

RADIATION PROTECTION, CCMB

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Guidance for Pregnant X-ray Workers

1.0 Protective Measures:

Radiation doses to occupationally exposed staff working with radiological equipment are generally low and are controlled due to protective measures and practices such as:

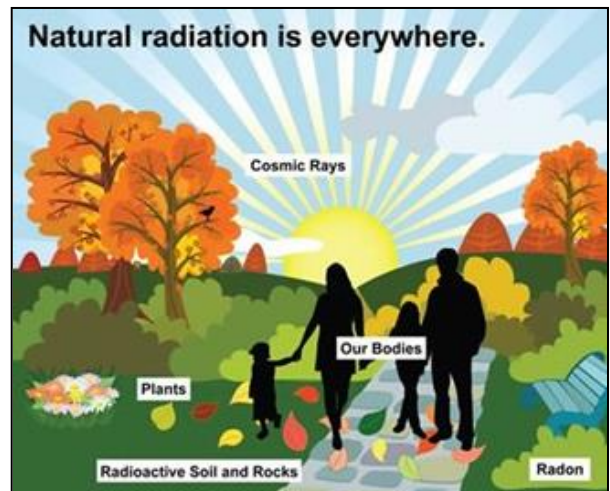
- Shielding specifications for radiological facilities are implemented to ensure annual dose limits and ALARA requirements are met.
- Practice ALARA using the three basic radiation protection practices:
 - a) Time: Limiting or minimizing the exposure time reduces the dose from the radiation source.
 - b) Distance: Increase the distance between the worker and the radiation source to reduce exposure.
 - c) Shielding: The use of barriers such as lead or concrete between workers and the source of radiation. Wear protective apparel where required.

2.0 Background Radiation:

2.1 People are exposed to small amounts of ionizing radiation from the environment known as background radiation. There is little we can do to change or reduce ionizing radiation that comes from natural sources like the sun, soil, or rocks.

2.2 The total worldwide average effective dose from natural background radiation is approximately 2.4 mSv per year. In Canada, it is approximately 1.8 mSv.¹

3.3 Records indicate that most x-ray workers are exposed to lower doses of occupational radiation than they would receive from natural background radiation (less than 1.8 mSv).



3.0 Annual Dose Limits:

3.1 Dose limits are set up to restrict occupational radiation exposures to radiation workers. Federal dose limits² for radiation workers, the public, technologists-in-training, and students are based on recommendations from the ICRP (Publications 103 and 118) as listed in Table 1. Radiation workers are classified as individuals who are occupationally exposed to ionizing X-rays. Radiation dose limits for radiation workers apply only to irradiation resulting directly from their occupation and do not include radiation exposures from other sources.

Table 1

Applicable Organ or Tissue	Limit Type	Dosimetry Period	Radiation Workers Limit Value (mSv)	Members of the Public, Technologists-in-Training, and Students Limit Value (mSv)
Whole Body	Effective Dose	One (1) year	20*	1
Lens of the Eye	Equivalent Dose	One (1) year	20*	15
Skin	Equivalent Dose	One (1) year	500	50
Hands and Feet	Equivalent Dose	One (1) year	500	50

Five (5) year effective dose for whole body limit value is 100 mSv.

* For whole body effective dose and lens of the eye equivalent dose: 20 mSv per year averaged over a defined 5-year period and no single year exceeding 50 mSv.



3.2 Dose Limit for Occupationally Exposed Pregnant Persons:

- a) For occupationally exposed persons, once pregnancy has been declared until the end of term, the fetus must be protected from x-ray exposure including applying a whole-body effective dose limit of **4 mSv** for the remainder of the pregnancy, from all sources of radiation.²
- b) The working conditions of a pregnant worker, after the declaration of pregnancy, should be such as to ensure that the additional dose to the embryo/fetus would not exceed an effective dose of 1 mSv during the remainder of the pregnancy.³ The methods of protection at work for persons who are pregnant should provide a level of protection for the embryo/fetus like that provided for members of the public.
- c) The annual dose limit for students and/or technologists in training is a whole-body effective dose of 1 mSv.² This annual dose limit should be used as a

guideline should a student and/or technologist in training declare pregnancy.

4.0 Personal Dosimeters:



4.1 The most effective method of monitoring exposures to the foetus is to measure the equivalent dose to the surface of the abdomen using a personal dosimeter (OSL).²

4.2 The recommended dose limit applies to the fetal dose and is not directly comparable to the dose measured on a personal dosimeter. A personal dosimeter may overestimate fetal dose by a factor of 10 or more.⁴

5.0 General Guidelines:⁵

5.1 When pregnancy is declared, the pregnant Medical Radiation Technologist's manager must review the most recent National Dosimetry Services exposure reports to determine whether the MRT's current and future work duties are compatible with the recommended dose limits. If the exposure reports indicate a consistent history of negligible occupational dose readings, and no increase in occupational dose is expected, then no modifications to the MRT's work duties are required. If the exposure reports indicate the potential for exceeding the dose limits given above, the manager and MRT must review safe radiation protection practices and consider modifying assigned work duties to limit the occupational radiation exposure levels for the duration of the pregnancy.

5.2 If the pregnant MRT has any concerns regarding safe radiation practice in their assigned work duties, they are to consult with their manager.

5.3 The manager is to review National Dosimetry Services exposure reports at the end of each wearing period to ensure that the employee's occupational dose readings are within recommended limits (as stated in 3.2).

5.5 Radiation Protection, CCMB, can provide specific information on personal dosimeter monitoring during pregnancy. They can also provide general advice on personal dosimeters and radiation safety and concerns.

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6.0 Summary:

- Practice ALARA: ALARA (as low as reasonably achievable) means avoiding exposure to radiation that does not have a direct benefit to you. To do this, use the three basic protective measures in radiation safety: time, distance, and shielding.
- Radiation doses to occupationally exposed staff working with radiological equipment are usually lower than the annual radiation exposure to natural background radiation (less than 1.8 mSv).
- For occupationally exposed persons, once pregnancy has been declared until the end of term, the fetus must be protected from x-ray exposure including applying a whole-body effective dose limit of 4 mSv for the remainder of the pregnancy. However, most x-ray workers rarely accumulate a whole-body occupational dose of 4 mSv in a lifetime despite pregnancy status.
- Wear your personal dosimeter while on duty to ensure that occupational radiation exposure levels are kept well below the annual effective dose and/or dose limit for occupationally exposed pregnant persons.
- Do not hesitate to contact Radiation Protection, CCMB, for any questions or concerns.

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¹ CNSC <http://nuclearsafety.gc.ca/eng/resources/fact-sheets/natural-background-radiation.cfm>

² Safety Code 35 <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/radiation/safety-code-35-safety-procedures-installation-use-control-equipment-large-medical-radiological-facilities-safety-code.html>

³ ICRP 103 <https://www.icrp.org/publication.asp?id=ICRP%20Publication%20103>

⁴ International Atomic Energy Agency (IAEA) <https://www.iaea.org/resources/rpop/health-professionals/radiology/pregnant-women>

⁵ X-ray Safety Manual <https://wrha.mb.ca/files/diagnostic-imaging-x-ray-safety-manual.pdf>