REGULATION OF URANIUM MINING AND MILLING IN CANADA

Atomic Energy Control Board
Ottawa, Canada

Presented to the Province of British Columbia Royal Commission of Inquiry into Uranium Mining

September 1979
Submission by the Atomic Energy Control Board of Canada
to the Province of British Columbia's Royal Commission
of Inquiry into Uranium Mining

Re: Regulation of Uranium Mining and Milling in Canada

In order to fulfill its mandate under the Atomic Energy Control
Act and Regulations, the AECB has of necessity become more involved in
the regulation of uranium mine-mill and tailings management facilities.
The regulatory requirements and the development of the licensing process
have been accelerated in the last few years, when renewed demand for
uranium has sparked the development of existing and new facilities.
It was also recognized that better control was necessary, based to a
great extent on past experience, if minimization of any undesirable
impact on workers' health and safety and the environment was to be
achieved.

To provide this control, the Board is relying on the input of
various federal and provincial agencies in their areas of expertise and,
as lead agency, has established a process for the joint federal-provincial
review and assessment of licence applications from uranium mining companies.
This joint process assures that no concerns related to the development and
operation of uranium mines, mills and tailings management facilities remain
unanswered.

The basic principles being considered in the assessment of any application
are whether sufficient measures are being provided in the proposed facility
to protect the health and safety of the employees and to minimize the
release of radionuclides and other harmful substance into the environment,
both during the operational phase and in the long-term.

Hence, the importance of the implementation of best available design
and construction technology, particularly in the waste management facility,
is obvious.
Criteria, guidelines and regulations relative to the above-mentioned principles have been developed in the last three years and are still being further developed by the Board, in consultation with other agencies, with special emphasis on measures required for assuring the integrity of the system after cessation of operations.

Criteria have been established on the degree of impermeability of tailings basins and retention structures. These, coupled with the requirement of diversion of the uncontaminated surface water and specific measures which will have to be implemented before the tailings area is decommissioned, should result in less-contaminated seepage and minimal air pollution from the tailings. In our opinion, revegetation of the tailings alone will probably not be sufficient to achieve satisfactory results in the long-term.

Storage or radium-barium co-precipitate in an easily retrievable manner in an engineered system is now a requirement for any new or reactivated tailings management facility. These concentrated radium-bearing wastes will eventually have to be recovered and disposed of in a suitable manner. Considerable research is necessary to determine the best solution for the disposal of this radioactive waste.

The tailings management facilities in existence today were developed at a time when very little consideration was given to the effects on the environment of mining and milling and their wastes. Therefore, they do not meet present requirements as outlined above. This is most applicable to those which at present are non-operative.

The operating tailings management facilities are gradually being modified, to the maximum extent possible, to meet present requirements.
The AECB considers the health and safety of the underground workers to be of primary concern in matters pertaining to assessment of any proposed mining practices. Secondary, although certainly important, is the influence these mining practices may have on waste streams, subsequent waste management and, consequently, the environment.

The Board has set limits for radiation exposures of the workers and members of the general public resulting from the operation of a nuclear facility in general and a uranium mine-mill facility in particular. Recognizing the very intimate relationship between the radon daughter concentration and ventilation, the Board is presently in the process of drafting the regulations governing both radiation and ventilation practices in the uranium mine-mill facilities. Exposure limits for silica dust and guidelines for gamma radiation monitoring are also being drafted.

The above is a brief outline of the principles, requirements procedures and activities of the Board pertaining to regulating the uranium mining industry.

