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Design of Uranium Mines and Mills: Ventilation Systems

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Design of Uranium Mines and Mills: Ventilation Systems

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This document can be viewed on the [CNSC website](#). To request a copy of the document in English or French, please contact:

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Preface

This regulatory document is part of the CNSC's Physical design series of regulatory documents, which also covers design for reactor facilities, laboratories and medical facilities. The full list of regulatory document series is included at the end of this document and can also be found on the [CNSC's website](#).

REGDOC-2.5.4, *Design of Uranium Mines and Mills: Ventilation Systems*, is a guide to help persons meet the requirements for submitting ventilation-related information when applying for a CNSC licence to prepare a site for and construct, operate or decommission a uranium mine or mill.

This document supersedes regulatory document G-221, *A Guide to Ventilation Requirements for Uranium Mines and Mills*, published in June 2003.

REGDOC-2.5.4 is intended to form part of the safety and control measures to be described in a licence application and the documents needed to support that application.

Guidance contained in this document exists to inform the applicant, to elaborate further on requirements or to provide direction to licensees and applicants on how to meet requirements. It also provides more information about how CNSC staff evaluate specific problems or data during their review of licence applications. Licensees are expected to review and consider guidance; should they choose not to follow it, they should explain how their chosen alternate approach meets regulatory requirements.

A graded approach, commensurate with risk, may be defined and used when applying the requirements and guidance contained in this regulatory document. The use of a graded approach is not a relaxation of requirements. With a graded approach, the application of requirements is commensurate with the risks and particular characteristics of the facility or activity.

An applicant or licensee may put forward a case to demonstrate that the intent of a requirement is addressed by other means and demonstrated with supportable evidence.

The requirements and guidance in this document are consistent with modern national and international practices addressing issues and elements that control and enhance nuclear safety. In particular, they establish a modern, risk-informed approach to the categorization of accidents – one that considers a full spectrum of possible events, including events of greatest consequence to the public.

Important note: Where referenced in a licence either directly or indirectly (such as through licensee-referenced documents), this document is part of the licensing basis for a regulated facility or activity.

The licensing basis sets the boundary conditions for acceptable performance at a regulated facility or activity, and establishes the basis for the CNSC's compliance program for that regulated facility or activity.

Where this document is part of the licensing basis, the word "shall" is used to express a requirement to be satisfied by the licensee or licence applicant. "Should" is used to express guidance or that which is advised. "May" is used to express an option or that which is advised or permissible within the limits of this regulatory document. "Can" is used to express possibility or capability.

Nothing contained in this document is to be construed as relieving any licensee from any other pertinent requirements. It is the licensee's responsibility to identify and comply with all applicable regulations and licence conditions.

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Design of Uranium Mines and Mills: Ventilation Systems

1. Introduction

1.1 Purpose

REGDOC-2.5.4, *Design of Uranium Mines and Mills: Ventilation Requirements*, aims to help persons address the requirements for submitting ventilation-related information when applying for a CNSC licence to prepare a site for and construct, operate or decommission a uranium mine or mill.

Provincial and territorial mining regulations for ventilation apply, unless exceeded by the requirements for nuclear safety noted in this document.

This regulatory document is also intended to help applicants for a uranium mine or mill licence understand their operational and maintenance obligations for ventilation systems.

1.2 Scope

REGDOC-2.5.4 is relevant to any application for a CNSC licence to prepare a site for and construct, operate or decommission a uranium mine or mill. This guide summarizes the ventilation-related obligations of uranium mine and mill licensees, and also describes and discusses the ventilation-related information that licence applicants should typically submit to meet regulatory requirements.

The regulatory document pertains to any ventilation of uranium mines and mills for the purpose of assuring the radiation safety of workers and onsite personnel. This ventilation may be associated with any underground or surface area or premise that is licensable by the CNSC as part of a uranium mine or mill. These areas and premises typically include mine workings, mill buildings, and other areas or premises involving or potentially affected by radiation or radioactive materials. Examples of the latter include offices, effluent treatment plants, cafeterias, lunchrooms and personnel change rooms.

This document may also assist in the design ventilation systems for deep geologic repositories.

