Canada's Nuclear Regulator

Uranium Mines and Mills

Licence Application Guide: Uranium Mines and Mills

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Preface

This regulatory document is part of the CNSC's regulated facilities and activities series of regulatory documents. 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.

In accordance with the *Nuclear Safety and Control Act*, a person must have a licence issued by the CNSC to prepare a site for and construct a uranium mine or mill, or to operate or decommission a uranium mine or mill. This regulatory document, REGDOC-1.3.1, *Licence Application Guide: Uranium Mines and Mills*, provides clarity on the requirements and guidance for preparing an application to obtain a licence to prepare a site and construct, operate and/or decommission a uranium mine or mill in Canada.

This document will be used by applicants to prepare an application for proposed new uranium mines and mills, and for licence renewals for existing uranium mines and mills.. Applicants must ensure they evaluate requirements related to those processes, in addition to the licensing requirements described in this document.

This document is the first version. It supersedes CNSC regulatory guide G-218, *Preparing Codes of Practice to Control Radiation Doses at Uranium Mines and Mills*.

For information on the implementation of regulatory documents and on the graded approach, see REGDOC-3.5.3, *Regulatory Fundamentals* [1].

The words "shall" and "must" are used to express requirements 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 that is 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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Licence Application Guide: Uranium Mines and Mills

1. Introduction

1.1 Purpose

This regulatory document provides clarity on the requirements and guidance for preparing an application for a licence to carry out activities related to mining and milling of uranium ore in Canada.

1.2 Scope

This document will be used by applicants to prepare a licence application for a licence to prepare a site for and construct, operate, and/or decommission a proposed new uranium mine or mill, or for the renewal of a licence for an existing facility.

Note: In general, this document does not apply to uranium prospecting and surface exploration activities. Uranium included in the form of drill core or bulk samples of ore are considered as naturally occurring radioactive material[1] (NORM) and the activities associated with drill core or bulk samples are regulated under provincial or territorial mining and environmental protection regulations. If a project advances to a stage that a sufficient uranium reserve is identified and sufficient project design information has been established to support the development and operation of a viable uranium mine or mill project, a licence is required to proceed to site preparation, construction, and operation.

1.3 Relevant legislation

The following provisions of the *Nuclear Safety and Control Act* (NSCA) and the regulations made under it are relevant to this document:

NSCA:

- Subsection 24
- Paragraphs 26(a), (b), (e)

Canadian Nuclear Safety Commission Cost Recovery Fees Regulations (CNSCCRFR):

- *Part 2*

General Nuclear Safety and Control Regulations (GNSCR):

- Section 3, 5 -7, 10, 15, 17, 21, 23, 27-32
- Subsection 12(1)

[1] The term naturally occurring nuclear substances can be used interchangeably with naturally occurring radioactive material

Nuclear Non-Proliferation Import and Export Control Regulations (NNIECR)

Nuclear Security Regulations (NSR)

Packaging and Transport of Nuclear Substances Regulations, 2015 (PTNSR 2015)

Radiation Protection Regulations (RPR)

Uranium Mines and Mills Regulations (UMMR)

The applicant must also comply with all applicable laws and regulations at all jurisdictional levels.

Note: This regulatory document includes select requirements that are based on the NSCA and the regulations made under the NSCA. While each section of the regulatory document addresses select requirements related to the safety and control area (SCA) or other topic of regulatory importance, applicants are responsible for ensuring that all requirements under the NSCA and regulations, for the proposed activities, are addressed in an application.

1.4 National and international standards

Key principles and elements used in developing this document are consistent with national and international standards.

1.5 CNSC contact information

A single point of contact from the CNSC is assigned to work with every licensee or applicant. This point of contact can provide the licensee or applicant with additional information or explanation of the information contained within this document.

To contact the CNSC, refer to the CNSC's website.

2. Licensing Basis and Licensing Process

When the term facility is used in this regulatory document, it is meant to cover both uranium mines and mills.

REGDOC-3.5.1, *Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills* [2], clarifies the licensing process in the context of the NSCA. Information on the licensing basis is found in REGDOC-3.5.3, *Regulatory Fundamentals* [1]. The licensing process is initiated when the applicant indicates in writing their intent to submit a licence application.

An applicant may submit an application for a licence to do any combination of: prepare a site for and construct, operate or decommission a uranium mine or mill.

The CNSC conducts environmental reviews as part of the licensing process to evaluate the environmental risks associated with proposed facility and activities. For more information on the CNSC's environmental review and licensing processes, see:

- REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures [3]
- REGDOC-3.5.1, Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills, [2]

Uranium mines and mills may require an assessment under the *Impact Assessment Act* (IAA). The relevant types of designated projects are identified in section 26 of the IAA. Information on the integrated impact assessment process can be found at canada.ca/IAAC. If the IAA does not apply, a provincial assessment processes may be required.

Standard licence application information is found in section 4 of this document.

The applicant is responsible for ensuring that the licence application contains sufficient information to meet regulatory requirements. The applicant should provide cross-references to detailed information in other sections as appropriate.

Early engagement with CNSC staff is encouraged. The applicant should consult CNSC staff to confirm which editions of codes and standards applicable to the mine or mill are to be cited or addressed in the application. This should be done prior to developing proposed safety policies, programs, processes, procedures and other safety and control measures. This supplemental guidance may also indicate documents other than those listed in appendix A that the applicant should consider and address in the application. The application should cite the regulatory documents, codes and standards that were used to demonstrate the applicant's ability to meet the regulatory requirements set under the NSCA. CNSC staff may request additional information to evaluate the application, as necessary.

The information provided in this document does not prevent applicants from proposing alternatives. However, any proposed alternative should appropriately reflect the complexities and hazards of the proposed activities and should be supported by suitable information.

The applicant may provide references to any documents included in another licence application for the same facility. The applicant should review the information in these documents and update it as required. Any updated information should be clearly identified.

The application should indicate the relevant sections of each supporting document. If the document version in the supporting information has changed, the applicant should provide the CNSC with the new version number and a revised copy of the document.

The application shall include program documents that provide information about how the regulatory requirements for the licensed activity will be met. These program documents may cite CNSC regulatory documents and other codes and standards. They should be organized into categories that represent the CNSC's fourteen SCAs. Program documents should be organized under an overarching management system. Each program document should provide references to associated procedures and work instructions.

The application should include engineering packages that contain specific design and construction details for the facilities. They may include information such as the design basis, risk assessments, process control logic, equipment specifications and for-construction drawings. The engineering design packages may be submitted as the detailed facility design progresses. The overall project may be allowed to proceed, based on primary control methods and approved design and construction processes, with the provision of detailed design for subsequent technical approval, carried out as hold points within the framework of the overall approved project.

The applicant shall provide the name, maximum quantity (at any given time) and form of any nuclear substance to be encompassed by the licence. The applicant should provide the scientific name of each nuclear substance. This information may be provided in summary format; for example, by providing a table of the nuclear substances and the information required for each substance.

In addition, if the application is for a new facility, the applicant should provide a list of any similar facilities owned or operated by the applicant that have been assessed and licensed by either the CNSC or any foreign regulatory body. The list should include the following information:

- facility name
- location
- date when the most recent licence was granted
- description of the facility

The CNSC encourages electronic transmission of information. Most information associated with applications for licences related to uranium mines and mills will be suitable for transmission via email. In some cases, arrangements may be required in support of secure encrypted electronic transmission. If an applicant intends to send significant portions of the application in hard copy, the CNSC should be contacted first to discuss alternatives.

It is prohibited to submit prescribed information via unencrypted email. Prescribed information, such as details of the security program, shall be submitted in accordance with sections 21 and 23 of the *General Nuclear Safety and Control Regulations*. Guidance for the protection and transmission of prescribed information can be found in REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material* [4].

Licence renewals

The applicant should provide the existing licence number if the application is for a licence renewal.

For the renewal of alicence, the applicant shall indicate if any information to be considered in the current application was submitted with previous licence applications. Subsequent applications should provide a list of the supporting documents and clearly identify which information was previously submitted. The applicant should review the information in previously submitted documents and update it as required. Changes should be clearly identified.

3. Regulatory Requirements and Guidance

The application should include sufficiently detailed information about the safety policies, programs, procedures and other documents that describe safety and control measures. All policies and programs should allow for continuous development, on an on-going basis for all lifecycle stages of the facility. The level of detail may vary depending on the activities requested in the application. A graded approach applies.

Management system

Unless otherwise indicated, the information listed for the Management system SCA is required for an application at any lifecycle stage.

3.1 Management system

3.1.1 General considerations

The application shall describe the proposed management system programs, processes and procedures that have been or will be put in place to protect the health and, safety of persons, and the environment, as well as a description of the organizational management structure.

The application should also describe the safety policies, the roles of external safety assessment organizations and the advisory committees that will advise the management of the organization that will carry out the licensed activities.

Where applicable, the application should refer to CSA N286, *Management system requirements for nuclear facilities* [5] as the requirements for the management system SCA. If an application does not use CSA N286, the applicant should provide the alternate standard used, with justification.

3.1.2 Management system

The application should describe how the applicant's management system is compliant with relevant requirements and how the management system will be implemented.

3.1.3 Organization

The application shall describe the applicant's organizational management structure insofar as it may bear on the applicant's compliance with the NSCA and the regulations made under it, including the internal allocation of functions, responsibilities and authority.

3.1.4 Performance assessment, improvement and management review

The application should describe the proposed programs covering performance assessment, improvement and management system assessment.

The application should describe the adequate provisions made for an objective internal self-evaluation program supported by periodic external reviews and taking into account national and international experience and feedback from the nuclear and other relevant industries.

The application should describe how organizational effectiveness and safety performance are measured, including the use of performance indicators to detect any shortcomings and deteriorations in safety.

The application should describe how organizational changes are managed to prevent degradation of safety performance.

The application should demonstrate that the analysis of the causes of significant events will consider technical, organizational and human factors aspects, and that the necessary arrangements have been made to report and analyze near-miss events.

The application should clearly state how the applicant intends to present, promote and assess the key characteristics of good safety culture and safety performance by all workers at the facility, including contractors and subcontractors. The application should provide a proposed timeline and milestones for completion of specific detailed safety performance documentation that will be developed later.

3.1.5 Operating experience

The application should describe how the program for feedback of operating experience has been implemented during site evaluation and design activities, and how it will continue during the construction, commissioning and operating phases of the mine or mill's lifecycle. Note that operating experience could be derived from the applicant's own experiences, or from available information from other relevant sources such as industry forums.

3.1.6 Change management

The application should describe change management within the facility. This should be in accordance with CSA N286, *Management system requirements for nuclear facilities* [5].

3.1.7 Safety culture

The application shall demonstrate that the applicant's approach to foster a healthy safety culture. This should be in accordance with REGDOC-2.1.2, *Safety Culture* [6].

