

# Guidelines

For personal radiation monitoring  
programs in Tasmania

Radiation Protection Unit  
Department of Health and Human Services



Tasmania  
Explore the possibilities

These Guidelines are issued in accordance with S57 of the *Radiation Protection Act 2005*.

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These guidelines for personal radiation monitoring programs are designed to assist Tasmanian licence holders to:

- a)** develop an appropriate personal radiation monitoring program for inclusion in their Radiation Management Plan
- b)** satisfy the condition of licence under the *Radiation Protection Act 2005* that requires implementation of an approved personal radiation monitoring program.

Such a program must allow estimation of all occupational exposures, in routine and accident situations. Approved programs could combine various methods of dose estimation, of which the wearing of personal radiation monitors is one. When used, the personal radiation monitors must be provided by a service approved for Tasmania (see [www.dhhs.tas.gov.au](http://www.dhhs.tas.gov.au) for details).

Other methods of estimating doses include calculating exposures from measured dose rates, area monitoring (monitoring at a specified location rather than monitoring individuals) or conducting personal monitoring for a pre-determined period (12 months, say) to establish typical exposures.

In some situations, area monitoring may be used to indicate the maximum radiation exposure to any person and may be appropriate where several people could be exposed to low levels of radiation from a source, for short time intervals. For example, a monitor placed on the edge of a walkway may indicate the maximum dose possible to industrial operators who occasionally walk past a radiation gauge fixed close to the walkway.

Similarly, a monitor attached to the handset of a dental X-ray unit could indicate the maximum dose to operators of the unit.

Table 1 of the Guideline provides recommended wearing periods for practices in which personal radiation monitoring is conducted.

The wearing period is the time after which monitors will be exchanged for new monitors. The Director of Public Health may approve alternative arrangements, provided that these are supported by a risk assessment. Contact the Radiation Protection Unit for further information.

Table 1 includes a "monitoring not mandatory" classification. This may be appropriate in situations where personal monitoring for a year, or so, has indicated that annual doses are less than 250  $\mu\text{Sv}$  and where high inadvertent doses are unlikely. If, however, the situation changes – eg the workload increases significantly or new technology, resulting in higher exposures, is used – then personal radiation monitoring should again be introduced.

The maximum recommended wearing period, of three months, is set by the personal monitor providers and is determined by the properties of the materials used in the monitors and by practical considerations.

The 'Guidance for particular situations', which follows Table 1, is based on enquiries from licence holders.

**Table 1** Recommendations for personal monitoring wearing periods Tasmania - July 2011

Practice	Typical annual radiation doses (from Tasmanian dose records)	Recommended wearing period (months)	Comments
Nuclear medicine	Annual doses >5 mSv recorded and/or potential for high exposures in routine work and in accidents	2	For nuclear medicine technologists and physicians
		1 Extremity monitors if dose >10% annual limit	For pregnant workers  (See ARPANSA publication RPS 14.2)
Industrial radiography	Annual doses >5 mSv have been recorded and there is the potential for high exposures in routine work and in accidents	1	
Blood irradiator	Annual doses <1 mSv but possibility of high exposures in accidents	2	For area monitor in irradiator room, RSO and deputy RSO
Radiotherapy	Annual doses <1 mSv but possibility of high inadvertent exposures	3	Plus supplementary monitoring, eg using direct reading dosimeters, for brachytherapy
Diagnostic radiology – interventional	Annual doses >5 mSv possible - potential for high exposures in routine work	2	Personal monitoring mandatory for radiologist/cardiologist. Two monitors should be worn – one below protective clothing and one outside protective clothing at collar level, to assess the eye dose. Also, see 'People requiring personal monitoring'
Service engineers and/or consultants (medical, dental, industry and research)	Annual doses <1 mSv but potential for inadvertent exposure, especially when investigating equipment malfunction	2	
*Diagnostic radiology – small hospital	Annual doses >250 µSv and <1 mSv and exposures uniform throughout year and high inadvertent exposures unlikely	3	
*Diagnostic radiology – large hospital/private practice/other hospitals (excluding interventional procedures)	Annual doses >250 µSv and <1 mSv and exposures uniform throughout year and high inadvertent exposures unlikely	3	