1.3 Relevant legislation

The provisions of the [*Nuclear Safety and Control Act*](#) (NSCA) and regulations that are relevant to this regulatory document include:

- Section 26 of the NSCA states that “no person shall, except in accordance with a licence,
 - (a) possess, transfer, import, export, use or abandon a nuclear substance, prescribed equipment or prescribed information;
 - (b) mine, produce, refine, convert, enrich, process, reprocess, package, transport, manage, store or dispose of a nuclear substance;
 - (c) produce or service prescribed equipment;
 - (d) operate a dosimetry service for the purposes of this Act;
 - (e) prepare a site for, construct, operate, modify, decommission or abandon a nuclear facility; or
 - (f) construct, operate, decommission or abandon a nuclear-powered vehicle or bring a nuclear powered vehicle into Canada.”
- Section 7 of the [*General Nuclear Safety and Control Regulations*](#) states that “An application for a licence or for the renewal, suspension in whole or in part, amendment, revocation or replacement

of a licence may incorporate by reference any information that is included in a valid, expired or revoked licence.”

- Section 15 of the *General Nuclear Safety and Control Regulations* states that “Every applicant for a licence and every licensee shall notify the Commission of

- (a) the persons who have authority to act for them in their dealings with the Commission;
- (b) the names and position titles of the persons who are responsible for the management and control of the licensed activity and the nuclear substance, nuclear facility, prescribed equipment or prescribed information encompassed by the licence; and
- (c) any change in the information referred to in paragraphs (a) and (b), within 15 days after the change occurs.”

- Section 3 of the *Uranium Mines and Mills Regulations* (UMMR) states that “An application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the *General Nuclear Safety and Control Regulations*:

- (a) in relation to the plan and description of the mine or mill,
 - (i) a description of the site evaluation process and of the investigations and preparatory work to be done at the site and in the surrounding area,
 - (ii) a surface plan indicating the boundaries of the mine or mill and the area where the activity to be licensed is proposed to be carried on,
 - (iii) a plan showing the existing and planned structures, excavations and underground development
 - (iv) a description of the mine or mill, including the installations, their purpose and capacity, and any excavations and underground development,
 - (v) a description of the site geology and mineralogy,
 - (vi) a description of any activity that may have an impact on the development of the mine or mill, including any mining-related activity that was carried on at the site before the date of submission of the application to the Commission,
 - (vii) a description of the design of and the maintenance program for every eating area,
 - (viii) the proposed plan for the decommissioning of the mine or mill, and
 - (ix) a description of the proposed emergency power systems and their capacities;
- (b) in relation to the activity to be licensed,
 - (i) a description of and the schedule for the planned activity,
 - (ii) a description of the proposed methods for carrying on the activity,
 - (iii) a list of the categories of material proposed to be mined and a description of the criteria used to determine those categories,
 - (iv) the anticipated duration of the activity, and
 - (v) the proposed quality assurance program for the activity;
- (c) in relation to the environment and waste management,
 - (i) the program to inform persons living in the vicinity of the mine or mill of the general nature and characteristics of the anticipated effects of the activity to be licensed on the environment and the health and safety of persons,
 - (ii) the program to determine the environmental baseline characteristics of the site and the surrounding area,
 - (iii) the effects on the environment that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects,
 - (iv) the proposed positions for and qualifications and responsibilities of environmental protection workers,

- (v) the proposed environmental protection policies and programs,
 - (vi) the proposed effluent and environmental monitoring programs,
 - (vii) the proposed location, the proposed maximum quantities and concentrations, and the anticipated volume and flow rate of releases of nuclear substances and hazardous substances into the environment, including their physical, chemical and radiological characteristics,
 - (viii) the proposed measures to control releases of nuclear substances and hazardous substances into the environment,
 - (ix) a description of the anticipated liquid and solid waste streams within the mine or mill, including the ingress of fresh water and any diversion or control of the flow of uncontaminated surface and ground water,
 - (x) the proposed measures to prevent or mitigate the effects of accidental releases of nuclear substances and hazardous substances on the environment, the health and safety of persons and the maintenance of security, including measures to
 - (A) assist off-site authorities in planning and preparing to limit the adverse effects of an accidental release,
 - (B) notify off-site authorities of an accidental release or the imminence of an accidental release,
 - (C) report information to off-site authorities during and after an accidental release,
 - (D) assist off-site authorities in dealing with the adverse effects of an accidental release, and
 - (E) test the implementation of the measures to control the adverse effects of an accidental release,
 - (xi) the anticipated quantities, composition and characteristics of backfill, and
 - (xii) a description of the proposed waste management system;
- (d) in relation to health and safety,
- (i) the effects on the health and safety of persons that may result from the activity to be licensed, and the measures that will be taken to prevent or mitigate those effects,
 - (ii) the proposed program for selecting, using and maintaining personal protective equipment,
 - (iii) the proposed worker health and safety policies and programs,
 - (iv) the proposed positions for and qualifications and responsibilities of radiation protection workers,
 - (v) the proposed training program for workers,
 - (vi) the proposed measures to control the spread of any radioactive contamination,
 - (vii) the proposed ventilation and dust control methods and equipment for controlling air quality, and
 - (viii) the proposed level of effectiveness of and inspection schedule for the ventilation and dust control systems; and
- (e) in relation to security, the proposed measures to alert the licensee to acts of sabotage or attempted sabotage at the mine or mill.”
- Section 4 of the UMMR states that:
 - “(1) In this section, *action level* means a specific dose of radiation or other parameter that, if reached, may indicate a loss of control of part of a licensee’s radiation protection program or environmental protection program, and triggers a requirement for specific action to be taken.
 - (2) An application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain a proposed code of practice that includes

