

## Decontamination

### 1.0 Statement

In the event of personal contamination, immediate action must be taken to decontaminate your eyes, skin, hair or clothing **in this order**. As soon as possible contact the RSO (709-864-8250) for assistance in safe decontamination techniques *and inform your supervisor*. The Canadian Nuclear Safety Commission (CNSC) will be notified by the RSO of any incident resulting in a dose received that exceeds 10% of the corresponding dose limit (see individual sections in this RSOP for limits).

Locate the contamination using appropriate survey meter. Pay close attention to your hands and feet. Ask a colleague for assistance to summon help if you are contaminated. Monitor slowly (1 cm/sec) with the contamination meter, with the setting on fast response.

**Dose rate measurements must be recorded FOR ALL INCIDENTS OF PERSONAL CONTAMINATION. Contact RSO for access to calibrated survey meter if you do not have direct access within your laboratory.**

**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**

**NOTE: Personal safety takes priority over monitoring. In the event of contamination with radioactive material with other hazardous substances that may cause immediate damage to the skin (eg. strong acids/bases, toxic chemicals, etc.) decontamination of the skin should be completed immediately (prior to dose monitoring) in order to remove imminently hazardous substance.**

**Procedure: refer to appendix 1 for a flow chart of required actions.**

### 2.0 Eye contamination (Dose limit = 1.5 mSv)

- 2.1 Measure and record net count rate and time
- 2.2 Use local eyewash as soon as possible. Monitor your hand for radioactive contamination; if clean use your thumb and index finger to open your eyelids. Flush for at least 15 minutes.
- 2.2 Monitor for contamination and if necessary repeat the flush. Record net count rate and time with each decontamination cycle.
- 2.3 If your fingers are contaminated, ask for assistance to hold your eyelids open.
- 2.4 Contact the RSO as soon as possible.

### 3.0 Skin contamination (Dose limit = 5 mSv)

#### 3.1 Wound and broken skin

If you cut yourself or sustain an abrasion while working with nuclear substances:

##### 3.1.1 **Stop work immediately!**

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- 3.1.2 Locate and monitor the area where the injury occurred including gloves or other protective clothing using appropriate survey meter. Record net count rate and time. Remove protective clothing if it is appropriate but do not discard them. Keep the contaminated gloves or clothing separate within the radiation work area.
- 3.1.3 Soak a piece of light cloth in lukewarm water and brush the contamination gently **away from the wound, never towards the wound**. Keep monitoring and decontamination efforts until you remove all removable contamination.
- 3.1.4 Flush the abraded area with lukewarm water. DO NOT use an abrasive without Radiation Safety Officer approval. Keep monitoring and decontamination efforts until you remove all removable contamination. Record net count rate and time with each decontamination cycle.
- 3.1.5 Contact the RSO as soon as possible (709-864-8250)

### 3.2 Unbroken skin

- 3.2.1 **Stop work immediately.**
- 3.2.2 Locate all contaminated areas including gloves or other protective clothing. Record net count rate and time. Remove protective clothing if it is appropriate but do not discard them. Keep the contaminated gloves or clothing separate within the radiation work area.
- 3.2.3 First flush the affected skin area with lukewarm water. Record net count rate and time with each decontamination cycle. If contamination persists, use mild **non-abrasive** soap. Keep monitoring and decontamination efforts until you remove all removable contamination.

**(note: Try household vinegar to remove P-32 contamination.)**

DO NOT use an abrasive without approval from the Radiation Safety Officer.

- 3.2.4 Contact the RSO as soon as possible (709-864-8250).

### 3.3 Hair contamination

- 3.3.1 Locate the contaminated area and measure and record net count rate and time.
- 3.3.2 Flush under lukewarm running water for at least 10 minutes. Re-monitor and if necessary repeat the procedure. Record net count rate and time with each decontamination cycle.
- 3.3.3 If the contamination persists it might be necessary to clip the contaminated hair.
- 3.3.4 Contact the RSO as soon as possible (709-864-8250).

