

Canadian Radiation Protection Association

Professional Recognition/Registration/Certification

‘CORE LEVEL COMPETENCY PROFILE’

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Reviewed by: Radiation Safety Professionals Committee
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Other professional organizations (CNSC, COMP, CAMRT)

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Core Level Competencies

11	Program Administration Manage a safety program that provides effective control of radiation protection activities in accordance with Federal and Provincial regulations.	
11.1	Manage radiation safety staff and operational budgets	
11.2	Ensure the role of a Radiation Safety Committee is incorporated in the organizational structure.	
11.3	Advise management and workers regarding issues related to the institute's use of radioisotopes and radiation emitting devices.	
11.4	Prepare corporate policies and procedures to assist management and workers to implement effective radiation safety practices.	
11.5	Develop administrative controls or procedures to ensure departments and individuals comply with radiation safety and regulatory requirements;	
11.6	Initiate revisions to corporate and department policies and procedures based on changes to license conditions or regulations.	
11.7	Conduct an annual review of the radiation safety program.	
11.8	Prepare an annual report of each licensed activity.	
11.9	Authorize the use, work procedures, and locations of use for radioactive material.	
11.10	Represent the Radiation Safety Program on committees and work groups.	
11.11	Maintain good relations with federal and provincial regulators and inspectors.	
12	Radiation Safety Act and Regulations Understand the overall acts and regulations and use them when developing specific radiation safety programs.	
12.1	Ensure the implementation of federal and provincial regulations governing sources of ionizing radiation.	
12.2	Interpret federal and provincial regulations relating to ionizing radiation.	
12.3	Provide advice and assistance to radioisotope users in understanding and complying with legislative requirements.	
13	Licences Have a general understanding of the requirements of a licence, different use types and applications and the mechanism to apply for a licence.	
13.1	Ensure the specific conditions of the licences are implemented.	
13.2	Ensure licenses for all sources of ionizing radiation are properly maintained.	
13.3	Review or prepare the organization's requests for initial licence or licence amendments.	
13.4	Prepare licence renewal applications.	
13.5	Ensure licensed areas are properly decommissioned when licence is not renewed.	
14	Working Rules Ensure that the work practices reflect the safe use of radioactive material, protection of the public and follow the principles to keep exposures as low as reasonable achievable.	
14.1	Establish working rules for all designated work areas where radioactive sources are used.	
14.2	Advise on the appropriate signs to post in work areas.	
14.3	Determine the procedures to be followed in order to maintain the security of	

	ionizing radiation equipment and sources.	
15	Record Keeping Establish a system where information regarding the use of radioactive material is documented, recoverable and available as needed.	
15.1	Prepare reports as required by legislation and organization policy.	
15.2	Ensure the required records are properly documented and stored.	
15.3	Submit records and reports required by the regulations.	
15.4	Dispose records in accordance with legal and regulatory requirements.	
20	Employee Qualifications – Performance	
20.1	Designate worker classification for employees based on duties and radiation exposure levels in the workplace.	
20.2	Assess the qualifications and performance of persons who apply to use, handle, ship or receive radioactive materials.	
20.3	Determine if individuals have the knowledge, skills and experience to effectively perform radiation protection practices associated with their work.	
20.4	Authorize persons to possess, use or handle radioactive materials or radiation devices.	
20.5	Ensure workers whose duties occasionally expose them to radioactive material receive appropriate training in radiation safety.	
20.6	Develop, implement and maintain radiation safety training programs to all staff based on observations and inspection results.	
20.7	Ensure radiation safety training is adequate, appropriate and effective for all staff who are required to use or handle radioactive material.	
20.8	Evaluate training programs/material on a regular basis and adjust training to meet the organization’s changing needs.	
20.9	Promote a culture of safety so personnel actively develop and improve methods of meeting radiation protection objectives and goals.	
20.10	Develop and maintain educational information, training material and information distribution systems (web sites, notice boards) related to the safe use of ionizing radiation.	
20.11	Provide in-service and continuing education training programs on ionizing radiation.	
20.12	Act as an educational resource person.	
30	Inspections-Audits-Investigations	
31	Inspections	
31.1	Perform hazard evaluations.	
31.2	Control work activities if hazardous situations involving radioactive materials arise.	
31.3	Suspend operations if hazardous situations become dangerous to the health and safety of the worker or general public.	
31.4	Inspect licensed activities to ensure compliance with regulations.	
31.5	Ensure that all persons using ionizing radiation follow institute procedures to prevent occupational exposures in excess of the regulations and in accordance with the <i>ALARA</i> principle of dose limitation.	
31.6	Monitor the users of ionizing radiation to ensure that the licensee’s operations, equipment and facilities comply with regulatory requirements.	