More detailed information will be provided by Board staff during the course of the Inquiry. In the meantime, for the Commission's use:

- Atomic Energy Control Act;
- Atomic Energy Control Regulations;
- Annual Report 1977-78;
- A.E.C.B. Guide No. 31;
- Personal Gamma Dosimetry in Uranium Mines;
- A.E.C.B. 1132 ;
- Use of Respirators in Uranium Mine Atmosphere (7 July 1977);
- Requirements, Directions and Orders of an Inspector Appointed
  Under Section 12 and 17 of the AEC Regulations SOR/74-334 for
  Uranium Mine-Mill Facilities;

- Access of the Union Health and Safety Committee to Health
  and Safety Information at Uranium Mine-Mill Facilities;

- Uranium Miners Dose Records - National Dose Registry;

- Efficiency Factor for Crediting Internal Exposure to Radon
  Daughters for use of the Airstream Powered Respirator;

- Use of Respirators in Uranium Mine Atmosphere (July 12 1979).

**NOTE:** Only those documents not already available
as separate AECB publications are attached
to copies of this submission.
June 22, 1979

Dear

Personal Gamma Dosimetry in Uranium Mines

The results of studies by Board staff and by uranium mining companies in Canada, the U.S.A. and France indicate that employees of uranium mining companies are likely to be exposed to significant doses of gamma radiation. It is therefore desirable that in addition to the current monitoring of the internal exposure of uranium-mine workers, the external (gamma) exposure of designated workers also be monitored and recorded on an individual basis.

In light of the above, the Board has decided to require gradual implementation of full scale personal dosimetry programs for gamma radiation for uranium mine-mill facilities. The results of this personal dosimetry will be recorded in the National Dose Registry of the Department of National Health and Welfare.

Recognizing the need for resolving some technical problems related to adaptation of personal gamma dosimeters for use in harsh underground environments and for the Radiation Protection Bureau to secure the necessary financial and human resources, the Board has set a target date of 31 December, 1980 for the full implementation of the program.

Discussions in the near future will be organized with all parties concerned aiming at resolving the problems mentioned above, and to firm-up the technical details of the program.

Any queries on this subject should be directed to Mr. A.B. Dory, Manager, Uranium Mine Division at (613) 995-3181.

Yours sincerely,

J. H. Jennekens

P.O. Box 1046 C.P. 1046
Ottawa, Canada Ottawa, Canada
K1P 5S9 K1P 5S9
7 July, 1977

Dear

USE OF RESPIRATORS IN URANIUM MINE ATMOSPHERE

It is currently the practice for uranium mine workers to wear a respirator when work is to be performed in an atmosphere of high radon concentration. In such instances, the worker's written certification that he has worn a respirator permits an adjustment to be made of his recorded exposure depending upon the efficiency of the respirator. Recognizing that the respiratory effort necessary to overcome the resistance of the respirator is appreciable coupled with the fact that heavy physical exertion is involved in most miners' work, there is a degree of uncertainty as to whether or not a respirator is actually worn at all times in all required instances. It is also recognized that the nature of mining operations makes it extremely difficult for the employer to ascertain whether or not respirators are being worn.

The AECB and other regulatory agencies are concerned about this problem; extensive discussions have been held with all parties concerned, including the Mines Inspectors Branches of the Ontario and Saskatchewan Departments of Labour, the major producers and union representatives. The Mine Safety Advisory Committee of the AECB has also considered the situation.

Until recently, there has not been a suitable, portable, light-weight, powered respirator available commercially. Fortunately, there is now at least one successful model available. Denison Mines Limited at Elliot Lake has tested the "Airstream" Helmet and their experience shows that it is efficient and comfortable.
After further consultations with the Mines Inspectors Branches of the Ontario and Saskatchewan Departments of Labour, it has been decided, effective immediately, to disallow any credits on recorded internal exposure to radon daughters for non-powered respirators. It must be emphasized that the management at every uranium mine-mill facility should make every effort to improve atmospheric conditions in all working places to the extent that concentrations of radionuclides and respirable dust are at acceptable levels. However, in unusual circumstances, where this is not reasonably achievable, the use of powered respirators should be considered and recorded internal exposures to radon daughters adjusted by a test-proven efficiency factor for this type of respirator.

Operators of uranium mine-mill facilities who do not yet have the powered respirators will be allowed to continue with the old practice until the powered air supply respirators are received. Written permission from the AECB for this temporary exemption is required, and it will be issued only if proof that powered respirators have been ordered is furnished with the application.

