

OUR STORY

A History of the Radiation Safety Institute of Canada



**Radiation Safety
Institute of Canada**
Institut de radioprotection du Canada

Good Science in Plain Language®

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I Mission and Vision

Our Mission

“To advance the safe use of radiation in all its forms”

- STRATEGIC DIRECTIONS, 2006

Our Vision

“The Institute shall be recognized as the Canadian centre of excellence for radiation safety, dedicated to promoting radiation safety in the workplace, in the environment and in communities, homes and schools. To deliver this vision, the Institute shall develop, and provide educational, scientific and technical services to enable those dealing with radiation to identify and reduce potential hazards and to maintain safe ongoing practices”

- STRATEGIC DIRECTIONS, 2006)



**Radiation Safety
Institute of Canada**

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II Context

Our beginnings: A response to a human disaster

Our beginnings – a response to a human disaster

The Radiation Safety Institute was founded in 1980 directly in response to a human disaster in the Elliot Lake uranium mines in Northern Ontario.

For years, healthy miners had been exposed to uncontrolled and excessive amounts of radioactive radon gas deep in the underground mines.

This excessive exposure to radiation resulted over time in the deaths of more than 220 healthy miners from lung cancer. The miner' union, the Steelworkers, believes that the real number may be up to 400 deaths. The cost to the Ontario workers compensation system is now approaching \$100 million.

In the midst of the ensuing public controversy, and the perceived failure of the mining companies and federal and provincial regulatory authorities to protect the miners, the Radiation Safety Institute of Canada was founded by a group of independent Canadians who were gravely troubled by the suffering of the miners

and their families.

They resolved that such a radiation disaster should never be permitted to happen again in Canada.

In 1980, the founders were granted a federal charter for this independent, non-partisan body, the Radiation Safety Institute of Canada. The Institute

was incorporated as a national, not-for-profit corporation. It began operations in Elliot Lake, Ontario in January 1981. In 1986, it was approved as a registered charity (No.0737171-21-13) by Revenue Canada.

At about the same time, the Radiation Safety Institute adopted the motto "good science in plain language"® to express succinctly its independent philosophy and its impartial approach to radiation issues. This much-admired motto is a registered trademark of the Radiation Safety Institute of Canada.

According to officials of the United Nations International Atomic Energy Agency (IAEA), the Radiation Safety Institute of Canada is unique. It is the only independent institute of its kind in any country.



*Mining Monument and Memorial Park,
Elliot Lake, Ontario*

Our first priority

In the early years, we focused our efforts on the protection of workers exposed to radiation from radon gas in Canada's uranium mining industry, particularly in Ontario. (Historically, radon exposure has been the most harmful form of workplace radiation exposure in Canada.)

In cooperation with senior surgeons and pathologists both at Toronto General Hospital and the Banting Institute of the University of Toronto and with the support of some 150 family physicians in Northern Ontario, we established for Ontario uranium miners what became the world's largest early lung cancer detection and treatment program and persuaded the uranium companies to pay for it. The program continued into the early 1990's.

We also went to France, invested in state-of-the-art French technology for monitoring the radiation exposure of individual miners, built a monitoring laboratory in Elliot Lake and persuaded the federal regulator (then AECB) and the Ontario uranium mining companies to use the new technology in a three-year pilot project.

Eventually, faced with competition from superior ore bodies and cheaper extraction methods in Saskatchewan, the Ontario industry closed.

In the meantime, while still in Elliot Lake, we began working also on the safety of uranium miners in Saskatchewan. We persuaded the Saskatchewan and Federal governments, the uranium companies and the unions to adopt more stringent standards of radiation safety for the new high grade mines of Saskatchewan.

We played an active and influential role in the adoption of a new regulatory philosophy

and the creation of new regulatory standards in Saskatchewan.

To focus these efforts and with the support of all parties, we built our National Laboratories in Saskatoon to provide both scientific and technical expertise in radiation safety and to provide specialized monitoring services to assist the companies to better protect the mine and mill workers and to comply with the new federal and provincial regulations.

