level, ionizing radiation, is provided with and properly uses a personal dosimeter acceptable to the

Board; (h) Ensure installation, operation and maintenance of equipment producing ionizing or non-ionizing radiation or ultrasonic energy meet the requirements listed in Sec. 7.23 of the Reg.; (i) Conduct a radiation survey for ionizing radiation at the times required by the Safety Code or regulations, if equipment has been damaged or modified, or if there's an indication of unusually high exposure to ionizing radiation; and (j) Keep, make available to the Board and retain: (i) radiation survey records for at least 10 years, and (ii) records of exposure monitoring and personal dosimetry data for as long as the monitored worker is employed plus 10 years

MANITOBA (*WSH Reg*, Part 18)

Employer must: (a) Develop and implement safe work procedures for workplace use of radiation to ensure workers aren't exposed to above limits listed in ACGIH publication *2019 Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices* ('TLV limits'); (b) Train workers in and ensure they comply with the safe work procedures; (c) Implement procedures to control workplace exposure to radiation if workers are, or may be, exposed to levels of radiation in excess of the TLV limits; and (d) Inform any worker who may be exposed to workplace radiation of the potential hazards of radiation exposure

NEW BRUNSWICK (*OHS General Reg*)

Laser Radiation: Employer must ensure laser beams are operated and used in accordance with ANSI Z136.1-1993, *American National Standard for Safe Use of Lasers* (Sec. 34)

Infra-red Radiation: Employer must ensure that: (a) All sources of intense infra-red radiation are shielded as near the source as possible by heat absorbing screens, water screens or other suitable devices; and (b) Employees are

provided with and wear properly fitting goggles, face shields or other adequate eye protective equipment when entering an area where they may be subjected to infra-red radiation liable to injure or irritate the eyes (Sec. 35)

Ultraviolet Radiation: If emissions of ultraviolet radiation are in the spectral region between 180 nm and 400 nm, employer must ensure that: (a) Access to areas where equipment emits ultraviolet radiation is limited to those persons directly concerned with its use; (b) Users of such equipment are trained in the hazards and need for precautions; (c) Warning signs or devices are used to indicate the presence of ultraviolet radiation hazard; (d) Protective cabinets or screens are placed around the source of emission, with observation ports made of suitable absorbent materials such as certain grades of acrylics, polyvinyl chloride or window glass; (e) Protective clothing is used by an employee as required; (f) Eye protective equipment such as ultraviolet absorbing goggles, spectacles or face shields are used by an employee whenever there's a potential eye hazard; and (g) Exposure of an employee to ultraviolet radiation does not exceed the threshold limit value (Sec. 36)

Radiofrequency Radiation: Employer must ensure that: (a) The installation and use of a radiation emitting device in the frequency range 10 kHz to 300 GHz meets the standards of *Limits of Exposure to Radiofrequency Fields at Frequencies from 10 kHz-300 GHz, Safety Code 6*, from the Environmental Health Directorate, Health Protection Branch and published by the Minister of National Health and Welfare; and (b) Exposure of an employee or other person to radiofrequency radiation at frequencies from 10 kHz to 300 GHz doesn't exceed the limits set out in the above mentioned safety code (Sec. 37)

NEWFOUNDLAND

***Radiation Health & Safety Act*:** Employer that's an owner of

radiation equipment must: (a) Install the equipment in accordance with the standards specified in the regs.; (b) Modify radiation equipment or how it's used to reduce the maximum permissible dose of radiation or an unnecessary level of the maximum permissible dose of radiation receivable; (c) Ensure there's a prominent warning system and appropriate warning symbol outside the door of each room where radiation equipment is installed; (d) Provide 'radiation workers' (defined as persons whose occupation requires them to be exposed to radiation emitted by radiation equipment) personal or survey dosemeters; (e) Provide safety training for radiation workers; (f) Discontinue use of radiation equipment, until changes have been made with the radiation equipment or the radiation equipment's manner of operation; and (g) Arrange for the medical examination of radiation workers if an inspector requires it

***Radiation Health & Safety Regs*.:** Employer that's an owner of radiation equipment must: (a) Maintain a separate record for each radiation worker indicating the extent to which he/she has been exposed to ionizing radiation on a continuous permanent basis; (b) If a radiation worker tells you she is or suspects she is pregnant, reassess and revise her job duties or training activities to ensure the maximum permissible dose for a pregnant person specified in the regs. isn't exceeded; (c) Before a radiation worker uses the radiation equipment or enters a space where it's used, give the worker written safety instructions covering: (a) the safe operation of the equipment; (b) the protective procedures to be followed; (c) the use of protective equipment; and (d) procedures to be followed in the event of an accident; (d) Post the above written safety instructions near the control of the equipment; (e) Report overexposures and other accidents to the Director in accordance with Sec. 18; and (f) Submit a radiation survey report to the Director every 2 years or at more frequent intervals if the Director requests it in writing.