- (a) any action level that the applicant considers appropriate for the purpose of this subsection;
- (b) a description of any action that the applicant will take if an action level is reached; and
- (c) the reporting procedures that will be followed if an action level is reached.”

- Section 5 of the UMMR states that:

“(1) An application for a licence to prepare a site for and construct a uranium mine shall contain the following information in addition to the information required by section 3 and subsection 4(2):

- (a) a description of the proposed design of the mine;
- (b) the proposed construction program, including its schedule;
- (c) a description of the components, systems and equipment proposed to be installed at the mine, including their design operating conditions;
- (d) the proposed quality assurance program for the design of the mine;
- (e) the results of a process-hazard analysis and a description of how those results have been taken into account;
- (f) a description of the proposed design, construction and operation of the waste management system, including the measures to monitor its construction and operation, the construction schedule, the contingency plans for construction and the measures to control the movement of water in existing waterways;
- (g) a description of the proposed disposition of the ore;
- (h) the anticipated quantities and grade of ore and waste rock that will be removed, their proposed storage location, and the proposed method, program and schedule, for their removal and disposal;
- (i) the proposed mining methods and programs; and
- (j) the proposed commissioning plan for the components, systems and equipment to be installed at the mine.

(2) An application for a licence to prepare a site for and construct a uranium mill shall contain the following information in addition to the information required by section 3 and subsection 4(2):

- (a) a description of the proposed design of the mill;
- (b) the proposed construction program, including its schedule;
- (c) a description of the components, systems and equipment proposed to be installed at the mill, including their design operating conditions;
- (d) the proposed quality assurance program for the design of the mill;
- (e) the results of a process-hazard analysis and a description of how those results have been taken into account;
- (f) a description of the proposed design, construction and operation of the waste management system, including the measures to monitor its construction and operation, the construction schedule, the contingency plans for construction and the measures to control the movement of water in existing waterways;
- (g) the proposed milling methods and programs;
- (h) a description of all proposed laboratory facilities and programs; and
- (i) the proposed commissioning plan for the components, systems and equipment to be installed at the mill.”

- Section 6 of the UMMR states that:

“(1)An application for a licence to operate a uranium mine shall contain the following information in addition to the information required by section 3 and subsection 4(2):

- (a) the results of any commissioning work;
- (b) a description of the structures, components, systems and equipment at the mine, including any changes to their design and their design operating conditions as a result of the commissioning;
- (c) the proposed policies, methods and programs for operating and maintaining the mine; and
- (d) the proposed methods for handling, storing, loading and transporting nuclear substances and hazardous substances.

(2) An application for a licence to operate a uranium mill shall contain the following information in addition to the information required by section 3 and subsection 4(2):

- (a) the results of any commissioning work;
- (b) a description of the structures, components, systems and equipment at the mill, including any changes to their design and their design operating conditions as a result of the commissioning;
- (c) the proposed policies, methods and programs for operating and maintaining the mill;
- (d) the proposed methods for handling, storing and loading concentrates and uranium-bearing material, both solid and liquid;
- (e) the proposed operating schedule;
- (f) the daily and annual design capacity of the mill, and the expected recovery and composition of mill feed, concentrates and tailings; and
- (g) a description of the proposed operation of the waste management system.”

- Section 7 of the UMMR states that “An application for a licence to decommission a uranium mine or mill shall contain the following information in addition to the information required by section 3 and subsection 4(2):

- (a) a description of and the proposed schedule for the decommissioning work, including the proposed starting date and the expected completion date of the decommissioning work and the rationale for the schedule;
- (b) the land, buildings, structures, components, systems, equipment, nuclear substances and hazardous substances that will be affected by the decommissioning;
- (c) the proposed measures, methods and programs for carrying on the decommissioning; and
- (d) a description of the planned state of the site upon completion of the decommissioning work.”

- Section 10 of the UMMR states that “Every licensee shall
 - (a) establish, implement and maintain written operating procedures for the licensed activity;
 - (b) train its workers to perform their work in accordance with the operating procedures; and
 - (c) audit its workers for the purpose of verifying compliance with the operating procedures.”