Eventually, because of our earned reputation for independent, non-partisan action and for "good science in plain language"[®], the uranium companies asked us to review their proposed radiation safety measures for the new mines and mills.

In response, we put together a team of internationally recognized scientific experts (from Canada, France and Switzerland) to test independently the companies' radiation safety design of the new mines and mills.



RSI National Laboratories, Saskatoon Saskatchewan

Our reports and conclusions were presented to the joint federal-provincial environmental assessment panel by the mining companies. In its own final report, the joint panel specifically praised our work for its clarity of thought and expression.

Finally, when the new federal Nuclear Safety and Control Act and Regulations were promulgated in 2000, the Radiation Safety Institute's unique radiation monitoring service ("personal alpha dosimetry") for uranium workers became the first in the world to qualify for a government licence under the new, rigorous national standards.

This was no small feat, achieved after three years of profound technical preparation by Institute staff. The service, run out of the Institute's National Laboratories in Saskatoon, is unique in all of the Americas.

A surprising fact and new priorities

There is a fact that startles most Canadians, mostly because it is so little known and so unexpected. It is this: almost 90% of Canadians monitored (as required by law) every day for exposure to radiation in the workplace have nothing to do with the nuclear energy industry.

The number of people so monitored is now approaching 140,000. They do not work in the nuclear energy industry, not in power plants or in uranium mines; but they are exposed to radiation none the less from radioactive materials and radiation machines commonly used in workplaces of every kind.

This phenomenon was generally unnoticed until uncovered by our own research in the late 1980's. We were well ahead of others in this respect.

Not until 2002, in the first UN Geneva conference on radiation safety in the workplace, did the world begin to move beyond the traditional focus on nuclear power plants and uranium mines to the common use of radioactive materials and radiation machines in workplaces everywhere.

So, while our early, primary and most urgent focus was on exposed workers in the uranium industry; and while we pursued this issue vigorously both publicly

and privately and with no small effect; as time went by, we also began to be called on for assistance in other areas.

Again, our earned reputation for independence, impartiality and "good science in plain language"® were the primary factors.

Disputes and controversies

Three times, we have been called into nuclear power plants for impartial assistance to address concerns over occupational radiation safety. Two of the requests were from unions; one from a provincial health and safety association in the power industry. Our assistance brought an effective resolution of the issues in all cases for all parties, without exception.

We have also been called upon to mediate on environmental radiation issues in community vs. government and industry disputes.

In Bancroft - Paudash Lake, in Eastern Ontario, we were called upon by the community to resolve a dispute of some 25 years; in Port Hope, Ontario, another long-standing and bitter dispute, we were called in by the federal government with the agreement of the community; and at Canadian Forces Base Borden, we were called in by the Department of National Defence, with the agreement of Base unions. Again, in all cases, the issues were resolved with our impartial assistance to the expressed satisfaction of all parties.

Our impartial assistance, public education and technical expertise have been requested also by a number of universities when they were facing potential regulatory sanction (University of Toronto, McGill University, University of Guelph, Memorial University).

We have assisted a number of school boards on environmental radiation issues, including the (now) Toronto District School Board, for whom we carried out the largest school radon monitoring program in Canada, together with a public education program and no controversy, even though two schools were found to have high radon levels (later effectively remediated).

Occupational concerns about radiation exposure (EMF) in certain industries (e.g. in the telecommunications industry) have resulted in calls to the Institute for assistance for workplace surveys and employee education. We are also concerned about radiation exposure in the health care sector, now a strategic priority.

Education and training

At the Radiation Safety Institute, we are acutely aware of a general difficulty that often exacerbates the challenge of dealing with the potential hazards of radiation exposure and concerns about its health effects: namely, the misunderstanding in people generally of the nature of radiation and the lack generally of both education and training in radiation safety.

These are major factors in the occurrence of unnecessary and potentially hazardous exposure. They have led us to develop a syllabus of education, training and short awareness courses for both workplaces and the public.

Among these, we now provide an intensive Radiation Safety Officer course for individuals in industries and the services sector who are responsible for the safe use of radioactive materials under federal licence.