NOVA SCOTIA

No radiation-specific requirements in the OHS laws or separate radiation safety laws

ONTARIO (*OHS X Ray Safety Reg*)

Key Definitions: (a) ‘X-rays’ mean an electrically-generated electromagnetic radiation of maximum photon energy not less than 5,000 electron volts; (b) ‘X-ray machine’ means an electrically powered device, the principal purpose of which is the production of x-rays; (c) ‘X-ray source’ means any device, or portion of a device, that emits X-rays, whether or not the device is an X-ray machine; and (d) ‘X-ray worker’ means a worker who, as a necessary part of his/her employment, may be exposed to X-rays and may receive a dose equivalent above the annual limits listed in the Reg. under Column 4 of the Schedule

Employer that’s the owner of an x-ray machine must: (a) Designate a person, for each X-ray source, who’s is competent because of knowledge, training or experience in the use and operation of X-ray sources and in radiation safety practices, to exercise direction over the X-ray source’s safe use and operation; (b) Advise a Director in writing of the name of the designated person; (c) Before a person hired as an X-ray worker begins his/her employment: (i) Notify the worker in writing that he/she is employed as an X-ray worker, (ii) inform the worker of the limits on the dose equivalent that the worker may receive by the worker and/or the dose equivalents that apply to a pregnant X-ray worker if the worker is female; (d) Keep a list of all X-ray workers that it employs; (e) Limit exposure to the dose equivalents specified in the reg.; (f) In a workplace where an X-ray source is used: (i) Post or install X-ray warning signs or warning devices in conspicuous locations, (ii) Label at its operating controls every X-ray source capable of producing an air kerma rate

greater than 5 micrograys per hour at any accessible point as a source of X-rays, and (iii) Use locks, interlocks, barriers and/or X-ray warning signs to control access to any area where the air kerma may exceed 100 micrograys in any one hour; (g) Furnish each X-ray worker a suitable personal dosimeter providing an accurate measure of the dose equivalent received by the X-ray worker, along with the record of the worker's radiation exposure; (h) Retain an X-ray worker's personal dosimeter records for a period of at least 3 years; and (i) If applicable, comply with the special requirements for X-ray machines used for industrial radiography or industrial fluoroscopy and X-ray sources kept in cabinets

PRINCE EDWARD ISLAND (*OHS Act General Regs*, Part 10)

General Non-Ionizing Radiation: Employer must ensure that controlled radiation areas allowing only restricted occupancy are clearly designated using adequate warning signs, and that maximum occupancy periods are posted

Laser Radiation: Employer must ensure that a laser or laser device is installed, operated, labelled and maintained in accordance with ANSI Z136.1-2014, *American National Standard For Safe Use of Lasers*

Infra-red Radiation: Employer must ensure that: (a) All sources of intense infra-red radiation are shielded as near the source as possible by heat absorbing screens, water screens, or other suitable devices; and (b) Workers are provided with and wear properly fitting goggles, face shields or other adequate eye protection when entering an area where they may be subjected to heat rays liable to injure or irritate the eyes

Ultra-violet Radiation: Employer must ensure that workers are protected from dangerous emissions of ultraviolet radiation by

remaining at a safe distance from the source or by the employer’s placing protective cabinets or screens around the sources of emission or a screen of ultra-violet absorbing glass or other material between the workers and the source of radiation

Microwave & Radio Frequency Radiation: Employer must: (a) In case of continuous or modulated microwave and radio frequency radiation in the frequency range 10 MHz – 300 GHz, ensure that whole or partial body exposures (with the exception of exposures to the extremities) doesn’t exceed: (i) In the frequency range 10 MHz – 1 GHz a maximum permitted average power density of 1 mW/cmý, when averaged over a one-hour period, (ii) In the frequency range 1 GHz – 300 GHz a maximum permitted average power density of 5 mW/cmý, when averaged over a one hour period, and (iii) In the frequency range 10 MHz – 300 GHz, a maximum permitted average power density of 25 mW/cmý, when averaged over a one-minute period; and (b) Ensure that for exposure of extremities to continuous or modulated microwave radiation in the frequency range 10 MHz – 300 GHz, the average power density doesn’t exceed 10 mW/cm’, when averaged over a one-hour period

QU□BEC (*OHS Reg*, Division XVI)