- Section 11 of the UMMR states that“Every licensee shall, with respect to the ventilation systems established in accordance with the licence,
 - (a) ensure that each main fan is equipped with a device that provides a warning signal when the main fan is not functioning properly;
 - (b) ensure that a person is designated to receive and respond to a warning signal provided by a device referred to in paragraph (a); and
 - (c) implement measures to prevent any person or activity from interfering with the proper operation of the ventilation systems.”

- Section 12 of the UMMR states that:
 - “(1) Where a ventilation system in a work place is not functioning in accordance with a licence, the licensee shall
 - (a) implement alternative measures to protect the health and safety of its workers; and
 - (b) ensure that only the work necessary to restore that system is performed in the work place.
 - (2) Before a worker performs any work that is necessary to restore a ventilation system, the licensee shall inform the worker of the protective measures that have been taken and are to be taken in connection with the work.”
- Section 16 of the UMMR states that:
 - “(1) Every licensee shall keep a record of
 - (a) its operating and maintenance procedures;
 - (b) its mine plans showing the actual and planned mine workings;
 - (c) the schedules for all of its planned mining operations;
 - (d) the plans of every tailings-containment structure and area and every diversion structure and system associated with the waste management system;
 - (e) the design of the uranium mine or mill and of the components and systems installed at the mine or mill;
 - (f) the method and relevant data used to ascertain the doses of radiation received by the workers at the uranium mine or mill and the intake of radioactive nuclear substances by those workers;
 - (g) any measurement made in accordance with the licence or the regulations made under the Act;
 - (h) the inspections and maintenance carried out in accordance with the licence or the regulations made under the Act;
 - (i) the quantity of air delivered by each main fan;
 - (j) the performance of each dust control system; and
 - (k) the training received by each worker.
 - (2) Every licensee shall make the records referred to in subsection (1) available at the uranium mine or mill to the workers and a workers’ representative.
 - (3) Every licensee shall retain a record of the training referred to in paragraph (1)(k) for the period that the worker is employed at the uranium mine or mill.
 - (4) Every licensee shall post, at a location within the uranium mine or mill that is accessible to all workers and where it is most likely to come to their attention, a record of the measurements made in respect of every work place in accordance with the licence and these Regulations.”

2. Environmental Assessment and Licensing Processes

The *Nuclear Safety and Control Act* obliges the CNSC to determine, before issuing a licence, whether the applicant for the licence is qualified and will make adequate provision for the health and safety of persons, national security and protection of the environment and measures required to implement Canada’s international obligations. To make these determinations, the CNSC needs credible and relevant information from applicants.

2.1 Environmental assessment process

Upon receipt of a licence application to prepare a site for and construct an uranium mine and/or mill facility and a complete project description, the CNSC determines whether the activity in the application requires an environmental assessment (EA) pursuant to the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). The CEAA 2012 sets out the federal EA process in Canada; EAs under the CEAA 2012 identify if a specific project is likely to cause significant environmental effects, and determine whether those effects can be mitigated. By considering environmental effects and mitigation early in project planning, potential delays and unnecessary costs can be avoided or reduced.

The CNSC is the sole federal responsible authority for conducting an EA for designated projects identified in the *Regulations Designating Physical Activities*. For additional information on EAs under the CEAA 2012 and the CNSC licensing process, refer to [REGDOC-3.5.1, *Licensing Process for Class I Facilities and Uranium Mines and Mills*](#). For additional information on the EA process under the CEAA 2012, refer to [REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*](#).

2.2 Licensing process

The CNSC's licensing process for uranium mines and mills follows the stages laid out in the *Uranium Mines and Mills Regulations*, proceeding progressively through site preparation and construction, operating, decommissioning and abandonment phases. At each licensing stage, the CNSC determines if the licence applicant is qualified and has made adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. If satisfied, the CNSC may issue a licence that contains appropriate conditions.

Typically, a CNSC licence incorporates the applicant's commitments and any other conditions that the CNSC considers necessary in the interests of health and safety of persons, national security and protection of the environment.

The information required by the CNSC at each licence application stage is influenced by case-specific circumstances. Typically, the information supplied at one stage serves as a building block for the next. An application for a CNSC licence may include new information or, in accordance with section 7 of the *General Nuclear Safety and Control Regulations*, it may incorporate by reference any information that is contained in another CNSC-issued licence. For additional information on EAs under the CEAA 2012 and the CNSC licensing process, refer to [REGDOC-3.5.1, *Licensing Process for Class I Facilities and Uranium Mines and Mills*](#).