32 Audits	
32.1	Determine deficiencies in the organization's radiation safety program.
32.2	Assess radiation protection program and analyze trends to identify and correct areas of program weakness and deficiencies in personnel performance.
32.3	Critically review the adequacy of safety procedures related to ionizing radiation.
32.4	Conduct audits of safety practices in accordance with the <i>ALARA</i> principle of dose limitation.
32.5	Recommend remedial actions or changes to correct areas of program weakness or deficiency.
33 Investigations	
33.1	Investigate radiation hazards, incidents, overexposures, contamination and loss of radioactive material.
33.2	Evaluate incidents and determine pertinent facts or events surrounding investigations.
33.3	Investigate situations where the organization's radiation safety action levels are triggered.
33.4	Diagnose and initiate corrective action for unusual conditions during routine work and accident situations.
33.5	Recommend appropriate actions or revisions to the radiation protection program in order to prevent recurrences.
33.6	Analyze trends of events and incidents.
33.7	Prepare reports on investigations and trends for the appropriate regulator or committee.
40 Exposure and Dose Control	
40.1	Manage radiation exposure levels through an effective ALARA program
40.2	Conduct radiation contamination surveys of laboratories and work surfaces.
40.3	Conduct radiation exposure surveys of rooms, devices and storage areas.
40.4	Conduct workplace hazard assessment and evaluation before work with radiation is started.
40.5	Identify high hazard work areas and establish procedures scaled to the hazard level.
40.6	Establish personnel traffic patterns, controlled work areas and work practices to protect staff and the general public from high radiation levels.
40.7	Monitor radiation levels throughout the institution and make recommendations regarding ways of reducing radiation exposure.
40.8	Monitor access control (security) and recommend changes to ensure the security of radiation devices and sources.
40.9	Evaluate shielding of areas where radioactive material and radiation devices are used.
50 Instrumentation and Equipment	
50.1	Ensure equipment is assessed to determine that it is appropriate for its intended use.
50.2	Administer the use, and maintenance of personnel monitoring devices and instruments.
50.3	Ensure radiation survey instruments are calibrated and serviced as required.

50.4	Perform efficiency tests and document count rates corresponding to contamination levels for each isotope likely to be used with that instrument.	
50.5	Document results of equipment calibration and service.	
50.6	Analyze equipment results for trends that indicate sub-optimal performance.	
50.7	Advise on the use of personnel protective equipment.	
50.8	Assess personal monitoring devices and assess new devices as they become available.	
60	Radioactive Inventory Management Manage a complete inventory control program to ensure the security and safe handling of radioactive material from purchase and storage to use and disposal.	
61	Purchasing	
61.1	Ensure the purchase of radioactive material permits only authorized users to place orders.	
61.2	Provide procedures to ensure inventory limits are not exceeded.	
61.3	Review requests for authorization to purchase radioactive material.	
61.4	Maintain an up to date inventory of radionuclides and sealed sources	
62	Receiving	
62.1	Ensure radioactive material shipments follow regulations relating to radiation safety and security.	
62.2	Receive and open packages using radiation safety and transport guidelines.	
62.3	Evaluate delivery or package inconsistencies.	
62.4	Log all radioactive material received into the inventory record.	
63	Transportation	
63.1	Package radioactive material in accordance with the regulations.	
63.2	Prepare shippers declaration and other documentation required by regulations.	
63.3	Ensure the organization's obligations to transport radioactive material are fulfilled.	
63.4	Ensure properly trained individuals transport radioactive material within the organization.	
64	Storage	
64.1	Maintain storage areas for both short term and long term radioactive waste.	
64.2	Ensure the locations where ionizing radiation is used comply with the regulations in such areas as signage, space, security and shielding.	
64.3	Assess space and security requirements of storage areas for radioactive material.	
65	Waste Management	
65.1	Identify waste streams and relate to regulatory conditions.	
65.2	Develop procedures for the disposal of liquid, solid, gaseous radioactive wastes or sealed sources.	
65.3	Develop procedures to monitor waste to determine if it can be disposed.	
65.4	Prepare requests to adjust release limits and waste disposal process.	
70	Personnel Dosimetry	
70.1	Evaluate potential internal and external personal radiation exposure hazards.	