3.1.8 Configuration management

The application should describe the provisions to establish and maintain configuration from concept until end of operation life.

The application to prepare a site and construct a mine or mill shall describe the proposed quality assurance program for the design of the facility. This information could also be provided in engineering design packages.

Design change control and configuration management should be in accordance with CSA N286, *Management system requirements for nuclear facilities* [5].

3.1.9 Records management

The application should describe the adequate provisions for records management. Licensees are required to keep records relating to the licence submitted to the Commission. Section 28 of the

General Nuclear Safety and Control Regulations include requirements on the retention of certain records.

3.1.10 Business continuity

The application should include a business continuity plan. This plan should provide procedures and information that guide the applicant to respond, recover, resume and restore to a predefined level following disruption. Some examples of disruptions are:

- natural disasters (such as hurricanes, extreme precipitation events, floods, blizzards, earthquakes and forest fire)
- accidents such as failure of key process equipment, or injury to workers
- sabotage, including cyber attacks and hacker activity
- labour actions
- loss of a key contractor
- power and energy disruptions
- communication, transport, safety and service sector failure
- health related epidemic or pandemic events that have or could have a measurable impact
- environmental events (such as pollution and hazardous materials spills)

For more information, see ISO 22301, *Security and resilience – Business continuity management systems – Requirements* [7].

3.2 Human performance management

The information listed under the Human performance management SCA is required for an application at any lifecycle stage.

3.2.1 General considerations

The application should describe the qualifications, adequate numbers, skills and competencies required by workers at the facility.

The application should describe the measures to promote and support human performance at all levels in the organization. The application should demonstrate how the applicant's programs and processes interface to support continuous improvement of human performance. The application should demonstrate various measures to identify and monitor human performance weaknesses and to correct any organizational deficiencies to minimize human error.

The application should describe the workforce planning process, including measures for knowledge transfer, to ensure that workers are recruited and trained to fill each key role within the organization.

3.2.2 Human performance program

The application should describe how the human performance program addresses and integrates the range of human factors that influence human performance. The program should include elements such as:

- the adequate provision of qualified workers
- the reduction of human error
- organizational support for safe work activities
- the continuous improvement of human performance
- monitoring hours of work

For guidance on the human performance program, refer to REDOC-2.2.1, *Human Factors* [8].

3.2.3 Personnel training

The applicant shall describe a training system. The training system shall be in accordance with REGDOC-2.2.2, *Personnel Training,* [9]. The CNSC uses the systematic approach to training (SAT) process as a standard by which training program submissions are evaluated. The application shall include the applicant's overall training policy and all governance documents (or a description) related to the training system. The application shall include descriptions of the initial and continuing training programs for all workers engaged in licensed activities, including workers employed as trainers and instructional staff.

The application should describe the processes established to:

- develop and manage documentation related to all phases of training, including analysis, design, development, implementation and evaluation
- manage training change control
- manage and track the status of staff and contractor qualifications

3.2.4 Work organization and job design

The application should describe the minimum number of workers with specific qualifications, who are available to the facility at all times, as required for normal operations and emergency response (minimum staff complement). The application should describe the measures in place to mitigate the effect of any violations of the minimum staff complement, until minimum staff complement is restored. The application should demonstrate that each shift's minimum staff complement will be monitored and recorded.

The application should demonstrate that the adequacy of the minimum staff complement has been determined through a systematic analysis to identify the required number of workers and their qualifications. The application should demonstrate that the minimum staff complement can meet the performance requirements and support the safe conduct of the licensed activity of the facility.

For additional guidance refer to REGDOC-2.5.1, *General Design Considerations: Human Factors* [10] and REGDOC-2.2.5, *Minimum Staff Complement* [11].

3.3 Operating performance

Unless otherwise indicated, the information listed under the Operating performance SCA is required for an application at any lifecycle stage.

3.3.1 General considerations

The application shall describe the proposed measures, policies, and procedures for carrying on the licensed activities.

The application shall include information on how the applicant will ensure that normal facility operations are carried out safely to keep radiation doses to workers and members of the public , and s any planned discharges or releases of radioactive material or hazardous substances from the facility within authorized limits. The operations shall adhere to any applicable legislation at all jurisdictional levels or other applicable codes and standards.

The application shall describe the proposed methods and the schedule for carrying on the planned activity.

An application to prepare a site for and construct a mine or mill shall describe the means for preparation of equipment for maintenance and the monitoring of structures, systems and components (SSCs) to confirm that they will continue to operate as required by the design. An application to operate or decommission a mine or mill should describe these features.

The application should also describe how the applicant will exercise overall responsibility for safety in conducting licensed activities, including ongoing upgrades and modifications to the facility, and carry out effective oversight of these activities.

The application should describe how the operating principles, policies, processes and programs will confirm that the SSCs, as an integrated unit, will perform and function in accordance with the design specifications and regulatory requirements, and as described in the safety analysis.

The application should include information regarding the development, verification, validation and implementation of programs and procedures related to commissioning, reliability testing, maintenance, operation and decommissioning.

For a new facility, the application should describe the processes used to ensure that the performance of the SSCs has been assured from site preparation to decommissioning and if major modifications are to be made to the facility in the future.

3.3.2 Conduct of licensed activities

An application to prepare a site and construct a uranium mine shall describe the construction processes and mining methods that will be used to manage the development of mine workings and construction of the supporting infrastructure as well as their proposed schedule.

An application to prepare a site or construct a uranium mine or mill shall contain the proposed method, program and schedule for the removal and disposal of ore and waste rock, tailings, and any other wastes produced as a result of operations, as applicable.

The following information should be provided for an application to operate a uranium mine or mill:

- a summary of verification of construction according to design
- the operating design verification information available from equipment and process circuit testing with water or waste rock

- the process to be used to complete and report on the commissioning activities during initial operation of the mine or mill facilities

This information should identify any changes to the original design and equipment specifications that resulted from the construction and commissioning of the facilities. Commissioning includes both construction verification and installed equipment operating verification activities. Validation of control room equipment should also be performed. Guidance is provided in REGDOC-2.5.1, *General Design Considerations: Human Factors* [10]. The full suite of operating design verification activities may not be complete before an application to operate the facility is submitted, since operating verification using actual ore feed may be required to fully evaluate the design and operating specifications for the installed facilities.

An application to prepare a site or construct a uranium mine or mill should describe the anticipated quantities and grade of ore and waste rock that will be removed and their proposed storage location.

An application to prepare a site, construct or operate a uranium mine should provide the proposed mining methods and programs.

An application to operate or decommission a facility should provide the following information:

- the operating methods and programs in the mine or mill operations program
- the process for handling ore and mineralized waste and any other nuclear substances involved in the mine or mill operations program
- the transportation of nuclear substances offsite as described in the packaging and transport program and following the specific requirements of the *Packaging and Transport of Nuclear Substances Regulations, 2015* , as applicable
- whether the mining or milling will be continuous or intermittent operations
- the overall objectives, expected operating conditions and maintenance shutdown plans

3.3.3 Mining operations program

An application to operate or decommission a uranium mine shall include a mining operations program. The mining operations information is intended to provide the methods and processes that will be used for the mining activities.

The mining operations program shall include:

- processes for mine planning and current life of mine schedules
- procedures used to carry out licensed activities
- proposed mining methods,
- proposed methods for the handling of ore and waste and any other nuclear substances involved in the mine operations
- procedures to be used for mining, and for the handling of and ore and waste and any other nuclear substances involved in mine operations
- processes for the development of any mitigation measures associated with the operations program

In addition, the mining operations program should identify:

- the purpose and scope, provide necessary definitions, identify roles and responsibilities for carrying out the program and the records that would be developed and maintained.
- the pre-operational history of the site prior to any activity on the site geology and ground structure, fault systems, and hydrogeological conditions
- associated information on the overall mine design, water control, radiation protection, ground stability conditions, risk assessment and control processes
- procedures that are used for the mine planning process
- processes to be used for mine development activities including mine engineering, geology, rock mechanics, ventilation, water management design and risk assessment
- any alternate mining and material handling processes that could be used
- operation of the associated mine infrastructure such as ventilation systems, mine water collection and handling systems, electrical and communication distribution systems, concrete handling systems, shafts and ramps and hoisting systems and refuge stations as appropriate

3.3.4 Milling operations program

An application to operate or decommission a uranium mill shall include a milling operations program. The milling operations information provides the methods and processes that will be used for the ore processing and milling activities. The program should identify the purpose and scope, provide necessary definitions, identify roles and responsibilities for carrying out the program and the records that would be developed and maintained. It should reference any associated procedures.

The milling operations program shall include:

- the proposed ore processing and milling methods
- the procedures to be used for processing of ore and/or other feed materials, and ore milling

In addition, the milling operations program should identify:

- any alternate processes that could be used
- the process monitoring and control processes
- the operation of the associated mill infrastructure such as ventilation systems, radiation protection design features, water handling systems, electrical and communication distribution systems, as appropriate

3.3.5 Procedures

The application should:

- describe the development, verification, validation and implementation of operating procedures covering normal, abnormal, unplanned and emergency conditions.
- should include information on how the applicant will ensure that the normal operating procedures are conducted safely in all normal operational configurations (including startup, operation, shutdown and maintenance), and that operation will be consistent with the safe operation of the facility
- include sufficient information to demonstrate that the operator actions required to diagnose and respond to anticipated and unanticipated events are covered appropriately and use symptom-based and/or event-based procedures

- describe how all normal, abnormal, unplanned and emergency operating procedures will be validated

3.4 Safety analysis

The information listed under the Safety analysis SCA is required for an application at any lifecycle stage.

3.4.1 General considerations

REGDOC-2.4.4, *Safety Analysis for Class IB Nuclear Facilities* may serve as guidance regarding the safety analysis for nuclear facilities that process uranium.

An application shall include the results of pilot studies, the derivation of design criteria, modeling exercises and baseline environmental data. The technical basis for this should be provided in the application documentation. It may be provided as part of the detailed engineering packages.

An application to prepare site for and construct, or to operate a mine or mill should include a safety analysis for the facility. The safety analysis should include a process-hazard analysis, such as a Hazard and Operability (HAZOP) study. The application should confirm that the facility's design is capable of meeting the applicable dose acceptance criteria and safety goals, even under credible accident and emergency conditions. Concurrent events may need to be considered if they are linked, for instance, a forest fire in conjunction with a loss of off-site power, or an extreme precipitation event in conjunction with flooding and high winds.

The application should demonstrate that, when operator action is taken into account, operators will have reliable information, sufficient time to perform the required actions, documented procedures to follow, and will have been trained. The application should demonstrate how the potential effects of climate change have been addressed over the projected operating life of the facility, or, for an application for a licence to decommission, over the projected lifespan of decommissioned structures such as capped tailings management facilities.

For new facilities, the application to operate should demonstrate that the safety analysis has been updated to reflect all changes made during construction and commissioning.