2.3 CNSC point of contact

The CNSC assigns every applicant or licensee a single point of contact, who can clarify or explain the information in this document if necessary.

The applicant should contact the CNSC early on to request the name and contact information of the person assigned to their application.

To contact the CNSC:
Tel.: 613-995-5894 or 1-800-668-5284 (in Canada only)
Fax: 613-995-5086
Email: info@cncs-ccsn.gc.ca

2.4 Submission of licence application

The applicant should ensure that the application is complete, dated and signed by the appropriate authority (the licence applicant), and that all supporting documents are clearly identified and cross-referenced.

If the licence application is subject to the *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations*, payment must be enclosed. For further details, contact the CNSC Cost Recovery Group at (613) 995-5894 or toll-free at 1-888-229-2672.

The applicant should send two printed copies of the signed and dated application to the Commission at the following address:

Commission Secretary
Canadian Nuclear Safety Commission
P.O. Box 1046, Station B
280 Slater Street
Ottawa, ON K1P 5S9

As required by section 27 of the *General Nuclear Safety and Control Regulations*, the applicant must keep a complete copy of the application for their records.

Applicants are strongly encouraged to submit the documents in electronic format (for example, on secure memory devices).

All information submitted is subject to the provisions of the *Access to Information Act* and the *Privacy Act*. It is the responsibility of the applicant to identify and justify any material that is not suitable for disclosure in accordance with those acts.

3. Overview of Ventilation Requirements in Legislation

The *Uranium Mines and Mills Regulations* contain both direct and indirect references to the ventilation of uranium mines or mills. Section 3 is a comprehensive summary of the general information to be included in an application for a uranium mine or mill licence, except for a licence to abandon. The section includes requirements that pertain exclusively to the ventilation of uranium mines or mills, as well as others that encompass, but are not limited to, ventilation-related matters.

Sections 4, 5, 6 and 7 of the *Uranium Mines and Mills Regulations* address ventilation systems and related matters, among other topics. These subjects include:

- codes of practice
- design of the mine or mill
- results of commissioning work
- design of equipment, systems and components
- quality assurance
- commissioning plans
- operating, maintenance and decommissioning policies, methods and procedures

Section 10 pertains to both ventilation-related and non-ventilation-related matters. It requires uranium mine and mill licensees to:

- establish, implement and maintain written operating procedures for their licensed activities

- train their workers to perform work in accordance with operating procedures
- audit their workers for the purpose of verifying compliance with operating procedures

Sections 11 and 12 specify the actions to be taken by CNSC licensees with respect to the operation or malfunction of ventilation systems.

Section 16 requires licensees to keep certain records, including those for ventilation systems and activities, and to make these records available to workers and workers' representatives.

4. Information Requirements at Prescribed Licensing Stages

Radiation safety in uranium mines and mills depends partly on the provision of adequate ventilation in the workplace, and the ventilation-related requirements discussed in this guide appear in the *Uranium Mines and Mills Regulations* (UMMR). Historically, uranium mines and mills have used active or passive ventilation measures to limit concentrations of airborne radioactivity in workplaces. When properly designed, constructed, monitored and maintained, such systems have proven to be practical and effective in reducing radiation hazards.

Under the UMMR, applicants for all classes of uranium mine and mill licences, except a licence to abandon, are responsible for submitting prescribed information pertaining to any proposed ventilation systems or activities. These information requirements will vary with the licensing stage. For example, an application for a uranium mine or mill operating licence should typically include a description of the finalized proposal (i.e., the “policies, methods and procedures”) for operating and maintaining any proposed ventilation system and “as-built” design details, whereas more preliminary information on operating and maintenance policies, methods and procedures might suffice at the siting and construction stage. Conversely, proponents who plan to use unproven or novel technologies or methods might need to provide more rigorous substantiations at an earlier licensing stage than proponents of more conventional, proven approaches.

For uranium mines and mills, the ventilation-related measures and activities proposed will depend partly on unique combinations of legislated requirements and case-specific factors, at all stages of the licensing process. These factors will reflect the options open to applicants or proponents and their respective preferences, and include site, environmental and technological constraints, such as ore-body characteristics, mining and processing technologies, facility designs and operating methods.

In addition to fulfilling regulatory requirements, proponents of uranium mine or mill projects may be assigned additional undertakings to complete. Supplemental work, or undertakings, can be identified through either the environmental assessment review process or licensing hearings, or both. Undertakings and conditions can be assigned by the CNSC or other government bodies from which approvals are required.

At all licensing stages, the CNSC will review any proposed ventilation systems or activities against regulatory requirements, and will consider relevant information that pertains directly or indirectly to the systems or activities. The NSCA and regulations do not prescribe the form of applications for uranium mine or mill licences, but state only the type of information that is to be included. However, to aid regulatory review, the information contained in licence applications should be organized and presented clearly and logically.