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### 4.0 Contaminated Clothing

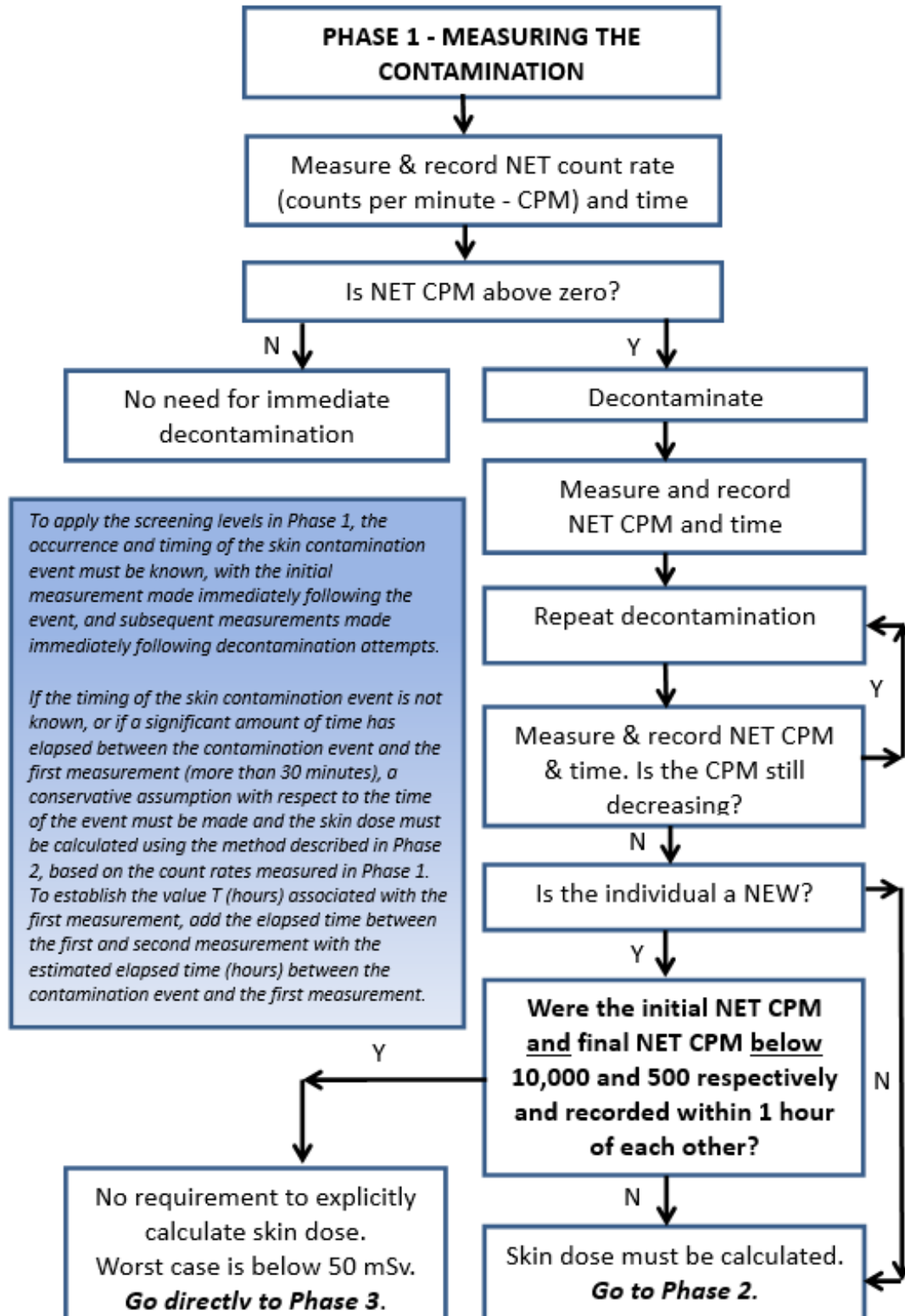
- 4.1 Monitor your clothing including gloves with an appropriate survey meter to locate contamination. Contaminated clothing should be removed and placed on an under pad or in a plastic bag to control contamination. Do not discard contaminated clothing. Keep the contaminated gloves or clothing separate within the radiation work area.