3.4.2 Hazard Analysis

The applicant should apply recognized hazard analysis and risk assessment processes to the proposed design, to identify hazards and risks and to identify the necessary engineering design and administrative control mitigation measures. This safety analysis should be provided for the facilities, including waste management design facilities. Hazard and operability studies should be carried out for mill process and effluent treatment facilities. The results of these studies and the associated design changes should be provided with the final design.

Safety analysis is a key component of a change management process. Any proposed changes should be assessed to determine if they will impact the initial design analysis, to ensure that all potential hazards are identified and that appropriate engineering and administrative controls to mitigate any potential risks have been incorporated.

The results of a process-hazard analysis, or other risk-assessment process, and the description of operational and design controls to mitigate significant hazards (facility description or program documents) should be provided.

The information on the anticipated releases of nuclear and hazardous substances to the environment should be determined from the design of the facilities and should be provided as part of the environmental risk assessment and any other applicable environmental or impact assessment to identify the hazards and risks that are associated with the proposed operation. The process flow diagrams should be developed during the detailed design of the facilities. These should identify the process reagents that will be added during the activities and the characteristics of the various process streams. The final effluent stream flow rates and general characteristics should also be provided in the process flow sheets.

The application should provide:

- the full chemical, radiological and physical characteristics of the emission streams
- the emission control systems and emission characterization
- any wastes produced from the operations that could contain hazardous or radiological contaminants, such as tailings, waste rock or other forms of domestic and industrial waste should also be identified both in the IA process and in the final facility description and detailed design.
- the methods to be used to control releases of nuclear substances and hazardous substances into the environment from these facilities
- the monitoring program in the environmental protection program

3.5 Physical design

Unless otherwise indicated, the information listed under the Physical design SCA is required for an application at any lifecycle stage.

3.5.1 General considerations

The applicant shall consider and meet design requirements of all jurisdictional levels.

For existing licensed facilities, the application should address the information in this section to the extent practicable.

Information on physical design should be submitted as part of an application to prepare a site for and construct a uranium mine or mill. The information should be reviewed and updated for activities related to operation or decommissioning. The application may refer to previously submitted information.

The application should include an appropriate level of detail about the description of the overall physical design of the facility, the design practices and the safety concepts commensurate with the activities being proposed in the licence. The application should demonstrate that the uranium mine or mill is sited, designed, constructed and operated in a manner that will facilitate decommissioning. The application should also describe the approach followed for the general design of the SSCs.

The overall project may be allowed to proceed, based on primary control methods and approved design and construction processes, with the provision of detailed design for subsequent technical approval, carried out as hold points within the framework of the overall approved project.

For a new facility, the application should include a comparison of the facility's design, construction, commissioning and operation with prevailing modern standards and international practices.

The application should provide 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. The description should identify any issues with the mineral or land rights, lease, ownership or disposition that may limit or place conditions on the extent of the activity, including any previous development that may have left behind liabilities that may need to be dealt with. Plans of previous mining or development that was carried out at the locations and the design specifications for any associated infrastructure should be provided.

The application should describe any land use activities that may be affected by the development of the mine or mill including:

- Traditional land use activities
- Indigenous knowledge

3.5.2 Design principles and requirements

The application should demonstrate that normal operations can be carried out safely such that radiation doses to workers and members of the public, and any planned discharges or releases from the facility, will be within authorized limits.

The results of tests and analyses conducted as part of the operating performance program may need to be revisited in the physical design program, primarily in those scenarios where a change is made to a facility. In these cases, the results of tests and analyses may be incorporated as part of mitigation measures to manage the identified risks.

The detail design packages should provide:

- a full description of the proposed facilities
- a review of the basis of the design
- a list of equipment and processes tha will be used to control the operations
- the alternative methods considered for the project,
- the risk assessment or hazard analysis processes that were used to evaluate the design,
- the design changes included to mitigate potential identified risks or hazards and any incorporated contingency measures to deal with identified potential deviations from the design conditions.

- a Human Factors Engineering Program Plan (HFEPP) to show how they have/will consider human factors in the design of the mill control room, and relevant areas in the mine

Design packages for mining development activities should include:

- a geological assessment of the area and ground stability
- hydrogeological assessment, structural faulting and radiological conditions.
- risk assessments for the development activities and the engineering controls and administrative controls that would be used to mitigate potential risks.
- the results of any third-party analysis and the proposed processes for the use of third-party consultants to monitor and evaluate the development activities and controls should

The application should ensure that the design process is established and controlled. Design actions should be established and should include:

- functional requirements
- performance and operational requirements
- environmental factors
- health and safety factors
- radiation safety factors
- human factors considerations (including the HFEPP)
- applicable regulations, codes and standards
- inputs from the IA process
- decommissioning objectives and plans

The application should identify the design authority responsible for the overall design. If the design authority has been transferred from another organization, the application should provide the formal relationships (including roles and responsibilities) and the prerequisites that had to be met prior to the transfer.

Design requirements should be defined in sufficient detail to provide a reference for making decisions, verifying designs and evaluating design changes. Design tools and analytical computer programs used should be appropriate for the application and the calculations, analyses, and studies should be controlled in such a manner that they are available for future users of the design.

The application should describe the control of design modifications such that the facility is maintained and modified within the limits prescribed by the design, analysis and licensing basis, once it is established.

To ensure adequate configuration management, the design basis should be documented and maintained to reflect design changes. The design basis should be maintained to reflect new information, operating experience, safety analyses, resolution of safety issues or correction of deficiencies.

The effects of any design changes should be fully assessed, addressed and accurately reflected in the safety analyses or analysis of record prior to implementation.

An application to prepare a site and construct a uranium mine or mill shall include the proposed commissioning plan for the components, systems and equipment to be installed at the facility. This information should be provided in the construction program and commissioning program documents, specific requirements for commissioning should also be indicated in engineering design packages or construction packages.

3.5.3 Design governance

The application should describe how the facility design takes into account human factors. It should describe the systematic process that has been followed, for all systems, to incorporate considerations of human factors into the specification, definition and analysis of requirements; design activities; and verification and validation activities. Refer to REGDOC-2.5.1, *Human Factors* [10] for more information.

The application should describe the interfaces of human factors in design with other areas (for example, as inputs to the development of operating and other procedures and training). The application should also describe the considerations of human factors that apply to the design of specific SSCs, including:

- human-machine interfaces for all facility states
- instrumentation, displays and alarms provided to monitor system operations
- physical location, accessibility and usability of equipment that is operated, tested, maintained or monitored
- physical interlocks, and indication of bypassed or inoperable status

The application should include a list of human factors analyses and activities that were used in developing the design. The applicant should demonstrate that human factors engineering and human-machine interface considerations have been applied to all operational states and accident conditions, and for all facility locations where such interactions are anticipated.

The application should provide a Human Factors Engineering Program Plan. Guidance on this plan can be found in REGDOC-2.5.1, *General Design Considerations: Human Factors* [10].

3.5.4 Site characterization

The application shall provide a description of the site evaluation process and the preparatory work done at the site.

The initial information on site characterization should be provided in an application to prepare a site and construct a uranium mine or mill. The applicant should update the information as needed through the different lifecycle phases.

An application to prepare a site and construct a uranium mine or mill should include the surface plan that shows property boundary and location of the proposed facilities. The boundary delineation should be supported by a legal survey.

The application should include a description of the basis for siting a facility in a particular location, including proximity to:

- the orebody (or orebodies) to be mined
- all sources of ore or other feed for a custom milling operation

- suitable locations for the management of mine and/or mill wastes

The description should include details on future planned site evaluation work. General information should be provided, containing detailed information provided in engineering packages and/or construction work packages.

The application should identify favourable geological, topographical and/or watershed features for the siting of a waste management facility with the capacity to manage the wastes produced over the operating life of the facility. The requirements and guidance for the management of mine waste are provided in REGDOC 2.11.1, *Waste Management, Volume II: Management of Uranium Mine Waste Rock and Mill Tailings* [12].

The application should include a detailed description of the site geology, including:

- geological and hydrogeological setting
- structural geology including fault and fracture characteristics
- petrology, mineralogy and geochemistry
- stratigraphy
- ore body characteristics including mineralization
- geomechanical properties

The application should provide a description of the surface environment, including:

- climate data (e.g. ground frost and snow cover, air quality, extreme and average temperature and precipitation information) and the potential impact of climate change
- aquatic and terrestrial environment
- surface water hydrology
- geomorphology
- geotechnical properties of surficial material

An application for a licence renewal should provide a description of any changes to the surface environment from any previously submitted information.

3.5.5 Facility and systems design

The application shall provide a description of the design of and the maintenance program for every eating area in the program documentation and referenced procedures. Each eating area should be supplied with heat, ventilation and hand washing and drying facilities. The facilities should be regularly cleaned and monitored to ensure that contamination is controlled.

The application shall provide a description of the anticipated liquid and solid waste streams. It is important to divert as much clean uncontaminated water as possible from the site of the activities to limit the quantity of water which will require treatment. This should be applied to both surface and groundwater flows that can be diverted and directly discharged to the environment. The methods which are used to prevent the ingress of uncontaminated water and contamination of water diversion systems should be described.

The application shall identify a policy with respect to the provision of emergency power systems. The application shall describe the operational plan during power outages, including:

- a description of the emergency power systems
- the power requirements for critical systems
- a description of the testing and preventative maintenance program for emergency power systems
- a description of preventative measures, such as early warning systems for lightning strikes and engineered controls such as alarms on main fans and fail-safe process equipment controls.
- the identification of contingency measures for failure of back-up systems , including measures to be taken if back-up generation systems are approaching fuel exhaustion.

The application shall include ventilation and dust control information. This should be in accordance with REGDOC-2.5.4, *Design of Uranium Mines and Mills: Ventilation Requirements* [13].

An application shall include a plan to categorize excavated material according to different characteristics such as the grade of the ore, special or mineralized waste, acid-generating or potentially acid-generating waste rock and clean waste rock. The general categories and estimated quantities of the material to be mined and any potential contaminants of concern in each of these categories should be identified.

The application should include a plan that shows the layout of any existing facilities (e.g., camp, core storage, core logging, power generation, sewage and potable water) as well as planned facilities (e.g., mine, mill and waste management facilities).

The application should include a description of the supporting site infrastructure and the controls that are applied to design, construction and management of the facilities. The additional facilities to be described include, as applicable:

- camp facilities
- airport facilities
- freshwater supply, handling and treatment systems for process and potable water
- fire water systems
- primary electrical systems and emergency power systems
- site communication systems
- emergency facilities including nursing stations, ambulance and firefighting facilities and equipment
- warehousing and equipment laydown areas
- site water diversion facilities
- site surface runoff storage ponds and water handling systems
- maintenance shops
- office facilities
- dries and change rooms
- construction camps
- core logging and storage facilities

The design packages included in an application to prepare a site or construct a mine or mill should include, as applicable:

- a description of the mine or mill facility design, including the installations, their purpose and capacity, and any excavations and underground development.
- a plan that shows the layout of any existing facilities (e.g., camp, core storage, core logging, power generation, sewage and potable water) as well as planned facilities (e.g., mine, mill and waste management facilities).
- design details for the installations at the site, including final signed versions for construction drawings
- construction stage drawings

The application should implement a program to identify and segregate ore and waste rock materials using predefined criteria to minimize long-term liabilities.