The following sections summarize and discuss information requirements for uranium mine and mill ventilation systems.

4.1 All classes of licences except a licence to abandon

Requirements

Subparagraphs 3(d)(vii) and 3(d)(viii) of the UMMR require an application for any CNSC licence in respect of a uranium mine or mill, other than a licence to abandon, to contain descriptions of:

- the proposed ventilation and dust control methods
- the proposed equipment for controlling air quality
- the proposed level of effectiveness of and inspection schedule for the ventilation and dust control systems

Guidance

The description of the proposed level of effectiveness of the ventilation and dust control systems should explain how the system will be or has been optimized in accordance with the ALARA (as low as reasonably achievable) principle of dose limitation.

If alternative radiation protection measures are to be substituted for engineered ventilation measures, these measures should be described and justified in the context of the applicant's radiation protection program.

The licence application should demonstrate that the proposed ventilation designs are appropriate and that the related performance predictions are valid. This documentation could include descriptions of supporting assumptions, criteria, calculations, research, modelling results, drawings, plans, or diagrams.

4.2 Licence to prepare a site for and construct

Requirements

In addition to the information required by subparagraphs 3(d)(vii) and 3(d)(viii) of the UMMR, an application for a licence to prepare a site for and construct a uranium mine or mill shall contain the following information, where it is relevant to the ventilation of the mine or mill:

- a proposed code of practice that includes:
 - a) any action level that the applicant considers necessary for purposes of subsection 4(2) of the UMMR
 - b) a description of any action that the applicant will take if an action level is reached, and
 - c) the reporting procedures that will be followed if an action level is reached (subsection 4(2))
- a description of the proposed design of the mine or mill (paragraphs 5(1)(a), 5(2)(a))
- a description of the components, systems and equipment proposed to be installed at the mine or mill, including their design operating conditions (paragraphs 5(1)(c), 5(2)(c))
- the proposed quality assurance program for the mine or mill (paragraphs 5(1)(d), 5(2)(d))
- the results of a process-hazard analysis and a description of how those results have been taken into account (paragraphs 5(1)(e), 5(2)(e))
- the proposed commissioning plan for the ventilation components, systems, and equipment to be installed at the mine or mill (paragraphs 5(1)(j), 5(2)(i))

Guidance

The information that is submitted to meet the information requirements listed above for a licence to prepare a site for and construct a uranium mine or mill should typically include such supporting details as:

- a description of any alarm system or component, including a main fan warning device, that will be installed to ensure that the ventilation system operates safely (subsection 11(a))
- a description of any design provisions to ensure effective separation of primary air intakes and exhausts
- a description of any proposed auxiliary ventilation systems
- the preliminary programs for monitoring air quality and quantity
- a description of the quantity and quality of air that is to be supplied to each workplace area;
- a description of the expected rate of air exchange in the workplace after installation of any proposed ventilation systems
- a description of the expected air quality in the workplace after installation of any proposed ventilation systems
- a description of any administrative provisions to ensure effective operation of the ventilation system
- proposed operating parameters for winter and summer; and
- any proposed measures to control the movement of radiation from unventilated to ventilated areas of underground mines

4.3 Licence to operate

Requirements

In addition to the information required by subparagraphs 3(d)(vii) and 3(d)(viii) of the UMMR, an application for a licence to operate a uranium mine or mill shall contain the following information, where it is relevant to the ventilation of the mine or mill:

- a proposed code of practice that includes:
 - (a) any action level that the applicant considers necessary for purposes of subsection 4(2) of the UMMR
 - (b) a description of any action that the applicant will take if an action level is reached, and
 - (c) the reporting procedures that will be followed if an action level is reached (subsection 4(2))
- the proposed policies, methods and programs for operating and maintaining the ventilation systems (paragraphs 6(1)(c), 6(2)(c))
- a description of the structures, components, systems and equipment that have been constructed or installed at the mine or mill, and their design operating conditions as a result of commissioning (paragraphs 6(1)(b), 6(2)(b))
- the results of any commissioning work (paragraph 6(1)(a))
- the measures to ensure that a person is designated to receive and respond to a warning signal provided by a main-fan warning device (subsection 11(b))
- the measures that are to be implemented to prevent any person or activity from interfering with the proper operation of the ventilation system (subsection 11(c) the measures that the applicant proposes to implement to protect the health and safety of workers if the ventilation system in the licensed workplace fails to function in accordance with the licence (paragraph 12(1)(a))
- the measures that the licence applicant proposes to implement to ensure, in the event of a ventilation system not functioning in accordance with a licence, that only the work that is immediately necessary to restore the system is performed in the affected workplace (paragraph 12(1)(b))

- how the licensee will inform a worker of the protective measures that have been taken and are to be taken in connection with any work necessary to restore a ventilation system (subsection 12(2))

Guidance

To meet the above requirements as they pertain to ventilation systems or related measures, an application for a licence to operate a uranium mine or mill should include or incorporate the relevant information, whether new or previously submitted.