In response to the new federal Nuclear Safety and Control Act and Regulations (2000), we have produced 1,000 Radiation Safety Officer (RSO) graduates across Canada for all industrial and service sectors, including graduates for the federal regulator itself, i.e. the Canadian Nuclear Safety Commission (CNSC).

We have also developed a specialized X-ray Safety Officer course for people using x-ray machines, CT scanners, etc. in airports, hospitals, police forces and so on. These radiation machines fall under provincial jurisdiction. Our course is unique in Canada and is now gaining ground with these sectors.

Finally, a word about our operating philosophy

When we are approached for assistance, we tell people that, if we agree to work with them, we will provide them with “good science in plain language”®.

We explain what this means.

To the radiation issue that concerns them, we promise, first, that we will apply peer reviewed science from the most reputable scientific sources we can find.

Next, we promise that we will translate (not dumb down) that scientific knowledge from the language of

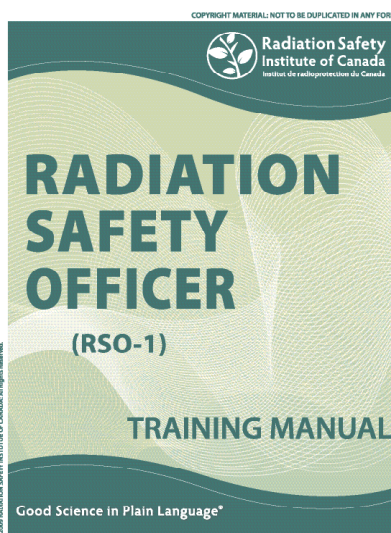
science into plain language, so that the people concerned will be able to understand what we are telling them. We dare to promise them that.

We explain further that our purpose as the independent and impartial Radiation Safety Institute of Canada is to empower people with real knowledge to give them the ability to make up their own minds, to come to their own informed conclusions and to make their own informed decisions about what should be done.

We say explicitly that we will not tell people what to think or what to do. We also assure them that we will be there at all times to support them as they work their way through the issues and to help address any questions or concerns they might have.

In practice, this philosophy of informed, independent and impartial assistance has proved extraordinarily effective in building trust and credibility. It has eased people’s minds about their ability to solve these vexing issues and has given them the confidence to resolve finally and effectively some of the most difficult disputes over radiation exposure in our society and some long-standing public controversies.

We have the track record to prove it.



III Our activities and services

Governance

- Board of Governors independently elected (Chair: Tim Armstrong)
 - Executive Committee (Chair: Tim Armstrong)
 - Finance and Audit Committee (Chair: Arnie Cader)
 - Human Resources and Nominating Committee (Chair: Vic Pakalnis)
- Independent Auditor (Allan Cheskes, CA, Partner, Deloitte Touche)
- Ex-officio: Chair of the Board and the President are ex-officio members of all Board committees

Administration

- President and Chief Executive Officer (Hon. Steve Mahoney PC)
- Administrative / Communications Assistant (Maria Costa)
- Chief Scientist (Mike Haynes, MSc)
 - Manager, National Laboratories (Jason Sadowski MSc)
 - Coordinator, Training Programs (Tara Hargreaves, MSc)
 - Staff Scientist, (Lynn MacDonalD)
- Chief Financial Officer (Bruce Sylvester, CA)
- Executive Director (Natalia Mozayani, MA)
- Staff:
 - Highly educated professional, scientific and technical staff at both the National Education

Centre in Toronto and National Laboratories in Saskatoon.

- Network of reputable and experienced consulting scientists employed on occasion as part-time staff or as sub-contractors for specialized work as required.

Scientific and technical services

1. Personal alpha dosimetry service (major service)
 - The Radiation Safety Institute provides radiation exposure detectors (“PAD dosimeters”) to client uranium mining companies for company designated employees.
 - These dosimeters detect specific kinds of radiation over a 30-day period; they are then returned to the National Laboratories in Saskatoon, where the detector film is removed from the instrument, chemically processed and analyzed under a microscope. Exposure is calculated using standard, scientifically established mathematical and quality control procedures.
 - Results are thoroughly reviewed and documented and sent to the client companies. The companies review the results and report them to the National Dose Registry at Health Canada in Ottawa.
 - The service is provided by the Institute under the regulatory control of the federal Canadian Nuclear Safety Commission (CNSC), under PAD

Dosimetry Licence - 07992-7-22.3 which states:

“This licence authorizes the licensee to operate a dosimetry service specified in section IV of this licence. This licence is issued for: commercial dosimetry services – radon progeny and long lived radioactive dust (593).”