An application should include procedures for geological assessment, material sampling, segregation and handling of excavated material.

In order to minimize environmental impacts associated with uranium mine and mill sites, the CNSC strongly encourages all applicants and licensees to consider how facilities such as mills, waste management facilities, airstrips, etc. can be shared across different sites, including sites operated by other companies.

Mine facility design

An application to prepare site and construct a uranium mine shall include the proposed design of the mine. The detailed design should be provided in engineering design packages or construction work packages.

An application to prepare a site for and construct a uranium mine shall include the estimated schedules for construction, start-up, and duration of operations.

The application for a mine shall include information about the planned backfill, including anticipated quantities, composition, and characteristics.

An application to prepare a site for and construct a uranium mine should provide a summary of the processes, facilities and equipment which are used to carry out the proposed activities. The application should summarize the facilities and provide supporting drawings such as process flow diagrams, general arrangement plans and piping and instrument diagrams (PIDs).

The applicant is encouraged to contact their CNSC point of contact to validate the details needed for their particular mine, as this may vary depending on site characteristics, the mining methods and technology being proposed. An application to prepare a site and construct a mine, or to operate a mine should contain details about the following, as applicable:

- the geology, mineralogy and geochemistry of the site and the ore body
- proposed mining methods and development plans
- rock mass quality and strength parameters
- ore and waste rock classification and expected quantities
- supporting infrastructure such as shafts, hoists, hoist house, head frame, collar house, shaft lining and water controls etc.
- ventilation systems, main fans, auxiliary fans and ducting systems, fan control systems
- concrete batch plant and material handling systems

- electrical switch rooms and emergency power systems
- ground freezing systems
- systems for the pumping, recovery and storage of lixiviants and of uranium bearing solution
- ore handling and storage facilities for ore and for any other nuclear substances involved in operations
- waste handling facilities
- water collection and handling facilities
- water balance – process flow diagrams
- backfill handling systems
- refuge stations
- fuel bays and shop facilities
- radiation protection design features such as shielding, layout and isolation of sources
- site plans and sections
- geotechnical and hydrogeological characteristics and design
- results of any supporting tests
- factor of safety for engineered pit slopes
- dewatering facilities – pit sumps, dewatering wells and water handling systems
- radiation protection design features such as shielding, layout and isolation of sources
- geochemistry of the ore zone and the geologic zones immediately surrounding the mineralized zone
- abandoned wells and exploration borings
- groundwater resources within the proposed property boundaries and adjacent properties, and information on past, current and anticipated future groundwater use, including wells for domestic and industry use
- proposed solution injection extraction method and recovery processes
- the location and layout of the proposed facilities
- dries and lunchroom design and contamination control methodology
- operating plans, design throughput
- effluent control systems
- environmental monitoring program, including excursion, groundwater and surface water monitoring
- plans for project waste management and disposal
- plans for ground-water quality restoration, decommissioning, and land reclamation
- geochemical assessments of wastes, results of acid-base accounting (ABA) and humidity cell testing and leaching characteristics
- waste pile designs, specifications, construction details
- hydrogeological assessments and estimated groundwater inflow rates
- site water balance and inflow modeling results
- mine water handling facility descriptions
- in-pit dewatering sump systems or underground dewatering system
- dewatering wells
- run-off water management – water diversion systems
- mining sequence

Mill facility design

An application to prepare site and construct a uranium mill shall include the proposed design of the mill.

An application to operate a mill shall include information about:

- the proposed capacity of the mill
- the expected recovery rate

- the composition of mill feed, concentrates (products),and tailings, and any other waste streams

An application to prepare a site for and construct a uranium mill shall describe the proposed laboratory facilities and programs.

An application for a mill should provide a description of the following items, as applicable:

- mill capacity
- ore or other input material characteristics, and product characteristics
- simplified process flow diagrams
- mill process flow sheets, PIDs and general arrangement drawings
- mill process block diagram
- a description of all processes used
- reagents used, quantities and material safety data sheets information on hazards and controls
- process controls, control parameters, control processes and facilities,
- distributed control systems (DCS)
- mill utilities
- reagent processing and handling systems
- water supply, treatment and handling systems
- electrical supply and emergency power backup
- steam, compressed air, instrument air and gland water systems
- building heating, ventilating and air conditioning systems
- radiation protection design features such as shielding, layout and isolation of sources
- process containment ventilation systems and emission control systems
- ventilation design principles
- process containment principles
- dries and lunchroom design and contamination control methodology
- safety systems such as fire protection systems, eye wash and shower stations, process alarms
- restricted areas and access controls
- process containment systems and sumps
- air emission control systems design and technical specifications
- liquid effluent treatment design and technical specifications
- waste treatment and handling systems

3.6 Fitness for service

Unless otherwise indicated, the information listed under the Fitness for service SCA is required for an application at any lifecycle stage.

3.6.1 General considerations

The application should identify all SSCs important to safety.

It is important to ensure that equipment is available to perform the intended function when called upon to do so. A maintenance program is a fundamental part of ensuring this is the case. Information about the maintenance program is only required for an application to operate a uranium mine or mill. Maintenance programs are not required for a an application for a licence to prepare a site and construct or an application to decommission a mine or mill; however, if an applicant is developing maintenance programs during site preparation or construction or decommissioning, the information in this section should be used as guidance.

In general, maintenance programs should include preventative maintenance and corrective maintenance. Maintenance activities include monitoring, inspecting, testing, assessing, calibrating, servicing, overhauling, repairing and replacing parts.

The application should include a clearly defined maintenance program containing the proposed measures, policies, methods and procedures that provide direction for maintaining SSCs. Maintenance programs should ensure that SSCs remain capable of maintaining their functions as described in design documents and safety analyses that are included in the facility licensing basis.

The maintenance program should include processes for planning, monitoring, scheduling and executing work activities that ensure SSCs continue to meet design specifications, prevent future degradation, or correction of current failure and impairments.

The maintenance program should describe:

- preventive maintenance activities
- corrective maintenance
- maintenance processes and procedures
- calibration of measuring and monitoring devices, including radiation monitoring devices
- SSC monitoring, activity optimization
- outage management, work assessment
- work planning and scheduling
- work execution
- post-maintenance verification and testing
- record retention requirements
- maintenance program assessment

3.7 Radiation protection

The information listed under the Radiation protection SCA is required for an application at any lifecycle stage..

3.7.1 General Considerations

The application shall describe the approaches for meeting the requirements of the *Radiation Protection Regulations.*

REGDOC-2.7.1, *Radiation Protection* [14], provides detailed guidance for applicants and licensees on meeting regulatory requirements for radiation protection.

The application shall include a radiation protection program and should demonstrate how the design of the program is commensurate with the radiological hazards associated with the licensed activities, based on a thorough analysis of radiological hazards, radiation exposures and dose

assessments, and an optimization of doses to conform to the ALARA (as low as reasonably achievable) principle.

The application shall include a code of practice. The code of practice shall include a set of action levels, a description of any actions that the applicant will take when an action level is reached, and the reporting procedures the licensee will follow when an action level is reached.

The application should describe the proposed action levels, along with the supporting technical justification. The action levels should be developed in accordance with REGDOC-2.7.1, *Radiation* Protection [14].

The code of practice should also include a set of administrative levels designed to prevent loss of control situations and maintain radiation levels ALARA. These additional control levels may indicate minor deviations from the radiation protection program and identify increasing radiation levels in the mine or mill environment and monitor the inhalation or ingestion of radioactive materials. Administrative levels should be based on short-term indicators to allow prompt initiation of investigations and remedial actions. Administrative levels should be expressed in terms of relevant parameters, such as:

- gamma radiation dose rate
- radon progeny concentration
- radon gas concentration
- long-lived radioactive dust concentration
- concentration of uranium in urine

Each administrative level should have an associated set of administrative actions. Typically, the greater the actual or potential radiation hazards present when an administrative level is reached, the more immediate and rigorous the corresponding response should be. Responses for when an administrative level is reached include:

- investigation to identify the reason for elevated measurements
- implementation of increased protective measures for workers
- suspending all or some operations

When an administrative level in a code of practice is reached, the associated reporting procedures should include appropriate protocols for:

- notifying the employees responsible for conducting investigations
- implementing findings
- notifying the CNSC

These protocols should specify who is to be notified and how they are to be notified (i.e. verbal or written). The urgency and level of internal reporting required in the code of practice should be commensurate with the anticipated consequences of reaching the associated control level.

3.7.2 Application of ALARA

The application shall describe how the radiation protection program ensures that effective dose and equivalent dose received by and committed to persons are ALARA, taking into account social and economic factors. The application should describe the application of ALARA, in accordance with REGDOC-2.7.1, *Radiation Protection* [14].

3.7.3 Worker dose control

The application should describe how worker dose will be controlled, in accordance with the principles found in REGDOC-2.7.1, *Radiation Protection* [14]. Licensees should refer to REGDOC-2.7.2, *Dosimetry, Volume I: Ascertaining Occupational Dose* [15] for guidance on ascertaining worker dose.

3.7.4 Radiation protection program performance

The application shall describe how radiation protection program performance will be evaluated. This should be in accordance with the principles found in REGDOC-2.7.1, *Radiation Protection* [14].

3.7.5 Radiological hazard control

The application shall describe how radiological hazards will be identified and controlled. This should be done in accordance with the principles found in REGDOC-2.7.1, *Radiation Protection* [14].

3.8 Conventional health and safety

The information listed under the Conventional health and safety SCA is required for an application at any lifecycle stage.

3.8.1 General Considerations

In addition to requirements under the NSCA and regulations made under the NSCA, the conventional health and safety SCA also addresses the requirements of the *Canada Labour Code Part II* and the *Canada Occupational Health and Safety Regulations* or, where applicable, the occupational health and safety legislation at any jurisdictional level.

The application shall describe the program and implementation of policies to minimize risk to the health and safety of workers posed by conventional (non-radiological) hazards in the workplace, including the elimination and/or management of workplace safety hazards and to protect workers. The application shall describe how the program will measure the performance of the program, and how the applicant will report to the CNSC in the case of events.

The applicant shall provide the name, form, characteristics and quantity of any hazardous substances that may be on the site while the activity to be licensed is carried on. The applicant should provide the scientific name of each hazardous substance. This information may be provided in summary format; for example, by providing a table of the hazardous substances and the information required for each substance (maximum quantity at any given time).