Accordingly, an application to the CNSC for a uranium mine or mill operating licence should demonstrate that any engineered ventilation system will be operated, monitored and maintained in accordance with regulatory requirements. Typically, the application should describe:

- the dimensions, location and layout of ventilation ducts
- the location, type and use of all ventilation system controls and regulators
- the design, location and operation of any equipment or devices to measure air quality or air quantity
- the location of system air intakes and exhausts
- how the ventilation system has been constructed to meet any relevant conditions of the associated CNSC licence to prepare a site for and construct the facility
- any available results from the monitoring of the performance of the ventilation system during commissioning
- any planned changes with respect to the design, operation, monitoring, maintenance or performance of the engineered ventilation system
- any proposed code of practice with respect to the ventilation system
- the policies, methods and procedures for operating, maintaining and controlling the ventilation system

4.4 Licence to decommission

Requirements

In addition to the information required by subparagraphs 3(d)(vii) and 3(d)(viii) of the UMMR, the regulations stipulate that an application for a licence to decommission a uranium mine or mill shall contain the following information where it is relevant to the ventilation of the mine or mill.

- a proposed code of practice that includes:
 - (a) any action level that the applicant considers necessary for purposes of subsection 4(2) of the UMMR
 - (b) a description of any action that the applicant will take if an action level is reached, and
 - (c) the reporting procedures that will be followed if an action level is reached (subsection 4(2))
- the proposed schedule for the decommissioning work, including the proposed starting date and the expected completion date of the decommissioning work and the rationale for the schedule (subsection 7(a))
- a description of the land, buildings, structures, components, systems, equipment, nuclear substances and hazardous substances that will be affected by the decommissioning (subsection 7(b))
- the proposed measures, methods and programs for carrying on the decommissioning (subsection 7(c))
- a description of the planned state of the site upon completion of the decommissioning work (subsection 7(d))

Guidance

The information submitted in support of an application for a licence to decommission should address the requirements listed above to a level of detail and accuracy that demonstrates that the applicant has made adequate allowance for the health and safety of persons, national security and protection of the environment during decommissioning.

One example of making adequate allowance might be to provide enhanced ventilation during some or all decommissioning activities. This could involve the continued use, with or without modifications, of a ventilation system that was used during the operating phase, or the use of new measures. Accordingly, a licence applicant's preferred measures will typically be influenced by case-specific circumstances, such as whether previously installed ventilation systems have become radioactively contaminated during use, or whether the proposed ventilation systems are likely to become similarly contaminated upon use. To expedite regulatory review and licensing, the application for a decommissioning licence should address any such possibilities.

CNSC staff need to know the details of an applicant's proposed decommissioning plans, so that it can evaluate the adequacy of any proposed use or decommissioning of ventilation systems and equipment.

To help control radiation doses to workers and the public during decommissioning activities, action levels that involve ventilation activities or results can be incorporated into codes of practice at uranium mines or mill.

5. Operational and Maintenance-Related Requirements

Requirements

If a code of practice is referred to in a uranium mine or mill licence, the licensee is required by section 9 of the *Uranium Mines and Mills Regulations* (UMMR) to post a copy of the code of practice at a location within the uranium mine or mill that is accessible to all workers and where it is most likely to come to their attention.

Paragraph 10(a) of the UMMR obliges every CNSC licensee to establish, implement and maintain written procedures for the conduct of licensed activities. Accordingly, uranium mine and mill licensees that use ventilation systems to help protect their workers and the public must establish, implement and maintain written procedures to ensure that these systems operate effectively. These operating procedures should include provisions, such as inspection, surveillance or sampling programs, for purposes of evaluating, controlling and demonstrating the effectiveness of the associated systems.

Paragraph 10(b) of the UMMR further obliges licensees to train their workers to perform work in accordance with operating procedures. To meet this obligation as it relates to a ventilation system at a uranium mine or mill, the licensee must ensure that the workers who are responsible for following the ventilation-related operating procedures receive training to perform their work.

Paragraph 10(c) of the UMMR also obliges licensees to audit their workers for the purpose of verifying compliance with the relevant operating procedures for the conduct of licensed activities, including those for ventilation systems at uranium mines and mills.