Infra-red Radiation: Employer must ensure that all intense infra-red radiation sources are shielded by heat absorbent screens, water screens or any other devices to protect workers

Ultra-violet Radiation: Employer must ensure that the following precautions are taken in areas where operations producing dangerous emanations of ultra-violet radiations such as arc welding and cutting and resistance welding are carried out: (a) Enclosure of the emanation sources with protective screens; (b) Use of gloves or protective creams to protect the hands and forearms of workers exposed to appreciable doses; and (c) Use of required PPE to protect the eyes and face

Ionizing Radiation: Employer must ensure that: (a) Workers exposed to ionizing radiation are monitored by dosimetry; and (b) In the event of an overdose, the workers exposed undergo medical examinations at more or less regular intervals, depending on the duration of exposure

SASKATCHEWAN (Sask. Employment Act; OHS Regulation)

OHS Regs **(Sec. 6-21):** If a radioactive substance or a device containing a radioactive substance is handled, used, stored or disposed of, employer must, in consultation with the JHSC, health and safety representative or the workers directly, develop and ensure the implementation of safe work practices and procedures to handle, use, store and dispose of radioactive substances or devices containing radioactive substances

Radiation Health and Safety Act Regs **(Part II, Ionizing Radiation):** Employer that's the owner of ionizing radiation equipment must: (a) Ensure that the effective dose a person receives doesn't exceed the limits set out in the regs.; (b) Submit a written report to the Radiation Safety Unit if the effective dose received by an 'occupational worker' (defined as one who in the course of employment might be exposed to radiation at doses that wouldn't be safe for members of the public) above 20 millisieverts in a one-year dosimetry period; (c) Ensure that the effective dose and equivalent dose received by an occupational worker is systematically determined; (d) Arrange for a thermoluminescent dosimeter to be issued by a licensed dosimetry service provider to any occupational worker that may receive an effective dose above 1 millisievert in a one-year period; (e) Maintain separate cumulative dose records on a continuous permanent basis for each occupational worker; (f) Inform each occupational worker at least every 3 months of his/her dose; (g) Reassess and, if

necessary, revise the job duties or educational activities of an occupational worker who tells you she is or suspects that she is pregnant; (h) If applicable, comply with the special requirements for mobile ionizing radiation equipment; and (i) Ensure operators are properly qualified

Radiation Health and Safety Act Regs **(Part III, Non-Ionizing Radiation)**

Ultraviolet Radiation: Employer that's the owner of ultraviolet radiation equipment must: (a) Limit exposure to ACGIH 'Ultraviolet Radiation' Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices (2003); (b) If the spectral composition of the radiation is unknown, ensure the total radiant exposure of an occupational worker's unprotected eyes or skin doesn't exceed 30 joules per square metre in any 8-hour period; (c) If it knows or ought to know that an occupational worker shows inherited photosensitivity to ultraviolet radiation or is under treatment with a photosensitizing drug, ensure that: (i) the worker's exposure to ultraviolet radiation is limited in accordance with the advice of a duly qualified medical practitioner; or (ii) the worker is issued any eye and skin protection that is specified by a duly qualified medical practitioner or OHS officer; and (d) If the exposure limits can't be complied with, issue to each occupational worker whose exposure to ultraviolet radiation may exceed those limits any eye and skin protection specified by a duly qualified medical practitioner or OHS officer, and if an officer requires it, a personal monitoring device to evaluate the worker's exposure

Laser Radiation: Employer that's the owner of a laser or laser device must: (a) Ensure it's installed, operated, labelled and maintained in accordance with ANSI Z136.1-2000 (or ANSI Z136.3-2004, if it's a health care facility); (b) Fully inform

all occupational workers who may be exposed to radiation from a laser or laser device of class 2, 3a, 3b or 4 as to the hazards of this radiation under the conditions of use; and (c) Ensure that no part of the body of any person is deliberately exposed to the direct beam of a class 3 or 4 laser except under the direction of a duly qualified professional

Ultrasound Radiation: Employer that's the owner of medical ultrasound equipment must: (a) Ensure that each operator of the equipment is properly qualified; (b) Ensure that the equipment is used safely in accordance with the guidelines specified in the regs. for the particular type of equipment

Radiation Health and Safety Act Regs **(Part IV, Both Ionizing & Non-Ionizing Radiation):** Employer that's the owner of ionizing or non-ionizing radiation equipment must: (a) Give the department written notice of accidents involving the equipment; (b) Take all reasonable steps to minimize the possibility of unnecessary irradiation of occupational workers or members of the public arising from malfunction of the equipment; (c) Post required warning signs and notices