- All procedures without exception, both at the Institute laboratories and at the company mine site are reviewed and approved by the CNSC. Any change to a procedure of any kind must be reported to the CNSC in a timely fashion.
- Twice yearly calibration tests of randomly chosen dosimeter instruments are conducted in the United States at an instrument calibration centre designated by the CNSC. The reports are sent independently to the CNSC.
- The CNSC licence to operate the service is granted for a 10-year period. The last licence review and renewal was in 2012; the next review and renewal will be in 2022.
- The CNSC conducts a full-scale audit of the service every three years. In addition, annual audits are required by an independent auditor with the report sent independently to the CNSC.
- The Radiation Safety Institute has passed all independent audits and all CNSC audits since establishment of the licensed service.

Please note:

- These radiation detectors (dosimeters) are NOT radioactive nor do they emit or transmit radiation of any kind. They are merely instruments (sophisticated instruments) for detecting certain kinds of radiation. They are not hazardous in any way.
- It is not the Institute, but the client uranium companies (Areva, Cameco) that are responsible under law for the protection of their employees.

2. Instrument calibration service

- This laboratory service conducts accuracy checks of radiation survey instruments submitted to the Institute’s National Laboratories by CNSC licencees and non-licensees (companies, etc) across the country, who must calibrate their instruments annually either to ensure CNSC

compliance or for internal quality control purposes.

- The Institute service is conducted in accordance with the CNSC expectations for calibration of survey meters.

3. Leak testing service

- This laboratory service provides special kits to clients to detect leaks from certain kinds of sealed containers of radioactive materials that clients use under CNSC licence for industrial or other purposes. These leak tests by clients are a mandatory requirement.
- The “swipes” from the leak test are sent back by clients for analysis at the National Laboratories to determine if there has been a leak and to what extent.
- The leak testing service is conducted in accordance with the CNSC expectations for leak testing of sealed sources.

4. Radon Calibration Chamber: static elimination source

- The Institute uses a small, secured CNSC licensed radioactive source for static elimination in the radon calibration chamber at the National Laboratories. It is held by the Institute under CNSC licence 07992-2-15.0.

5. Radon testing of homes, schools and other buildings

- Without exception, radioactive radon gas is present at some level in every home and building in Canada. The question is not whether radon is present, but how much of it is present.
- For many years, the Institute conducted a public health campaign to persuade Canadian federal and provincial governments to bring Canada into line with other countries on testing homes and buildings for radon and to reduce permissible levels of exposure.
- The campaign succeeded in 2007 when the federal Minister of Health announced a reduction in Canadian exposure guidelines to internationally accepted levels.

- Radon testing of homes and schools in particular is now a national and provincial priority; for example:
 - Health Canada is about to launch a national program to test 18,000 homes across Canada
 - Saskatchewan Government is currently testing 1,000 locations in homes and buildings across the province;
 - Manitoba Government is about to launch a similar program in 800 buildings;
 - Nova Scotia Government is continuing its systematic testing program initiated in 2006-07.
- For the past 20 years, the Radiation Safety Institute has responded to requests for testing of individual homes, schools and even small communities. To date, about 6,000 locations across Canada have undergone such testing by the Institute.
- The Institute uses two technologies for testing:
 - One is the internationally and Health Canada accepted EPERM radon gas monitor manufactured in the United States.
 - The other, used only in special cases, is the Institute's own radon progeny monitor (not radon gas), the same technology used under CNSC licence for radon progeny dosimetry of uranium workers (see above).
- Results information is presented by the Institute in plain language out of consideration for the client.
- All results are reported in relation to the national radon gas acceptable level (200Bq/m³) established as of 2007 by the federal and provincial governments. In cases where the level is found to be above the national guideline, the institute advises all such clients to conduct a second test to verify the initial result before spending money on potentially expensive remedial work.
- The purpose of testing is to reduce the risk of lung cancer from excessive exposure to radon and to enhance public health. Lung cancer has a latency period of between 5 and 15 years. Smoking is the major cause; radon comes second.