If contamination has reached the skin, refer to section 3

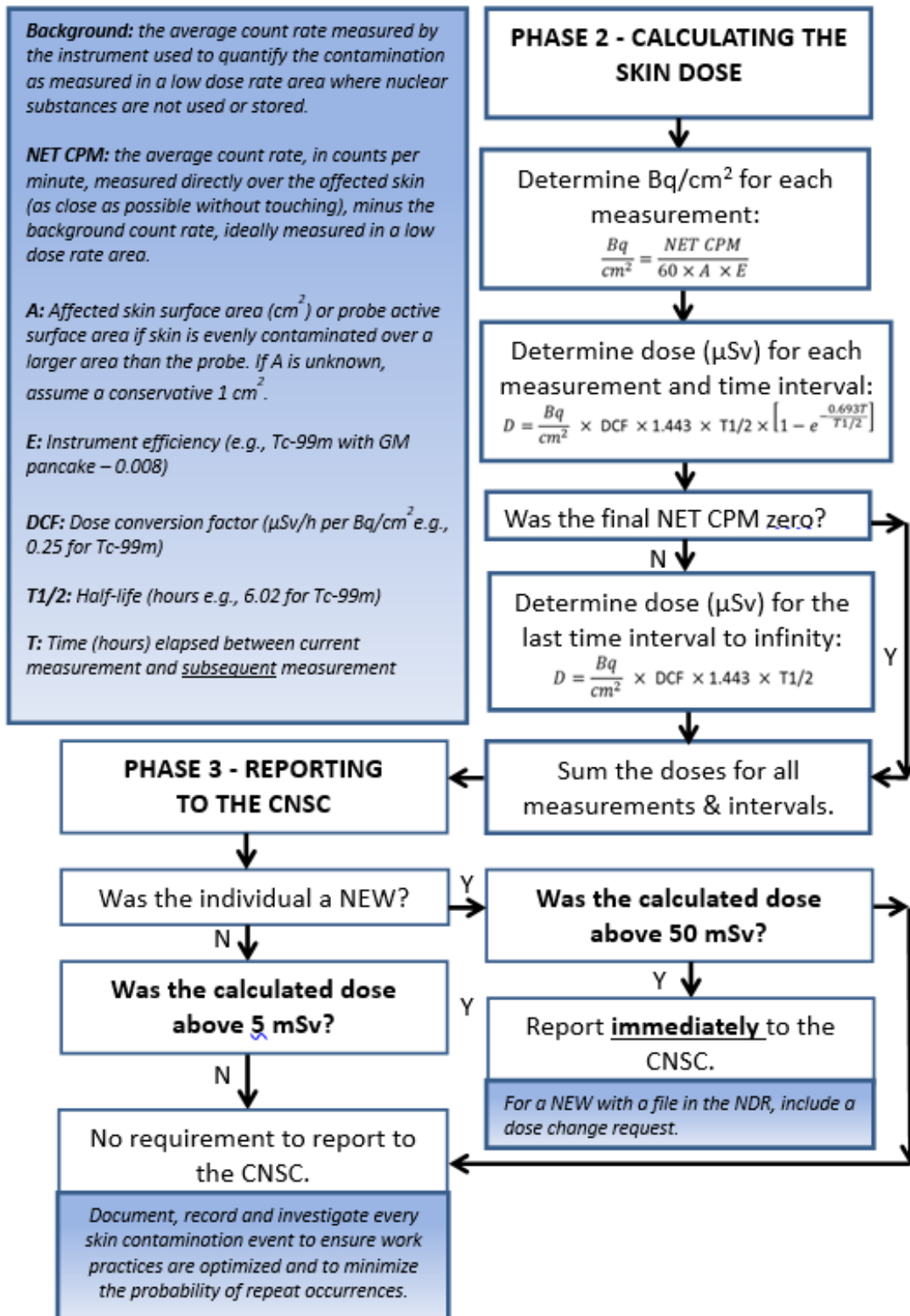
- 4.2 Contact the RSO as soon as possible (709-864-8250) for situation assessment and advice.

