Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

Canada

The Canadian Nuclear Safety Commission's (CNSC) Experience in Evaluating Skin Dose Estimates from Direct Contamination

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VARSKIN Technical Meeting

Ottawa

nuclearsafety.gc.ca

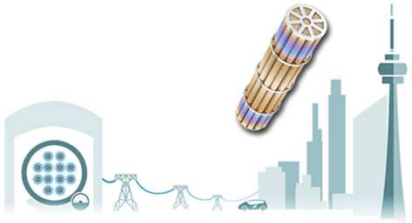
Our Mandate

- Regulates the use of nuclear energy and materials to protect health, safety, and security and the environment
- Implements Canada's international commitments on the peaceful use of nuclear energy
- Disseminates objective scientific, technical and regulatory information to the public

The CNSC Regulates All Nuclear-Related Facilities and Activities

Uranium mining

Uranium fuel processing



Nuclear power

Transport

Waste management

Dosimetry Services

Nuclear research

Medical uses

Nuclear substance processing

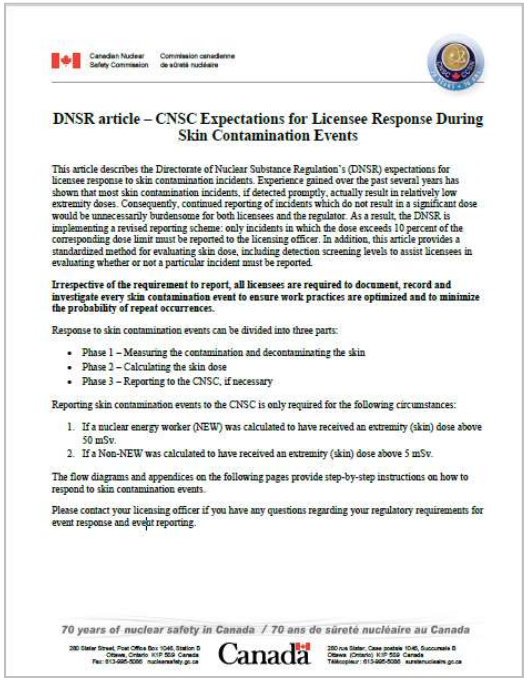
CNSC's Dose Limits

- Equivalent dose limits for the skin are prescribed in section 14(1) of the *Radiation Protection Regulations*

Organ or Tissue	Person	Period	Equivalent Dose Limit (mSv)
Skin	Nuclear energy worker	One-year dosimetry period	500
Skin	Any other person	One calendar year	50
Hands and feet	Nuclear energy worker	One-year dosimetry period	500
Hands and feet	Any other person	One calendar year	50

Skin Contamination - CNSC's Expectations (1)

- *CNSC Expectations for Licensee Response During Skin Contamination Events* provides guidance on how to respond to a skin contamination event in three parts:
  1. measuring contamination and decontaminating the skin
  2. calculating skin dose
  3. reporting to the CNSC



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DNSR article – CNSC Expectations for Licensee Response During Skin Contamination Events

This article describes the Directorate of Nuclear Substance Regulation's (DNSR) expectations for licensee response to skin contamination incidents. Experience gained over the past several years has shown that most skin contamination incidents, if detected promptly, actually result in relatively low extremity doses. Consequently, continued reporting of incidents which do not result in a significant dose would be unnecessarily burdensome for both licensees and the regulator. As a result, the DNSR is implementing a revised reporting scheme: only incidents in which the dose exceeds 10 percent of the corresponding dose limit must be reported to the licensing officer. In addition, this article provides a standardized method for evaluating skin dose, including detection screening levels to assist licensees in evaluating whether or not a particular incident must be reported.

Irrespective of the requirement to report, all licensees are required to document, record and investigate every skin contamination event to ensure work practices are optimized and to minimize the probability of repeat occurrences.

Response to skin contamination events can be divided into three parts:

- Phase 1 – Measuring the contamination and decontaminating the skin
- Phase 2 – Calculating the skin dose
- Phase 3 – Reporting to the CNSC, if necessary

Reporting skin contamination events to the CNSC is only required for the following circumstances:

1. If a nuclear energy worker (NEW) was calculated to have received an extremity (skin) dose above 50 mSv.
2. If a Non-NEW was calculated to have received an extremity (skin) dose above 5 mSv.