6. Workplace EMF surveys

- EMF radiation is non-ionizing radiation, therefore

less hazardous than ionizing radiation from (for example) radioactive materials and x-ray machines.

- However, there is growing public concern about exposure to EMF radiation from power lines, building generators, cell phones, cell towers, etc.
- The Institute is frequently called upon by unions, employers and sometimes individual homeowners to address workplace and homeowner concerns about exposure to levels of EMF. This is particularly the case in the telecommunications industry.
- In response, the Institute typically does three things:
 - Surveys the workplace with appropriate instruments to establish whether and where there is exposure and how much;
 - Provides a full professional report with an educational section explaining the science in plain language, the state of scientific knowledge about health effects and, in context, the complete numerical results of the survey undertaken;
 - Conducts an employee radiation safety awareness course on EMF exposure, if the employees request it and the employer agrees.
 - In our experience, this has proven to be a highly successful approach to resolving workplace controversies and concerns.
- As yet, there are no regulations in Canada or internationally on EMF exposure.

7. Radiation safety reviews

- In recent years, the Institute has been called on to conduct independent radiation safety reviews for a number of institutions who have found themselves in difficulty with the national regulator, the CNSC and with their own local communities.
- The following are the primary examples:
 - University of Toronto: poorly conducted de-commissioning of the Slowpoke research reactor, resulting in potential on-campus exposure of students and faculty;
 - Guelph University: in jeopardy of losing its CNSC licence for 100 laboratories because of poor procedures, inadequate training, unsecured storage of radioactive materials;
 - Memorial University: in jeopardy of losing its CNSC licence for laboratories and institutes because of unsecured radioactive materials, unreliable inventories of radioactive wastes, etc.
- These crises were fully resolved by Institute intervention, during which the Institute, as required by each case:
 - conducted extensive reviews of radiation safety culture and practices
 - decommissioned laboratories
 - identified radioactive materials for removal
 - reconstituted documentation,
 - conducted radiation safety education and training from the level of vice-presidents, deans and directors to laboratory technician
 - and brought the respective institutions out of regulatory jeopardy.
- The Institute received great praise for its professionalism and effectiveness from all three institutions.

Workplace information, education and training services

1. WSIB agreement

- Institute designated by Ontario government in 2000 as the radiation safety partner to the Ontario health and safety system.
- On-going agreement reached with WSIB to pay for package of information services to Ontario workplaces.
- **Insurance requirement:** WSIB agreement (par 8.13) requires the Institute to maintain “general liability insurance and adequate workplace safety and insurance coverage as required by applicable laws and as would be maintained by a prudent person engaged in the type of activities in which the recipient is engaged. The Recipient’s insurer shall waive subrogation against the WSIB or its suppliers or sub-contractors.”

2. Institute education and training courses

- Radiation Safety Officer (RSO 1, RSO 2):
 - Intensive one-week and two-day (respectively) training courses to produce RSO graduates for CNSC licensee companies, institutions, health care facilities, government agencies as required under CNSC regulations.
 - Over 1,000 graduates certificated by the Institute.
 - First class reputation: CNSC and other government agencies send their own employees to these courses.
- X-ray Safety Officer (XSO):
 - Intensive three-day course for x-ray licencees under provincial jurisdiction.
 - Attracts participants from health sector and other sectors using x-ray equipment of various kinds; new course, fewer than 100 graduates.
- Awareness education courses:
 - Half-day to one day courses to introduce workers to the concepts of radiation exposure and the principles of radiation safety.
 - Conducted in industries of various kinds, including e.g. auto, steel and petroleum refining industries, government agencies, telecommunications, universities, etc.