## Decontamination

Appendix 1: CNSC expectations during skin contamination events.



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### Appendix 1 – Flow diagram assumptions

1. Any measurement of contamination on the skin should be immediately washed.
2. The skin dose **must** be calculated whenever the incident involves a non-NEW.
3. The calculated skin dose threshold above which immediate reporting to the CNSC is required is **50 mSv** for a NEW and **5 mSv** for a non-NEW.
4. The worst case skin dose resulting from a 10,000 CPM NET measurement followed by a 500 CPM NET measurement after decontamination within one hour is approximately 48.3 mSv (Ga-67 measured with a pancake meter over  $1 \text{ cm}^2$ , skin decontamination unsuccessful beyond the 500 CPM, and a 27-day exposure). Consequently, the default screening level(s) for which the ascertaining of dose for a NEW is not required is:
  - **Less than 10 000 CPM NET (167 CPS)** on the initial measurement **AND 500 CPM NET (8.3 CPS)** on the subsequent measurement after decontamination efforts when both measurements are taken **within one hour** of each other
  - OR
  - **Less than 500 CPM NET (8.3 CPS)** if only one measurement is taken
5. These default values were established based on a worst case combination of isotope and detector. Note that, as illustrated in appendix 2, at these count rates, the dose incurred from isotopes other than Ga-67 would be much less than 50 mSv.
6. Licensees may choose to establish their own screening thresholds for reporting based on the isotopes they use and detection efficiency of their contamination monitors for those isotopes. In general, this would be expected to increase the count rates, at which reporting is required. Licensees who wish to adopt this approach must submit their evaluation of the screening levels to the CNSC for review prior to implementation.

*Note: Equivalent skin doses that have been ascertained to be above 50 mSv should result in the licensee submitting a dose change request to the CNSC on behalf of the affected individual to facilitate the addition of the equivalent dose to the skin to their dose of record in the National Dose Registry.*

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**Appendix 2 – Skin dose calculations**

Skin dose conversion coefficients ( $\mu\text{Sv/h}$  per  $\text{Bq/cm}^2$ ):

C-14	F-18	P-32	Ga-67	Y-90	Tc-99m	In-111	I-123	I-125	I-131	Tl-201
0.32	1.9	1.9	0.35	2.0	0.25	0.38	0.38	0.021	1.6	0.27

Reference: IAEA-TECDOC-1162

10 000 CPM NET - Doses after 1 hour				
Tc-99m	Ga-67	I-131	F-18	P-32
4.9 mSv	7.3 mSv	1.8 mSv	1.3 mSv	1.3 mSv
500 CPM NET - Doses after 27 days				
Tc-99m	Ga-67	I-131	F-18	P-32
2.3 mSv	41.0 mSv	22.3 mSv	0.2 mSv	22.8 mSv
Total Doses				
Tc-99m	Ga-67	I-131	F-18	P-32
7.2 mSv	48.3 mSv	24.1 mSv	1.5 mSv	24.1 mSv

Assumptions used in skin dose calculations

- Instrument used: pancake (Background 50 CPM)
- Measurement efficiencies: Tc-99m 0.8%, Ga-67 0.8%, I-131 15%, F-18 20%, P-32 25%
- Contaminated skin surface area:  $1 \text{ cm}^2$