The application should address requirements and guidance found in REGDOC-2.8.1, *Conventional Health and Safety* [16].

3.8.2 Performance, practices and awareness

The application shall describe programs and policies in place to demonstrate compliance with *Canada Occupational Health and Safety Regulations*. The applicant should also list all hazardous substances used, produced, handled and stored for use in the workplace and list their respective recommended threshold limit values as adopted by the *Canada Occupational health and safety Regulations*. Where applicable, both short-term exposure limits and long-term exposure limits should be provided.

3.9 Environmental protection

Unless otherwise indicated, the information listed under the Environmental protection SCA is required for an application at any lifecycle stage.

3.9.1 General considerations

The specific information to be provided for the environmental protection SCA as part of the application to prepare a site or construct a facility is determined as part of the environmental review for the facility.

The application shall contain information regarding the effects on the environment and 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.

The application should include a comprehensive set of environmental protection measures that meet the requirements of REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3] . The application should include detailed information related to the potential environmental effects resulting from the nuclear facility's interactions with the environment and the public.

The release of hazardous substances is regulated by the CNSC and other governmental authorities. The application should demonstrate compliance with applicable laws and regulations at all jurisdictional levels.

The application should identify and describe all standards, guidelines or criteria that have been applied with respect to preventive and control measures for environmental protection from facility discharges, including:

- preventive and control measures pertaining to environmental protection, including their expected performance
- a list of SSCs that are important for preventive and control measures; for example, equipment related to the liquid, solid and gaseous treatment systems the maintenance program established to ensure the sustained operational performance of preventive and control measures
- alarm systems to be installed to respond to failure of preventive and control measures
- identification of the measures that will be taken to make appropriate data available to the authorities and the public

Information about the planned releases should be provided in an application to prepare site and construct a uranium mine or mill, and then further developed for an application to operate a uranium mine or mill. The information should be amended again for an application to decommission a uranium mine or mill.

3.9.2 Effluent and emissions control

The application shall include information about the anticipated releases of nuclear substances and hazardous substances into the environment. This information shall include the proposed maximum quantities and concentrations, anticipated volumes and flow rates, as well as the characteristics of the substances.

The application should propose licensed release limits and establish environmental action levels that are performed as per REGDOC-2.9.2, *Controlling Releases to the Environment* (in development) [17]. The effluent and emissions control measures in place are used to inform the development of the licensed release limits and environmental action levels for the facility of activity being licensed.

The application should include a Best Available Technology Economically Achievable (BATEA) assessment performed as per REGDOC-2.9.2, *Controlling Releases to the Environment* (in development) [17].

3.9.3 Environmental protection policy and program

The licence application should provide the environmental protection policy and a high-level description of the environmental protection program.

For guidance on developing an environmental protection policy and program, refer to REGDOC-2.9.1, *Environmental Principles, Assessments and Protective Measures,* [1].

3.9.4 Environmental risk assessment

The licence applicant should conduct an environmental risk assessment (ERA) to identify, quantify and characterize the risk posed by contaminants and physical stressors in the environment. The ERA should include a human health risk assessment and an ecological risk assessment.

For additional guidance in developing an environmental risk assessment, refer to CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills,* [18].

3.9.5 Effluent and environmental monitoring programs

The licence application shall include an effluent monitoring program to demonstrate compliance with authorized release limits and an environmental monitoring program to demonstrate that the facility is operating within the predicted conditions under which the facility was licensed.

The applicant shall develop an environmental code of practice, which contains the following:

- administrative and action levels for certain contaminants or physical stressors measured at the final discharge point and for engineered containment facilities
- a description of actions to take if an administrative or action level is reached
- the reporting procedure to follow if an action level is reached

The purpose of an action level is to trigger an investigation to determine whether a loss of control of the environmental protection program has occurred and to enable corrective actions if warranted.

For additional guidance in developing environmental action levels, refer to REGDOC-2.9.2, *Controlling Releases to the Environment* (in development) [17] and CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities* [19].

The application should also consider action levels for engineering controls and other discharges not to the environment that may have the potential to create a loss of control event of the environmental protection program. Examples include hydraulic head and discharges to tailings pore water.

For additional guidance in developing an effluent and environmental monitoring program, refer to the following standards:

- CSA N288.4, *Environmental Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills* [20]
- CSA, N288.5, *Effluent and emissions monitoring programs nuclear facilities* [21]

3.9.6 Groundwater monitoring program

The licence application should develop a groundwater monitoring program that protects the quality and quantity of groundwater by minimizing interactions with the environment from activities associated with a nuclear facility.

For additional guidance in developing a groundwater monitoring program, refer to CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills*, [22].

3.9.7 Protection of people

The application shall identify and describe all the radiological and hazardous aspects of site activities that could have environmental effects, including exposure to members of the public during operation.

An application to operate or decommission an existing facility shall include the maximum effective doses to the public resulting from activities conducted at the facility during the current licence period.

All applications should submit the technical basis for calculating the dose to the public from licensed activities.

3.9.8 Environmental management system

The licence application should submit the requested information in an environmental protection program, or environmental management system (EMS) document.

For additional guidance in developing an environmental management system, refer to the following:

- ISO 14001, *Environmental management systems – Requirements with guidance for use* [23]
- REGDOC-2.9.1, *Environmental Principles, Assessments and Protective Measures* [3]

In addition to the guidance in REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3], the following should also be documented in the environmental protection program:

- reporting processes for Environment and Climate Change Canada environmental effects monitoring reporting, National Pollutant Release Inventory reporting, and CNSC environmental monitoring program results, in addition to reporting to appropriate Provincial authorities
- environmental performance measurement, including:
  - effluent and emission monitoring and control processes, including establishing administrative and action levels to ensure that the effluent controls are operating within normal operations
  - water quality, surface runoff, wastewater, surface receiving water and groundwater quality
  - air quality at the mine or mill site, including high-volume air samplers and ambient radon detectors
  - soil contaminant concentrations around the mine or mill site and lichen or other terrestrial vegetation species for evaluation in the vicinity of the mine or mill site
  - sediment quality in the receiving water bodies
  - fish and fish habitat – benthic macro-invertebrate effects in receiving water bodies
  - macrophyte effects
  - fish tissue and other receptor species tests for exposure uptake
  - processes for recording, analyzing, reporting and maintaining monitoring information

3.10 Emergency management and fire protection

Unless otherwise indicated, the information listed under the Emergency management and fire protection SCA is required for an application at any lifecycle stage.

3.10.1 General considerations

This SCA includes conventional emergency and fire response. Fire protection operations, design and analysis are discussed in the appropriate SCA of operating performance, safety analysis or physical design.

The application shall describe an emergency preparedness program. The program should meet the requirements of REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response* [24].

An effective emergency preparedness program is based on the following components:

- planning basis
- program management
- response plan and procedures
- preparedness

The application should describe the preparations that have been made to ensure that onsite and offsite emergencies and severe accidents will be dealt with safely and effectively.

3.10.2 Nuclear Emergency Preparedness and Response

The application to operate or decommission a mine or mill should describe how the nuclear emergency program encompasses both emergency preparedness and emergency response measures. The program should include provisions set out in REGDOC-2.10.1, *Nuclear Emergency Preparedness and Response* [24]. Given the remote nature of many current and proposed uranium mine and mill sites, arrangements for transport of injured persons off-site should be given careful consideration.

No information about nuclear emergency preparedness and response is required for an application to prepare a site and construct a uranium mine or mill.

3.10.3 Conventional Emergency Preparedness and Response

The application shall describe all non-radiological, non-routine conditions at the facility for which the emergency preparedness program has been established. The description should include details about which provisions exist on site and which provisions involve off site response support.

3.10.4 Fire Emergency Preparedness and Response

The application shall describe a comprehensive fire protection program to ensure the licensed activities do not result in unreasonable risk to the health and safety of persons and the environment due to fire. The program should include provisions for a third-party audit of the industrial fire brigade once every two years. Additional requirements and guidance for fire emergency preparedness may be found in the applicable provincial requirements as well as in CSA N393, *Fire protection for facilities that process, handle, or store nuclear substances* [26].

3.11 Waste management

Unless otherwise indicated, the information listed under the Waste management SCA is required for an application at any lifecycle stage.

3.11.1 General considerations

The application should describe the waste program that will address radioactive and/or hazardous waste generated during day-to-day operations of the facility and during planned or unplanned outages to its transfer to the waste storage management facility or another authorized facility.

The waste management program should address both conventional and radioactive waste. For information on the required waste management program elements refer REGDOC-2.11.1, *Waste Management Volume I: Management of Radioactive Waste* [28].

Additional requirements and guidance for waste management and decommissioning are found in the following:

- REGDOC-2.11, *Framework for Radioactive Waste Management and Decommissioning in Canada* [26]
- REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste* [27]
- REGDOC-2.11.1, *Waste Management, Volume II: Management of Uranium Mine Waste Rock and Mill Tailings* [13]
- REGDOC-2.11.1, *Waste Management, Volume III: Safety Case for Long-Term Radioactive Waste Management* [29]
- REGDOC-2.11.2, *Decommissioning* [30]
- REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* [31]

Further guidance is also found in CSA N292.0, *General principles for the management of radioactive waste and irradiated fuel* [32].

3.11.2 Waste characterization

The application shall identify, classify and characterize all solid, liquid and gaseous wastes expected to be produced in the waste management program. This should be done in accordance with REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste* [27].

The waste rock classification criteria for clean rock, mineralized waste rock or potentially acid generating waste rock should be identified. The processes used for geological segregation, sampling and analysis to ensure that effective segregation of the materials is maintained during the mining operations should also be provided.

The process for segregation of different types of solid wastes such as radiological contaminated waste, industrial waste and domestic waste and the use of separate storage and handling systems for prevention of contamination of material that may be reused of recycles should be described.

3.11.3 Wastes produced

The application should include an inventory of both the radioactive and hazardous wastes that may result from the operation of the mining facility. These wastes include:

- tailings
- waste rock
- contaminated water and its residuals
- contaminated air and its residuals
- industrial and chemical waste
- domestic waste
- sewage

This information should be used as a basis for the design of the various waste management systems.

3.11.4 Waste minimization

The application should describe the measures taken to minimize the generation and accumulation of waste produced during operation. The application should include provisions to reduce the generation of waste to a level that is as low as practicable.

3.11.5 Waste management practices

The detailed design of the facilities and the supporting design assessments should be provided in engineering design packages or construction work packages. Further information and expectations for the safety analysis and physical design of waste management facilities are found in sections 4.4 and 4.5, respectively, in this document.