Independent mediation of workplace and public controversies and disputes

The Institute's earned reputation for independence, impartiality and "good science in plain language"® has induced various organizations to request the Institute's assistance in resolving difficult public and workplace disputes.

In every case, without exception, once the Institute responded to the request and the Institute's conditions for mediation were accepted, the dispute was resolved to the satisfaction of the parties involved.

The following are cases in point:

- Community of Paudash Lake (Bancroft area):

- Issue: 5 million tonnes of abandoned radioactive uranium mine wastes; 25 years of bitter public controversy and widespread suspicion and mistrust on all sides.
- Resolution: Community and federal government brought to mutually satisfactory practical agreement on disposal of wastes; federal regulation of mine wastes instituted for first time.
- No further disputes or controversy.

- Pickering Nuclear Generating Station:

- Issue: Contamination of workers and their homes by radioactive carbon-14 during refurbishing of a reactor; work refusal by some workers following clean-up over health concerns
- Resolution: Institute called in by CUPE 1000. Institute conducted independent review of scientific analysis of exposure results by consultants; confirmed integrity of the analysis; reported in plain language directly to workers.

- Work refusal ended.

- Darlington Nuclear Generating Station:

- Issue: Work stoppage: workers concerned about personal exposure to radioactive tritium at new Tritium Removal Facility.
- Resolution: Institute called in by CUPE 1000; met with management and workers together, then with workers alone; conducted independent scientific, technical and safety culture review; found and reported serious concerns about prevailing safety culture and the established provisions for protecting workers; recommended changes, including areas for further applied research, were accepted unanimously by joint management/worker health and safety committee.
- Work stoppage ended on promise of implementation.

- Community of Port Hope:

- Issue: where to put radioactive wastes from contaminated sites in the town and its environs
- Resolution: Assistance requested by federal government and the community; Institute reviewed issues with community representatives; focused on pertinent issues for practical action; devised and conducted public education campaign implemented by citizen representatives; achieved majority consent on action plan;
- achieved a first in Canada: Port Hope overcame its NIMBY syndrome and agreed to a permanent site in Port Hope for the community's own radioactive wastes;
- Institute-drafted report accepted unanimously by Council;
- \$250 million plus clean-up and permanent disposal project now underway.

- Canadian Forces Base Borden:

- Issue: Fears and controversy in civilian base community over proposed introduction of radioactive training material on the base training campus. Issue about to become a public controversy beyond the base.
- Resolution: Assistance requested by DND HQ in Ottawa; Institute met with Base command and officers; then met independently with concerned families and union representatives; conducted independent



CFB Borden. Courtesy Department of Defense

technical review; wrote educational report to address concerns; report conclusions presented with educational technical demonstration to community, unions, officers and HQ representatives in combined meeting.

- With fears alleviated, all agreed to permit training use of material on base campus.
- Peace at last and annual savings to DND of \$100,000 in training costs.

- New: Now under active consideration is a request to the Institute for assistance to uranium mining unions in Africa, through the agency of an international union organization in Geneva.
- This may result in the provision of a number of services, especially training, but possibly also our dosimetry service. Discussions are on-going.

Public and media inquiries and requests for information

- The Institute receives many hundreds of enquiries each year from the public and the media.
- Information and scientific staff respond with explanations of facts, regulations, potential health effects, etc and provide written materials from reputable sources.

International activities

- The Institute has an international network of scientific, government, industry and union contacts, including the UN International Atomic Energy Agency (IAEA).
- Foreign nationals (e.g. UK, Dubai) have attended our RSO courses in particular. Other foreign nationals (e.g. Ghana) have been refused visas to enter Canada for our courses.



Southern Africa



Radiation Safety Institute of Canada

Institut de radioprotection du Canada

National Education Centre

607-1120 Finch Avenue West
Toronto, ON M3J 3H7
(416) 650-9090 ph
(416) 650-9920 fax

National Laboratories

102-110 Research Drive
Saskatoon, SK S7N 3R3
(306) 975-0566 ph
(306) 975-0494 fax

1-800-263-5803

www.radiationsafety.ca

info@radiationsafety.ca