If there are any queries, please contact Board staff.

Yours sincerely,

J. H. Jennekens
Director
Directorate of Licensing
July 9, 1979

Dear

Re: Requirements, Directions and Orders of an Inspector Appointed Under Sections 12 and 17 of the AEC Regulations SOR/74-334 for Uranium Mine-Mill Facilities

Section 12(3)(e) of the above regulations states, that an inspector may direct "such action to be taken as he deems necessary to remedy the breach of these Regulations or the condition of the licence, as the case may be, and to minimize the consequences, if any, of the occurrence."

We would like to emphasize that if you as an AECB Inspector decide that a breach of the above Regulations and/or a condition of a licence issued pursuant to the above Regulations is breached, you may direct the licensee to initiate action which would remedy the situation which caused the breach of the Regulations and/or licence conditions.

If this direction or order is issued it has to clearly indicate that its issuance is pursuant to Section 12(3)(e) of the Atomic Energy Control Regulations SOR/74-334.

Yours sincerely,

J. H. Jennekens
July 9, 1979

Dear

Re: Access of the Union Health and Safety Committee to Health and Safety Information at Uranium Mine-Mill Facilities

It is the policy of the Atomic Energy Control Board that the Union Health and Safety Committees should be kept informed about the issues relating to specific questions of occupational health and safety.

To avoid any possible uncertainty as to the type of information supplied to the Health and Safety Committees, the AECB feels that a clarification would be beneficial to all parties concerned.

A copy of any requirements, orders and directions communicated by Board staff project officers or an inspector appointed under Sections 12 and 17 of the Atomic Energy Control Regulations SOR/74-334, and any letters from the licensee to the regulatory agencies reporting on occupational health and safety issues including statements resulting from requirements, orders and directions referred to above, should be forwarded by mail to the Health and Safety Committee.

The AECB would also recommend to the licensees that when any new work practice or method requiring a change in safety procedures is considered for implementation, a prior consultation with the Health and Safety Committee might prove to be desirable and would likely result in better understanding and cooperation by the workers, and therefore, in better safety on the job.

Yours sincerely,

J. H. Jennekens

P.O. Box 1046 C.P. 1046
Ottawa, Canada Ottawa, Canada
K1P 5S9 K1P 5S9
31 January, 1978

Dear: (See attached list)

URANIUM MINERS DOSE RECORDS - NATIONAL DOSE REGISTRY

During the past year, the Atomic Energy Control Board and Health and Welfare Canada have collaborated in an effort to establish an appropriate means for including the exposure of uranium miners to radon daughters in the National Dose Registry of Health and Welfare Canada.

This letter is to inform you that the National Dose Registry is now ready to accept input on the exposure of miners to radon daughters. Enclosed please find the document "Uranium Miners Dose Records Protocol for Inclusion in the National Dose Registry", which explains the manner in which records should be submitted and outlines the data required for initial submission, subsequent submission and submission of past records.

You are hereby requested to organize your radon exposure reports for the first quarter of 1978 in a format containing data required for initial submission, which is to be submitted to the Board's Project Officer in lieu of your normal, monthly exposure reports, as currently required by your licence. The Board will ensure this information is forwarded to the National Dose Registry. It is also recommended that you submit available data on past exposure records at your earliest convenience, in order that this information can be included in the dose registry records. In turn, the mining companies will receive quarterly print-outs of their employees' exposures, including total accumulated lifetime exposures, regardless of where (i.e., at which mine) the exposures were received.

P.O. Box 1046  C.P. 1046
Ottawa, Canada  Ottawa, Canada
K1P 5S9  K1P 5S9
It is hoped that the establishment of the central dose records will be of great help both to the industry and the regulatory authorities.