70.2	Develop procedures to minimize radiation exposure hazards.	
70.3	Understand regulatory requirements regarding screening and bioassay related to the potential for internal radiation exposure.	
70.4	Monitor the occupational radiation exposures received by employees and where records indicate that exposures are unnecessarily high,	
70.5	Recommend measures to reduce radiation exposures in the workplace.	
70.6	Assign personal monitoring devices.	
70.7	Develop and respond to action levels regarding personal radiation dose records.	
70.8	Develop a policy to ensure that pregnant workers can maintain their occupational radiation exposure within regulatory limits.	
70.9	Advise departments on changes to work practices required if an individual declares a pregnancy.	
80 Contamination Control		
80.1	Design and implement radioactive decontamination programs.	
80.2	Coordinate, or participate in, emergency responses to accidents involving radioactive materials.	
80.3	Respond to radiation safety emergencies or spills.	
80.4	Conduct contamination surveys or leak tests of laboratories, devices and storage areas.	
80.5	Evaluate procedures intended to prevent or minimize contamination.	
90 Emergency Procedures		
90.1	Develop procedures for dealing with emergencies involving radioactive material.	
90.2	Advise on the handling of contaminated individuals to the Emergency Department.	
90.3	Advise departments on the handling of deceased patients who have had recent treatment and are a potential radiation source.	
90.4	Act as a resource for those responding to transport or other accidents involving radioactive material.	
90.5	Establish an emergency response team and conduct practice drills.	
Specialty Area Competencies		
To be developed as needed		

Curriculum Guide

This guide can be used when developing course material to meet the competency requirements. It is not the intent of the association to be prescriptive in the material that course developers cover and the definitive material, when developing training programs, should ultimately be the competency profile.

10. Organization/Administration

11. Radiation Safety Program Administration

1. Administration/Responsibilities
 1. Executive
 2. Radiation Safety Committee
 3. Radiation Safety Professional
 4. Permit Holders/Authorized Users
 5. Department Management
 6. Radiation Users/Employees
2. Committees
 1. Radiation Safety Committee
 2. Workplace Safety Teams
 3. Annual and Quarterly Reports
3. Policy and Procedure Development
 1. Notification, Posting, Implementation
 2. Radiation Safety Office Organization and Responsibilities

12. Radiation Safety Act and Regulations

1. Canadian Acts and Regulations
 1. Provincial (Radiation Emitting Devices)
 2. Radiation Protection Bureau (Federal Radiation Emitting Devices)
 3. Canadian Nuclear Safety Commission
 4. Transport of Radioactive Material
 5. Occupational Health and Safety Act
2. Other Regulatory Agencies
 1. International Atomic Energy Agency (IAEA)
 2. International Commission on Radiation Protection (ICRP)
 3. Nuclear Regulatory Commission (NRC)
 4. National Council on Radiation Protection and Measurement (NCRP)
3. Canadian Nuclear Safety Commission General Policy and Guides

13. Licence/Permits

1. Types of Licences
 1. Nuclear Substance and Facility
2. Exemptions
 1. Exemption quantities of Nuclear Substances
3. Applications
 1. Licence application process

14. Working Rules

1. Area Posting and Signs
2. Security
3. Working Habits/Rules

1. General Safety

15. Record Keeping

1. Requirements
2. Forms
3. Disposal of records

20 Employee Qualifications/Performance

Categories of Worker-Public

1. Nuclear Energy Workers
2. Radiation Users (Authorized Users)
3. General Public
4. Pregnant Worker

Employee Training/Continuing Education

1. Program Development
 1. Competencies
 2. Knowledge Assessment
 3. Skills Identification
2. Program Outlines (appropriate for worker category)
3. Employee Training Requirements
4. Evaluation Methods

30. Inspections/Audits/Investigations

31. Inspections

1. Compliance Enforcement
 1. Minor Offence
 2. Major Offence

32 Audits

1. Elements of Radiation Safety Quality Control Program

33 Investigations

1. Reporting Incidents/Concerns
 1. Action Levels
2. Incident Response by Radiation Safety Professional
3. Trends

40 Exposure and Dose Control

Ionizing Radiation Theory

1. Types of Exposure
 1. Natural
 2. Medical
 3. Occupational
2. Types of Radiation
3. Radioactive Decay
 1. Types of decay
 2. Half-life
4. Interaction with Matter