The flow diagrams and appendices on the following pages provide step-by-step instructions on how to respond to skin contamination events.

Please contact your licensing officer if you have any questions regarding your regulatory requirements for event response and event reporting.

70 years of nuclear safety in Canada / 70 ans de sûreté nucléaire au Canada

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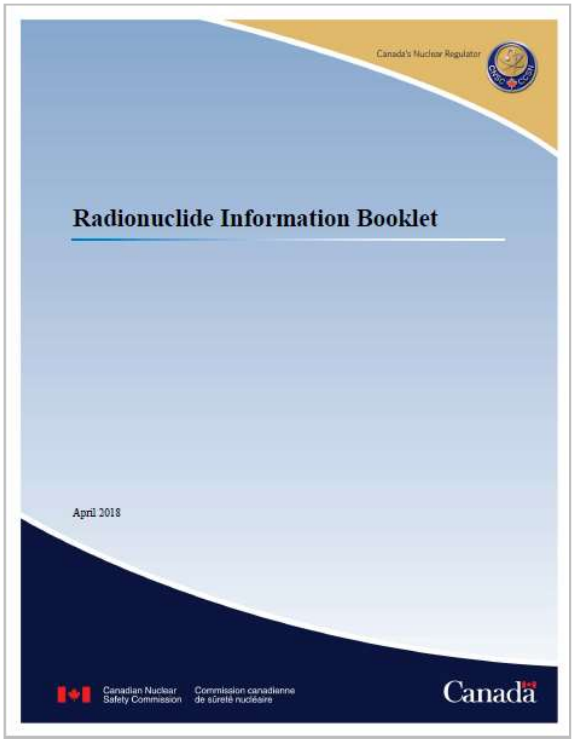
Skin Contamination - CNSC's Expectations (2)

- CNSC REGDOC-2.7.2 Volume I, *Dosimetry: Ascertaining Occupational Dose*
  - public consultation planned for fall 2018

Skin Contamination – Dose Estimates

- Most licensees calculate skin dose using published dose coefficients:
  - IAEA TECDOC 1162
  - *Radionuclide and Radiation Protection Data Handbook* (Delacroix et al., 2002)
  - CNSC's *Radionuclide Information Booklet*
- Some licensees have VARSKIN



Use of VARSKIN at the CNSC (1)

- Used by CNSC staff in the Radiation Protection Division
- Used to verify skin dose calculations
- Used for 1-2 cases per month
  - usually I-131, Tc-99m
- Used to carry out skin dose estimates
- Used to calculate skin dose coefficients
  - surface contamination limits in REGDOC-1.6.1, *Licence Application Guide: Nuclear Substances and Radiation Devices*
  - model different scenarios for performing autopsies and embalmment for the purposes of REGDOC-2.7.3, *Radiation Protection Guidelines for Safety Handing of Decedents*

Use of VARSKIN at the CNSC (2)

- Geometries
  - usually disk sources
  - cylinders to model syringes
  - sealed sources
  - CNSC's *Radiation Protection Regulations* states, *"when skin is unevenly irradiated, the equivalent dose received by the skin is the average equivalent dose over the 1 cm^2 area that received the highest equivalent dose"*

Use of VARSKIN at the CNSC (3)

- Skin thickness
  - skin is defined in CNSC's *Radiation Protection Regulations* as, "*the layer of cells within the skin that are 7 mg/cm^2 below the surface*"
  - special case: wound contamination
- Shielding
  - gloves
  - clothing
  - source encapsulation

What We Like About VARSKIN

- Fast
- User friendly
- Can model relatively complex exposure situations
- Technical advice from the VARSKIN team

Opportunities for Improvement

- Making the latest version of VARSKIN more accessible to CNSC licensees
- VARSKIN has been used to estimate dose to the lens of the eye
  - information on the appropriateness and limitations would be helpful
- Sealed sources
  - consider charged particles produced in encapsulation for situations in which a person picks up a gamma emitting source (e.g., radiography)

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Questions?

Thank You!

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