Yours sincerely,

A.T. Prince

enclosure

c.c.  Dr. E.G. Letourneau
    Dr. A.B. Morrison
24 August, 1977

Mr. C. H. Frame
Executive Vice-President
Mining Operations
Denison Mines Limited
Suite 3900, South Tower
Royal Bank Plaza
P.O. Box 40
TORONTO, Ontario
M5J 2K2

Dear Mr. Frame:

EFFICIENCY FACTOR FOR CREDITING INTERNAL EXPOSURE TO RADON DAUGHTERS FOR USE OF THE AIRSTREAM POWERED RESPIRATOR

Thank you for your letter of 4 August, 1977, concerning the rate of credit to be applied on exposures when using the powered respirator.

The Mine Engineering Branch of the Ontario Ministry of Labour, will conduct, in the near future, tests to verify the efficiency of the Airstream Helmet for protection to the wearer against the radon daughter concentration in the mine atmosphere.

In the interim period, until such tests are completed, an efficiency factor of 80% should be used to calculate adjusted internal exposures to radon daughters, based on measured concentrations of radon daughters in the ambient air.

This efficiency factor was arrived at by statistical analysis of test results as contained in your "Efficiency Evaluation of Airstream Helmet", preliminary report dated 18 February, 1977, and can be applied only when the helmet is operated with the visor down.

After verification tests, modifications to the efficiency factor will be made, if necessary.

Yours sincerely,

A. T. Prince
President

C.C. Mr. D. Gray
C.C. Mr. P. McCrodon
C.C. Mr. W. Bardswich
C.C. Mr. W. Cannon
P.O. Box 1046 C.P. 1046
Ottawa, Canada Ottawa, Canada
K1P 5S9 K1P 5S9
Use of Respirators in Uranium Mine Atmospheres

A letter under the above heading, dated 7 July, 1977 sent to the licensees, dealt with the questions of the use of positive pressure air supplied respirators in uranium mines.

As a result of field testing of various models of positive pressure air supplied respirators by the companies and by the Ontario Ministry of Labour on behalf of the AECB, an efficiency factor of 80% has been determined to be a representative value for calculating credits on recorded exposures to radon daughters.

During the extended period of the practical use of these respirators, concerns arose regarding the degree of uncertainty as to the actual time the respirators were worn. A joint management-union survey and subsequent Ontario Ministry of Labour - AECB survey at Denison Mines Limited (results attached) indicate that the respirators are worn on average for five hours of an eight hour shift.

After the assessment of the results of the surveys, in consultation with the Ontario Ministry of Labour, the Board decided that effective 1 August, 1979 a credit factor of 50% shall be used for calculating exposures to radon daughters. This factor has been derived by using the following formula:

\[
\frac{5 \text{ hours}}{8 \text{ hours}} \times 80\% = 50\%
\]

and combines the efficiency factor of 80% with the utilization factor of 62.5% (5 hours : 8 hours).

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The Board would like to emphasize again that the management at every uranium mine-mill facility should make every effort to improve atmospheric conditions in all working places to the extent that concentrations of radionuclides and respirable dust are at acceptable levels.

Even though improvements in this regard have been noted over the past two years a more concentrated effort is necessary, with the objective that the average conditions in a given mine by 1 July, 1981 shall be such that exposures can be kept within the limits without the wearing of respirators.

After 1 July, 1981, production activities (as opposed to corrective actions), in a workplace where wearing the respirator is mandatory, may be allowed only in exceptional cases for a limited time upon a written approval by the Inspector. The application for this approval will have to be accompanied by a report showing justifiable cause for exemption.

On the other hand, in keeping with the principle of as low as reasonably achievable, the Board strongly encourages voluntary use of these respirators with the corresponding credits applied to the recorded radon daughter exposures.

Considering the incremental difference in the lifetime exposure owing to the change of protection factor, the Board can see no appreciable advantage in requiring the licensees to recalculate radon daughter exposure records of individuals for the years of 1977, 1978 and 1979.

Any queries on this subject should be directed to Mr. A.B. Dory, Manager, Uranium Mine Division at (613) 995-3181.

Yours sincerely,

J. H. Jennekens