3.11.6 Tailings management facilities

Specific information that should be provided for tailings management facilities includes, as applicable:

- design intent and capacity
- design of facilities, facility description, tailings handling systems
- site characterization (e.g., geotechnical, hydrogeological, climatic) as described in section 4.16.3 of this document
- general construction details (with further details to be provided in engineering design packages)
- characteristics of tailings,
- mill process controls to engineer tailings
- process flow, PID and general arrangement drawings
- risk and impact modelling assessments (e.g., geochemical, geotechnical, contaminant transport modelling, hazard analysis studies)
- long-term design impact assessment
- close out considerations – design for close-out, preliminary decommissioning plan
- water recovery systems
- fresh stormwater diversion systems
- secondary containment for potential spillage, monitoring and control
- process control and process monitoring, tailings density and percent solids
- tailings monitoring and control processes

3.11.7 Waste rock management facilities

Specific information that should be provided for waste rock management facilities includes, as applicable:

- design intent and capacity of waste rock storage or disposal facilities
- description of waste rock segregation and handling systems and design of waste rock storage or disposal facilities.
- site characteristics, (e.g., geotechnical, hydrogeological, climatic) as described in section 4.16.3 of this document

- general construction details (further details to be provided in engineering design packages)
- characteristics of waste rock,
- risk assessment, impact modelling assessments – geochemical, geotechnical, contaminant transport modelling, hazard operability studies
- close out considerations – design for close-out, preliminary decommissioning plan
- runoff containment and recovery systems
- fresh water diversion systems
- monitoring and control processes

3.11.8 Water treatment plant and facilities

Specific information that should be provided for water treatment plant facilities includes:

- process description
- process flow sheets, PIDs and general arrangement drawings
- influent water quantities and physical and chemical characteristics
- design objectives, design specifications, predicted effluent quality
- monitoring and control processes
- treatment sludge or other waste characteristics, quantities and handling and disposal processes to be used
- hazard operability or other hazard and risk assessment processes used and any results, changes or additional controls to be applied
- contingencies for increased capacity requirements or changes in influent characteristics
- reagents used and associated hazards and controls
- reagent handling systems and controls
- water handling systems and controls for freshwater, contaminated water streams, filter backwash systems, final effluent
- influent water storage and feed ponds, design specifications, pond liner and leak management controls and influent monitoring systems
- effluent sampling and monitoring systems, identification of final point of control and controls to stop discharge during periods of ineffective treatment
- final effluent handling systems, monitoring pond systems (if applicable), continuous discharge systems and off- specification water recycle systems
- exterior pipeline secondary containment systems, heat tracing and insulation systems, leak detection and flow monitoring systems

3.11.9 Other wastes

The licence application should provide a description of the processes for the separation, handling, disposal, reduction, recycling and reuse of wastes from the facilities with design specifications and associated description of facilities. The following types of wastes, as applicable, should be considered:

- domestic waste
- industrial waste
- chemical or radiological contaminated wastes
- hazardous substances or waste dangerous goods
- sewage

The applicant must comply with waste management requirements at any applicable jurisdictional level.

3.11.10 Waste management program

The handling of other nuclear substances and hazardous substances shall be described in appropriate documents such as the mine operations program, mill operating program, radiation protection program, conventional health and safety program, maintenance program or waste management program. This is needed for an application to operate a uranium mine or mill. Transportation of nuclear substances off-site should be described in the packaging and transport program and follow the applicable requirements of the *Packaging and Transport Regulations.*

The licence application should identify the operating policies, processes and facilities associated with the management of wastes at the facility. The waste management program should consider waste hierarchy and identify the roles and responsibilities in waste management. The processes for the management and operation of the waste management facilities and processes should be described in the waste management program. The proposed waste handling, storage and disposal methods to be used should be described. Any alternate processes that could be used should also be described. The procedures to be used for waste handling, storage and disposal should be referenced. The process monitoring and control processes should also be described.

Water management systems should be described. The processes to be used for the collection and handling of mine water from development and mining operations and from clean water infiltration through shafts and other uncontaminated areas should be described. Processes to maintain segregation of these different classes of water to prevent contamination and to reduce the quantity of mine water that will require treatment should be described.

The water handling, storage and treatment systems and processes for mine and mill effluents should be described. Any mine water inflow contingency systems for the handling of excess water flows should be described. The processes to be used for sampling and segregation of different types of water for reduction of the quantity of water that requires treatment should also be described.

Processes for monitoring and control of effluent treatment systems should be described. The design specifications for the operation of the facilities should be identified. The expected effluent quality, any administrative and action levels to be used to control the treatment operations and any effluent discharge limits that would apply to the treated effluent should be identified.

Domestic sewage treatment systems to be used at the facilities should be described.

The processes used for the training of operators should be identified with further detail, as appropriate, provided in the training program documentation.

3.11.11 Decommissioning plans

An application to prepare site for and construct, or operate a mine or mill shall contain a Preliminary Decommissioning Plan. Information on the Preliminary Decommissioning Plan is found in REGDOC-2.11.2, *Decommissioning* [30]. Planning for decommissioning is an ongoing process that is considered at each lifecycle stage of the facility.

An application to decommission a mine or mill shall contain a Detailed Decommissioning Plan (DDP). Information on the Detailed Decommissioning Plan is found in REGDOC-2.11.2 Decomissioning.

Requirements and guidance for providing cost estimates and financial guarantees are found in REGDOC-3.3.1, *Financial Guarantees for decommissioning of nuclear facilities and termination of licensed activities* [31].

3.12 Security

The information listed under the Security SCA is required for an application at any lifecycle stage.

Further requirements and guidance on the security of sealed sources and on prescribed information are found in REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material*, Version 2 [4].

Access control

The application shall describe the measures that will be taken to prevent unauthorized access to the mining or milling facility and to areas within the facility where nuclear substances and prescribed equipment are used and stored. This could include control of access to source storage areas, laboratories and designated radiation areas. This information could be included in a security program level document and referenced procedures.

Control of loss and illegal use of nuclear substances

The application shall describe the measures that will be taken, to prevent the loss of materials (e.g., ore, yellowcake and tailings) and devices authorized by the licence and their use, possession and use by an authorized individual. This information should be provided in the nuclear security program document (which constitutes protected information) and may include:

- removal of materials from site by employees or contractors
- transfer of nuclear substances to facilities which do not have the required CNSC licence
- release of contaminated equipment and materials from the site

The application shall describe the proposed measures for protecting prescribed information, if applicable.

3.12.1 Security program

The application, should include processes to ensure that release of nuclear material and/or prescribed information is controlled in the security program document.

The required elements and measures to be incorporated into the security program should be based on a site vulnerability threat risk assessment (TRA) that identifies the potential security risks and assesses the vulnerability of the facility to those risks. The risks considered in the TRA should include those arising from cyber attack. The measures that are incorporated into the security program should be based on these identified potential risks and vulnerabilities.

The application shall also establish processes to inform the workers of the security measures and programs that are to be followed and the requirement under the NSCA and regulations to report any of the occurrences specified. The program submitted with the application should identify how this requirement would be met.

Paragraph 3(e) of the *Uranium Mines and Mills Regulations* requires the submission of the proposed measures to alert the licensee to acts of sabotage or attempted sabotage at the mine or mill. The application shall identify the measures to be implemented to meet this requirement in the application.

3.13 Safeguards and non-proliferation

The information listed under the Safeguards and non-proliferation SCA is required for an application for a licence at any lifecycle stage of a uranium mine or mill.

3.13.1 Safeguards program

In addition to requirements of regulations made under the NCSA, the safeguards and non-proliferation SCA addresses the requirements of the following safeguard agreements:

- IAEA INFCIRC/164, *Agreement between Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* [33]
- IAEA INFCIRC/164/Add.1, *Protocol Additional to the Agreement between Canada and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* [34]

- Note: Either before or concurrent with applying for a licence relating to a uranium mine or mill, the applicant shall complete and submit to the CNSC a completed the IAEA safeguards Design Information Qquestionnaire (available upon request from the CNSC International Safeguards Division). The CNSC encourages applicants to submit the completed questionnaire early. For more information, see REGDOC 2.13.1, *Safeguards and Nuclear Material Accountancy* [40].

An application to operate or decommission a uranium mine or mill shall describe the program for compliance with the safeguards conditions. The safeguards program should meet the requirements of CNSC document REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [35].

The safeguards program should cover the following provisions:

- to provide the IAEA, an IAEA inspector, or a person acting on behalf of the IAEA, with such reasonable services and assistance as are required to enable the IAEA to carry out its duties and functions pursuant to a safeguards agreement
- not interfere with, alter, deface or break a safeguards seal, except pursuant to a safeguards agreement
- implement measures to prevent damage to, or the theft, loss or sabotage of samples collected pursuant to a safeguards agreement or the illegal use, possession, or removal of such samples
- make such reports and provide such information to the Commission or a person authorized by the Commission as are required to facilitate Canada’s compliance with any applicable safeguards agreement

3.14 Packaging and transport

Unless otherwise indicated, the information listed under the Packaging and transport SCA is required for an application at any lifecycle stage.

3.14.1 Package design and maintenance

An application to operate or decommission a facility shall describe how the program ensures that all shipping packages are designed and maintained for the protection and containment of the quantities transported, as per the *Packaging and Transport of Nuclear Substance Regulations, 2015*, where applicable.

An application to operate or decommission a facility shall describe elements such as package certification, package testing, inspecting and maintenance.

3.14.2 Packaging and transport program

An application to operate or decommission a facility shall describe the processes for compliance with the packaging and transport conditions as outlined in the *Transportation of Dangerous Goods Regulations* and the *Packaging and Transport of Nuclear Substances Regulations, 2015*. This information should be provided as part of packaging and transport program.

3.14.3 Registration for use

An application to operate or decommission a facility shall describe the measures in place to ensure that certified packages, if required, are registered for use prior to transport.

3.15 Reporting

An application for lifecycle stage should describe how the reporting and trending programs, processes and procedures meet the requirements of REGDOC-3.1.2, *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills* [36].

3.16 Public information and disclosure program

An application at any lifecycle stage shall describe the program for informing persons living in the vicinity of the mine or mill about the licensed activities. The description shall include how and with what tools the licensee will communicate with the public, particularly with those persons living in the vicinity of the site, and the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the operation of the facility. The application must also describe how their proposed public information and disclosure program (required by all licensees) meets the requirements in REGDOC-3.2.1, *Public Information and Disclosure* [37]. The application should include consideration of which communications tools will be most effective for key populations and should specifically describe how communications will be performed with Indigenous Nations and

communities who hold rights related to the area in which the uranium mine and/or mill is found. Use of relevant Indigenous languages in communications products is strongly recommended.

An application at any lifecycle stage should demonstrate that ongoing engagement with appropriate parties has been continued from previous activities and integrated into future activities.

At all times in the application process, CNSC staff strongly encourages the applicant to consider the proactive public posting and active dissemination of information associated with the application, including the full versions of documents submitted to the CNSC as part of the application. While not required, this best practice will serve to create the conditions for trust between the applicant, Indigenous Nations and communities, and the public. The use of various communication tools, such as web content, social media, print media, local radio and television, and in-person community meetings are all encouraged.