Concepts of Risk

1. Radiation vs Lifestyle Risks
2. Risks vs Benefits

1. Diagnostic exposures
2. Therapeutic exposures
3. Occupational exposures

Units of Radiation Exposure and Dose

1. Exposure [Coulomb/Kg (C/Kg)]
2. Absorbed Dose [Gray (Gy)]
3. Dose Equivalent [Sievert (Sv)]
4. Activity [Bequerel (Bq)]

Radiation Exposure Limits

1. ALARA (As Low As Reasonably Achievable)
2. Dose Limits
 1. Nuclear Energy Worker vs General Public
 2. Effective Dose and Allowable Limits on Intake (ALI)
3. Area Surveys
 1. Storage, Rooms, General Areas

Practical Means of Radiation Protection

1. Time
2. Distance
 1. Inverse Square Law
3. Shielding
 1. Shielding Formula
 2. General Requirements for alpha, beta, x-ray, gamma, neutrons
 3. Half Value Layer
4. Protecting Patients/General Public (Minimizing Dose)

50 Instrumentation and Equipment

Radiation Monitoring Devices/Equipment

1. Types
 1. Contamination Monitors
 2. Survey Meters (Exposure)
2. Selection of Monitors for licence uses

Performance Checks/Calibrations

Radiation Protection Devices/Equipment

1. Personal Protection
2. Work Area

60 Radioactive Material Inventory Management

61. Purchasing/Inventory Tracking

1. Licence Conditions and Regulations
2. Purchasing Procedures
3. Inventory Tracking
 1. Routine (transfers)
 2. Loss or Theft

62. Receiving

1. Licence Conditions and Regulations
2. Receiving - Delivery
3. Opening Packages - Dangerous Occurrences

63. Transportation

1. Transport of Dangerous Goods Regulations

2. Packaging

3. Shipping

64. Storage

1. Requirements

1. Short Term vs Long Term Waste

2. Sealed Sources (routine and in devices)

65. Waste Disposal

1. General Responsibilities, Forms and Records

2. Categories of Waste

3. Environment Considerations

1. Landfill, Sewer, Incineration

4. Disposal

1. Limits and off-site options

70 Personnel Dosimetry

Radiation Exposure Hazards

1. External

1. Common Sources

2. Internal

1. Common Sources

2. Methods of Entry

Factors Influencing Dose

1. Critical Organs vs Target Organs

2. Physical Properties

3. Biological Properties

4. Radionuclide Toxicity

Personal Monitoring

1. Licence Conditions and Regulations

2. Classification of Workers (see Section 20)

3. Monitoring Devices

1. Type and Style of Personal Dosimeters

2. Appropriate Wearing of Dosimeters

4. Monitoring Services

1. Assigning Monitors

2. Applying for Monitors

3. Action Criteria

4. Record Keeping

Bioassay (General Awareness)

1. Requirements and Frequency

2. Sampling Methods

External Exposure/Internal Dosimetry

1. Calculation of Absorbed Dose

2. Effective Dose Calculations

3. Contact Dose Rates

Radiation Biology (General Awareness)

1. Cell Structure and Function

2. Molecular and Subcellular Effects

3. Radiosensitivity

4. Biological Effects

1. Somatic, Genetic, Deterministic, Stochastic

2. Damage to Chromosomes

5. Medical Effects on Humans
 1. Acute vs Chronic
 2. Effects on Tissue
 3. Dose Limits
 4. Partial vs Whole Body Exposure
 5. Factors Influencing Effects

Pregnant Radiation Users

1. Licence Conditions and Regulations
2. Classification of Workers
3. Declaring Pregnancy
4. Dose Limits
5. Procedures and Forms

80 Contamination Control

Contamination Surveys

1. Contamination Monitoring
 1. Direct Monitoring (Contamination Meter)
 2. Indirect Monitoring (Wipe Test/Leak Test)
2. Personal Monitoring
3. Lost Sources

90 Emergency/Special Procedures

Emergency Procedures

1. Plan of action for different scenarios
2. Radiation Emergency Contact List
3. Response Equipment, Teams and Practice Scenarios

Specialty Area Curriculum Guide: To be developed as needed.

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Key Words for Competencies:

Assess • Adhere • Advise • Calculate • Calibrate • Check • Conduct • Demonstrate • Determine • Educate • Employ • Ensure • Explain • Evaluate • Follow • Identify • Implement • Initiate • Instruct • Investigate • Listen • Maintain • Manage • Monitor • Obtain • Operate • Perform • Plan • Prepare • Provide • Recognize • Recommend • Record • Respond • Select • Share • Use • Verify