Section 11 of the UMMR requires every licensee to:

- ensure that each main fan of the ventilation systems established in accordance with the licence is equipped with a device that provides a warning signal when the main fan is not functioning properly (paragraph 11(a))
- ensure that a person is designated to receive and respond to any warning signal provided by the main-fan warning device (paragraph 11(b))
- implement measures to prevent any person or activity from interfering with the proper operation of the ventilation systems (paragraph 11(c))

Where a ventilation system in a uranium mine or mill workplace is not functioning in accordance with the licence, section 12 of the UMMR requires the licensee to:

- implement alternative measure to protect the health and safety of the workers (paragraph 12(1)(a))
- ensure that only the work necessary to restore the ventilation system is performed in the workplace (paragraph 12(1)(b))

Subsection 12(2) of the UMMR stipulates that before a worker performs any work that is necessary to restore a ventilation system at a uranium mine or mill, the uranium mine or mill licensee shall inform the worker of the protective measures that have been taken, and are to be taken in connection with the work.

Section 16 of the UMMR requires every uranium mine or mill licensee to keep the following records that pertain to, or could pertain to, mine or mill ventilation systems:

- operating and maintenance procedures (paragraph 16(1)(a))
- the design of the components and systems installed at the mine or mill (paragraph 16(1)(e))
- the method and relevant data used to ascertain the doses of radiation received by workers at the uranium mine or mill and the intake of radioactive nuclear substances by those workers (paragraph 16(1)(f))
- any measurement made in accordance with the licence or the regulations made under the Act (paragraph 16(1)(g))
- the inspections and maintenance carried out in accordance with the licence or the regulations made under the *Nuclear Safety and Control Act* (paragraph 16(1)(h))
- the quantity of air delivered by each main fan identified in the licence (paragraph 16(1)(i));
- the performance of each dust control system (paragraph 16(1)(j)) and
- the training received by each worker (paragraph 16(1)(k))

Section 16 of the UMMR requires uranium mine or mill licensees to:

- make the records referred to in subsection (1) available at the uranium mine or mill to the workers and a workers' representative (subsection 16(2))
- retain a record of the training received by workers employed at the uranium mine and mill (subsection 16(3))
- post at a location within the uranium mine or mill that is accessible to all workers, and where it is most likely to come to their attention, a record of the measurements made in respect of every workplace in accordance with the licence and the UMMR (subsection 16(4))

Glossary

For definitions of terms used in this document, see [REGDOC-3.6, *Glossary of CNSC Terminology*](#), which includes terms and definitions used in the *Nuclear Safety and Control Act* and the regulations made under it, as well as in CNSC regulatory documents and other publications. REGDOC-3.6 is provided for reference and information.

References

CNSC, REGDOC-3.5.1, *Licensing Process for Class I Facilities and Uranium Mines and Mills*, Ottawa, Canada, 2015.

CNSC, REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, Ottawa, Canada, 2016.

CNSC, G-129, Revision 1, *Keeping Radiation Exposures and Doses “As Low as Reasonably Achievable (ALARA)”*, Ottawa, Canada, 2004.

CNSC, G-4, *Measuring Airborne Radon Progeny at Uranium Mines and Mills*, Ottawa, Canada, 2003.

CNSC, G-228, *Developing and Using Action Levels*, Ottawa, Canada, 2001.

CNSC Regulatory Document Series

Facilities and activities within the nuclear sector in Canada are regulated by the Canadian Nuclear Safety Commission (CNSC). In addition to the *Nuclear Safety and Control Act* and associated regulations, these facilities and activities may also be required to comply with other regulatory instruments such as regulatory documents or standards.

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Series

- 1.1 Reactor facilities
- 1.2 Class IB facilities
- 1.3 Uranium mines and mills
- 1.4 Class II facilities
- 1.5 Certification of prescribed equipment
- 1.6 Nuclear substances and radiation devices

2.0 Safety and control areas

Series

- 2.1 Management system
- 2.2 Human performance management
- 2.3 Operating performance
- 2.4 Safety analysis
- 2.5 Physical design
- 2.6 Fitness for service
- 2.7 Radiation protection
- 2.8 Conventional health and safety
- 2.9 Environmental protection
- 2.10 Emergency management and fire protection
- 2.11 Waste management
- 2.12 Security
- 2.13 Safeguards and non-proliferation
- 2.14 Packaging and transport

3.0 Other regulatory areas

Series

- 3.1 Reporting requirements
- 3.2 Public and Aboriginal engagement
- 3.3 Financial guarantees
- 3.4 Commission proceedings
- 3.5 CNSC processes and practices
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