3.17 Indigenous engagement

The CNSC, as an agent of the Crown, has the responsibility for fulfilling Canada's legal duty to consult and, where appropriate, to accommodate Indigenous peoples when the CNSC's decisions have or may have had adverse effect on potential or established Indigenous or treaty rights. The CNSC is committed to meaningful ongoing engagement and consultation with Indigenous Nations and communities who have an interest in facilities and activities regulated by the CNSC.

To meet the CNSC's obligations for consultation, the CNSC may use the information collected and measures proposed by licensees regarding avoiding, mitigating or offsetting adverse effects. REGDOC-3.2.2, *Indigenous Engagement* [38] outlines requirements and guidance for applicants whose proposed projects may raise the Crown's duty to consult and accommodate. While the CNSC cannot delegate its obligation, it can delegate procedural aspects of the consultation process to licensees, where appropriate.

Conducting engagement activities with the public and Indigenous peoples early in the project development process, including site evaluation, is expected to result in more effective and efficient consultation practices, strengthen relationships and assist the Crown in meeting its obligations regarding any potential legal duty to consult and accommodate, as well as reduce the risk of delays in the regulatory review process.

4. Standard application information

4.1 Statement of purpose

An applicant must complete a licence application when:

- requesting a new licence
- renewing, amending, replacing or revoking an existing CNSC licence

The application provides details for the licence, which will consequently authorize only specified activities. The applicant must provide:

- a description of any nuclear facility and any prescribed equipment or information to be encompassed by the licence
- information about all activities to be licensed, as described in any of paragraphs 26(a) to (f) of the NSCA, and their purpose

For a licence renewal, the activities requested in this application must match those currently listed on the existing CNSC licence.

This information may be provided in summary format; for example, by listing facilities, equipment or information.

4.2 Licence period

The applicant should state the requested licence period. The licensee may request a specific licence period to match planned activities or anticipated change in status.

4.3 Description of site

The application must contain a description of the site of the activity to be licensed.

For uranium mines and mills, the applicant must provide a site plan and site description (drawings), and land ownership and control documentation.

4.4 Applicant's name and business address

The applicant must provide the applicant's name and business address.

The name must be that of the persons or organization applying for the licence, as it appears on the proof of legal status documentation, such as the proof of incorporation or sole proprietorship.

The applicant should name an individual, only if that person is a sole proprietor or will be solely responsible for the licence.

The business address must be the legal, physical address of the applicant's head office, including the complete street name and number, city, province or territory and postal code. A post office box number is not acceptable.

4.5 Mailing address

If the mailing address is different from the business address, the applicant must provide the mailing address, including the complete street name and number, city, province or territory and postal code.

If no address is provided, any licence issued in response to the application will be mailed to the head office address. A post office box number is acceptable as a mailing address.

4.6 Authority to act

The applicant must notify the Commission of the persons who have authority to act for them in their dealings with the Commission.

The applicant should provide a list of names, positions and contact information of all persons who are authorized by the applicant to interact with the CNSC.

Note: The applicant may request, for security reasons, this information be subject to confidentiality requirements.

4.7 Applicant authority

The applicant must provide the name, title and contact information—address, email address and telephone number—of the individual who has the legal signing authority for the application.

The signature of the applicant authority indicates that all statements and representations made in the application and on supplementary pages are binding on the applicant.

4.8 Proof of legal status

Applicants should provide proof of legal status by appending proof of incorporation, corporation number or charter. When submitting an application to renew, a revised proof of legal status should be provided if the applicant's original organization name has changed.

If the applicant is a corporation, the application should include the following information:

- corporation’s legal name
- corporation number
- date of incorporation
- jurisdiction of incorporation
- registered office address (if different from the head office address)

4.9 Owner or authority for the site

The applicant must provide evidence that the applicant is the owner of the site or has authority from the owner of the site to carry on the activity to be licensed.

4.10 Other information

If applicable, the applicant should describe the relationship of this application to any previous licences issued by the CNSC for activities at this facility, including any changes to the licensing basis that were included in previous licences.

The applicant should reference any other CNSC licences that apply to the use of other nuclear substances and authorized activities conducted at the facility; for example, licences for nuclear substances and radiation devices, dosimetry service, and import/export of controlled nuclear and nuclear-related substances, equipment and information.

Where applicable, the applicant may provide supporting information, including:

- the results of experimental programs, tests or analyses (for example, results of manufacturers’ material tests and qualification data)
- those that have been submitted to, received from, or published by a foreign national regulatory body

- information published by a national agency or an international nuclear agency

4.11 Cost recovery

Where applicable, the application must be accompanied by the appropriate regulatory fee as outlined in the *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations*. Any questions can be addressed to the CNSC Cost Recovery Advisory Group.

4.12 Financial guarantees

The application must describe the financial guarantees for the costs of decommissioning the facility or licensed activity according to the NSCA and the *General Nuclear Safety and Control Regulations* (GNSCR). The applicant should also provide a cross-reference to the supporting document regarding the value and form of the financial guarantee.

For more information about financial guarantees and licensing, consult REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* [31].

4.13 Billing contact person

The applicant must provide the following information for the person responsible for the licence fee payments:

- name
- position
- contact information (email, telephone, facsimile)
- mailing address, if different from the business address

4.14 Notification

The applicant must notify the CNSC within 15 days of any changes to the contact names identified in the application.

4.15 Structuring the application

The application may be completed in either of Canada's official languages. The applicant may choose to organize the information in any structure. However, the applicant is encouraged to organize the licence application according to the SCA framework to facilitate CNSC staff review. The CNSC uses SCAs as the technical topics to assess, review, verify and report on regulatory requirements and performance across all regulated facilities and activities, as outlined in REGDOC-3.5.3, *Regulatory Fundamentals* [1]. This REGDOC also contains information on licensing and certification, including the licensing basis and other key regulatory concepts, such as the graded approach.

4.16 Submitting the application

The applicant must ensure that the application is complete, dated and signed by the appropriate authority, that all supporting documents are clearly identified and cross-referenced and submitted in a secure format to the CNSC Registry at registry-greffe@cnsc-ccsn.gc.ca.

If the applicant chooses to submit the licence application in printed format, the applicant should provide two signed and dated printed copies of the application to:

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

All information submitted is subject to the *Access to Information Act* and the *Privacy Act*. The applicant must identify, with justification, any material that is subject to confidentiality requirements and not suitable for public disclosure. Any information that is submitted may be presented to the Commission to support the licensing decision. Any such information is also made available to the public upon request, in total or in a redacted form, according to the CNSC's legal obligations.

The applicant must keep a record of all licence information, as required by section 27 of the GNSCR.

The CNSC may request additional information from the applicant to further substantiate claims made in the application or to address any gaps found in the application.

Appendix A: Regulatory Documents and Standards

The CNSC's regulatory requirements and expectations for the safety performance of programs are organized into a framework made up of 14 SCAs, which are subdivided into specific areas.

The table that follows outlines each SCA, their specific areas and the reference materials that relate to an application to for a uranium mine or mill.

Table 1: Applicable reference documents by SCA and specific area

Safety and control area	Specific area	Standard(s) or regulatory documents
Management system	Management system	CSA N286, *Management system requirements for nuclear facilities* [5] REGDOC-2.1.1, *Management Systems* [A1] IAEA GSR Part 2, *Leadership and Management for Safety: General Safety Requirements* [A2] IAEA GS-G-3.1, *Application of the Management System for Facilities and Activities* [A3] IAEA GS-G-3.5, *The Management System for Nuclear Installations* [A4] ISO 14001, *Environmental management systems – Requirements with guidance for use* [23] ISO 9001, *Quality management systems – Requirements* [A5] IAEA, GS-G-3.4, *The Management System for the Predisposal Management and Disposal of Radioactive Waste* [A6]
	Organization	CSA N286, *Management system requirements for nuclear facilities* [5] REGDOC-2.1.1, *Management Systems* [A1] IAEA GSR Part 2, *Leadership and Management for Safety: General Safety Requirements* [A2] ISO 14001, *Environmental management systems – Requirements with guidance for use* [23] ISO 9001, *Quality management systems – Requirements* [A5]
	Performance assessment,	CSA N286, *Management system requirements for nuclear facilities* [5]

Safety and control area	Specific area	Standard(s) or regulatory documents
	improvement and management review	REGDOC-2.1.1, *Management Systems* [A1]
	Operating experience (OPEX)	CSA N286, *Management system requirements for nuclear facilities* [5] REGDOC-2.1.1, *Management Systems* [A1] ISO 14001, *Environmental management systems – Requirements with guidance for use* [23] ISO 9001, *Quality management systems – Requirements* [A5]
	Change management	CSA N286, *Management system requirements for nuclear facilities* [5] REGDOC-2.1.1, *Management Systems* [A1]
	Safety culture	CSA N286, *Management system requirements for nuclear facilities* [5] REGDOC-2.1.1, *Management Systems* [A1] REGDOC-2.1.2, *Safety Culture* [6]
	Configuration management	CSA N286, *Management system requirements for nuclear facilities* [5] REGDOC-2.1.1, *Management Systems* [A1] ISO 9001, *Quality management systems – Requirements* [A5]
	Records management	CSA N286, *Management system requirements for nuclear facilities* [5] REGDOC-2.1.1, *Management Systems* [A1] ISO 14001, *Environmental management systems – Requirements with guidance for use* [23] ISO 9001, *Quality management systems – Requirements* [A5]

Safety and control area	Specific area	Standard(s) or regulatory documents
	Business continuity	REGDOC-2.1.1, *Management Systems* [A1] ISO 22301, *Security and resilience – Business continuity management systems – Requirements* [7]
Human performance management	Human performance program	REGDOC-2.2.1, *Human Factors* [8] NUREG-7000 *Human-System Interface Design Review Guidelines* [48] NUREG-0711 Rev 3 *Human Factors Engineering Program Review Model* [49]
	Personnel training	REGDOC-2.2.2, *Personnel Training* [9] CSA N286, *Management system requirements for nuclear facilities* [5]
	Work organization and job design	REGDOC-2.5.1, *General Design Considerations: Human Factors* [10] REGDOC-2.2.5, *Minimum Staff Complement* [11] NUREG-0700, *Human-System Interface Design Review Guidelines* [48] NUREG-0711 Rev 3, *Human Factors Engineering Program Review Model* [49]
Operating performance	Conduct of licensed activities	REGDOC-2.2.5, *Minimum Staff Complement* [11] REGDOC-2.3.2, *Accident Management* [A9] REGDOC-2.4.4, *Safety Analysis for Class IB Nuclear Facilities* [51] REGDOC-2.5.1, *General Design Considerations: Human Factors* [10] REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3] REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [35] REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* [31] NUREG-0700, *Human-System Interface Design Review Guidelines* [48]

Safety and control area	Specific area	Standard(s) or regulatory documents
		NUREG-0711 Rev 3, *Human Factors Engineering Program Review Model* [49] ASME B31.1, *Power Piping* [A10] ASME B31.3, *Process Piping Guide* [A11] ASME B31.5, *Refrigeration Piping and Heat Transfer Components* [A12] ASME BPVC, *Boiler and Pressure Vessel Code* [A13] CSA N286, *Management system requirements for nuclear facilities* [5] CSA N288.1, *Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities* [A14] CSA N288.4, *Environmental Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills* [20] CSA N288.5, *Effluent and emissions monitoring programs at nuclear facilities* [21] CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [18] CSA N292.3, *Management of low- and intermediate-level radioactive waste* [A15] CSA N294, *Decommissioning of facilities containing nuclear substances*[A16]
	Reporting and trending	REGDOC-3.1.2 [36]
Safety analysis	Safety analysis	CSA N393:22 [26] INSAG-4, *Safety Series No. 75* [A17] NUREG-0711 Rev 3, *Human Factors Engineering Program Review Model* [49] REGDOC-2.4.4?

Safety and control area	Specific area	Standard(s) or regulatory documents
	Hazard analysis	NUREG-0711 Rev 3, *Human Factors Engineering Program Review Model* [49] REGDOC- 2.4.4, *Safety Analysis for Class IB Nuclear Facilities* [51] CCME, *Canadian Environmental Quality Guidelines* [A18] REGDOC-1.2.1 [3] CSA N393:22 [26] REGDOC-2.7.1 [14] Government of Canada, *Canadian Climate Normals* [A19]
Physical design	Site characterization	REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3] REGDOC 2.11.1, *Waste Management, Volume II* [12] CCME, *Canadian Environmental Quality Guidelines, Canadian Water Quality Guidelines for the Protection of Aquatic Life* [A20] CCME, *Canadian Environmental Quality Guidelines, Sediment Quality Guidelines for the Protection of Aquatic Life* [A21] IAEA, SSG-18 [A22]] Government of Canada, *Canadian Climate Normals* [A19]
	Facility design	REGDOC-2.5.1, *General Design Considerations: Human Factors* [10] REGDOC-2.5.4 [13] REGDOC-2.11.1, Waste Management, Volume III [29] CSA N393:22 [26] ASME B31.1, *Power Piping* [A10] ASME B31.3, [A11] ASME B31.5, *Refrigeration Piping and Heat Transfer Components* [A12] ASME BPVC, *Boiler and Pressure Vessel Code* [A13]

Safety and control area	Specific area	Standard(s) or regulatory documents
		NUREG-0700 *Human-System Interface Design Review Guidelines*[47] NUREG-0711 Rev 3, *Human Factors Engineering Program Review Model* [48] National Building Code of Canada [A24] National Fire Code of Canada [A25]
	Structure, system and component design	REGDOC-2.5.4 [13] CSA B51 [A23] CSA N393 :22 [26] ASME B31.1, *Power Piping* [A10] ASME B31.3, *Process Piping Guide* [A11] ASME B31.5, *Refrigeration Piping and Heat Transfer Components* [A12] ASME BPVC, *Boiler and Pressure Vessel Code* [A13] National Fire Code of Canada [A25] National Building Code of Canada [A24]
Fitness for service	Maintenance program	CSA N393 :22 [26] CSA B51 [A23] ASME B31.1, *Power Piping* [A10] ASME B31.3, *Process Piping Guide* [A11] ASME B31.5, *Refrigeration Piping and Heat Transfer Components* [A12] ASME BPVC, *Boiler and Pressure Vessel Code* [A13]

Safety and control area	Specific area	Standard(s) or regulatory documents
Radiation protection	Application of ALARA	REGDOC-2.7.1 [14]
	Worker dose control	REGDOC-2.7.1 [14] REGDOC 2.7.2, Dosimetry, Volume I [16]
	Radiation protection program performance	REGDOC-2.7.1 [14]
	Radiological hazard control	REGDOC-2.7.1 [14] CSA N292.5-11 [A26]
Conventional health and safety	Performance, practices and awareness	Canada Labour Code [A27] REGDOC-2.2.2, *Personnel Training* [9] REGDOC-2.8.1 [16]
Environmental protection	Effluent and emissions control (releases)	REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3] REGDOC-2.9.2 [17] CSA N288.0 [A28] CSA N288.5, *Effluent and emissions monitoring programs at nuclear facilities* [21] CSA N288.8 [19]
	Environmental management system (EMS)	REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3] CSA N288.0 [A28] ISO 14001, *Environmental management systems – Requirements with guidance for use* [23]

Safety and control area	Specific area	Standard(s) or regulatory documents
	Assessment and monitoring	REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3] CSA N288.0 [A28] CSA N288.4, *Environmental Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills* [20] CSA N288.7 [22]
	Environmental risk assessment	REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [3] REGDOC-2.9.2 [17] CSA N288.0 [A28] CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [18] Health Canada, *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment* [A29]
	Protection of people	REGDOC-2.7.1 [14] CSA N288.0 [A28] CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills* [18] CSA N288.1:20, *Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities* [A14]
Emergency management and fire protection	Conventional emergency preparedness and response	REGDOC-2.2.2, *Personnel Training* [9] REGDOC-2.3.2, *Accident Management* [A9] REGDOC-2.10.1 [24] REGDOC-2.10.2 [25] CSA N393:22 [26]

Safety and control area	Specific area	Standard(s) or regulatory documents
		REGDOC-3.2.1 [37]
	Nuclear emergency preparedness and response	REGDOC-2.2.2, *Personnel Training* [9] REGDOC-2.3.2, *Accident Management* [A9] REGDOC-2.10.1 [24] CSA N1600 [A30]
	Fire emergency preparedness and response	REGDOC-2.2.2, *Personnel Training* [9] REGDOC-2.10.1 [24] REGDOC-2.10.2 [25] National Building Code of Canada [A24] CSA N393:22 [26]
Waste management	Waste characterization	CSA N292.0:19 [32] CSA N292.8:21 [A31] REGDOC-2.11.1, *Waste Management*, Volume I [27] REGDOC-2.11.1, *Waste Management*, Volume II [31]
	Waste minimization	REGDOC-2.11.1, *Waste Management*, Volume I [27] CSA N292.0:19 [32] CSA N292.5-11[A26]
	Waste management practices	REGDOC 2.11 [30] REGDOC-2.11.1, *Waste Management*, Volume I [27] REGDOC-2.11.1, *Waste Management*, Volume II [18]

Safety and control area	Specific area	Standard(s) or regulatory documents
		REGDOC-2.11.1, *Waste Management*, Volume III [29] CSA N292.3, *Management of low- and intermediate-level radioactive waste* [A15] CSA N292.0:19 [32] CSA N292.8:21 [A31] CSA N292.5-11 [A26]
	Decommissioning plans	REGDOC-2.11.2 [30] REGDOC-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities* [31] CSA N294, *Decommissioning of facilities containing nuclear substances* [A16]
Security	Facilities and equipment	REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material* [4] U.S. DOD UFC 3-340-02, *Structures to Resist the Effects of Accidental Explosions* [A32] REGDOC-2.2.2, *Personnel Training* [9] REGDOC-2.2.4, *Fitness for Duty, Managing Worker Fatigue* [A33] REGDOC-2.2.4, *Fitness for Duty, Volume II: Managing Alcohol and Drug Use* [A34] REGDOC-2.12.2, *Site Access Security Clearance* [A35] REGDOC-2.12.1, *High-Security Sites: Volume II: Criteria for Nuclear Security Systems and Devices* [A36]
	Response arrangements	REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material* [4]

Safety and control area	Specific area	Standard(s) or regulatory documents
	Security practices	REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material* [4] REGDOC-2.12.2, *Site Access Security Clearance* [A35] IAEA NSS No. 23-G, *Security of Nuclear Information* [A37] IAEA NSS No. 7, *Nuclear Security Culture* [A38] IAEA NSS No. 8, *Nuclear Security Culture* [A39] IAEA NSS No. 26-G, *Security of Nuclear Material in Transport* [A40] IAEA NSS No. 30-G, *Sustaining a Nuclear Security Regime* [A41]
	Cyber security	CSA N290.7, *Cyber security for nuclear facilities* [A42] IAEA NSS No.17, *Computer Security at Nuclear Facilities* [A43]
Safeguards and non-proliferation	Nuclear material accountancy and control	REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [35] IAEA INFCIRC/164, *Agreement between the Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* [33] IAEA INFCIRC/164/Add.1, *Protocol additional to INFCIRC/164* [34] REGDOC 2.13.2, *Import and Export* [A44]
	Access and assistance to the IAEA	REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [35] REGDOC 2.13.2, *Import and Export* [A44] IAEA INFCIRC/164, *Agreement between the Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* [33] IAEA INFCIRC/164/Add.1, *Protocol additional to INFCIRC/164* [34]

Safety and control area	Specific area	Standard(s) or regulatory documents
	Operational and design information	REGDOC 2.13.2, *Import and Export* [A44] REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [35] IAEA INFCIRC/164, *Agreement between the Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* [33] IAEA INFCIRC/164/Add.1, *Protocol additional to INFCIRC/164* [34]
	Safeguards equipment, containment and surveillance	REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [35] IAEA INFCIRC/164, *Agreement between the Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* [33] IAEA INFCIRC/164/Add.1, *Protocol additional to INFCIRC/164* [34]
	Import and export	REGDOC 2.13.2, *Import and Export* [A44] REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [35] IAEA INFCIRC/164, *Agreement between the Government of Canada and IAEA for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* [33] IAEA INFCIRC/164/Add.1, *Protocol additional to INFCIRC/164* [34]
Packaging and Transport	Packaging and transport program	REGDOC-2.12.3, *Security of Nuclear Substances: Sealed Sources and Category I, II and III Nuclear Material* [4] REGDOC-2.14.1, *Packaging and Transport Volume II: Radiation Protection Program Design for the Transport of Nuclear Substances* [A45]

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, and in CNSC regulatory documents and other publications. REGDOC-3.6 is provided for reference and information.

References

The CNSC may include references to information on best practices and standards such as those published by CSA Group. With permission of the publisher, CSA Group, all nuclear-related CSA standards may be viewed at no cost through the CNSC Web page "How to gain free access to all nuclear-related CSA standards".

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2. CNSC, REGDOC-3.5.1, *Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills*, Ottawa, Canada, 2022
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Additional Information

The CNSC may recommend additional information on best practices and standards such as those published by CSA Group. With permission of the publisher, CSA Group, all nuclear-related CSA standards may be viewed at no cost through the CNSC webpage "How to gain free access to all nuclear-related CSA standards".

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Facilities and activities within the nuclear sector in Canada are regulated by the 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. CNSC regulatory documents are classified under the following categories and series:

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