Practice	Typical annual radiation doses (from Tasmanian dose records)	Recommended wearing period (months)	Comments
Visiting medical specialists (e.g. use of lithotripter at specified intervals)	Annual exposures received as an accumulation of doses, each over a short time interval	3	Also, see 'People requiring personal monitoring'.
Veterinary – practices taking >5 radiographs per month (particularly those where animals are manually restrained and/or involving field radiography)	Annual doses >1 mSv possible, but rare, due to inadvertent exposure to the primary beam	3	
Industry	Annual doses >250 µSv and <1 mSv and exposures uniform throughout year and high inadvertent exposures unlikely	3	Area monitoring suitable when many employees may be exposed for short times to radiation from fixed gauges. Responders to accidents (eg RSO) must have personal monitors. Also, see 'People requiring personal monitoring'
Soil moisture and density gauge users	Annual doses >250 µSv possible. High inadvertent exposures unlikely	3 (all users during periods of use)	RSO must have personal monitor at all times
+Research – government (excluding tritium)	Annual doses generally <250 µSv and high inadvertent exposures unlikely	3 (all users during periods of use)	Monitoring is required because work is project based and often involves novel techniques. RSO must have personal monitor at all times
+Research – medical and veterinary (excluding tritium)	Annual doses generally <250 µSv and high inadvertent exposures unlikely	3 (all users during periods of use)	Monitoring is required because work is project based and often involves novel techniques. RSO must have personal monitor at all times
*Diagnostic radiology – other medical practices	Annual doses <250 µSv and exposures uniform throughout year and high exposures unlikely even in accident situation	Monitoring not mandatory	Includes GP practices. Initial verification period (one year) required
Dental and dental specialties	Annual doses <250 µSv and exposures uniform throughout year and high exposures unlikely even in accident situation	Monitoring not mandatory	After initial verification period of one year
Chiropractic	Annual doses <250 µSv and exposures uniform throughout year and high exposures unlikely even in accident situation	Monitoring not mandatory	After initial verification period of one year

Practice	Typical annual radiation doses (from Tasmanian dose records)	Recommended wearing period (months)	Comments
Veterinary - those practices where five or fewer than five radiographs per month are taken	Annual doses <250 $\mu$ Sv and exposures uniform throughout year and high exposures unlikely even in accident situation	Monitoring not mandatory	After initial verification period of one year
Baggage X-ray	Annual doses <250 $\mu$ Sv and exposures uniform throughout year and high exposures unlikely even in accident situation	Monitoring not mandatory	
Education	Annual doses <250 $\mu$ Sv and high exposures unlikely even in an accident situation	Monitoring not mandatory	Use of radiation must be in accordance with the ARPANSA Safety Guide for the Use of Radiation in Schools - Part 1: Ionizing Radiation (2009)
Industry	Annual doses >250 $\mu$ Sv and <1 mSv and exposures uniform throughout year and high inadvertent exposures unlikely	3	Area monitoring suitable when many employees may be exposed for short times to radiation from fixed gauges. Responders to accidents (eg RSO) must have personal monitors. Also, see "People requiring personal monitoring"
Users of Ni-63 sources; suppliers of ionization smoke detectors	Annual doses <250 $\mu$ Sv and high exposures unlikely even in an accident situation	Monitoring not mandatory	
XRF and XRD users of hand-held units or those units without sample auto-changing	Personal monitors worn at chest or waist may not detect leakage radiation	Extremity monitoring recommended	
Workplaces where radon levels may exceed 1000 Bq/m <sup>3</sup>	If radon levels cannot be reduced, monitor workplace radon levels and employee gamma levels	Monitor for twelve months, to establish exposure levels	
Mining and milling of radioactive ores	Monitor, calculate and record employee radiation exposure as per ARPANSA RPS 9.1		

\* These categories are specified by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) personal radiation monitoring service.

+ Personal radiation monitors suitable for use with tritium are not currently available – calculations and wipe test results may be used to estimate exposure from tritium.

**Note:** 250  $\mu$ Sv per annum is consistent with the Tasmanian Standards for Places that require radiation exposures of less than 20  $\mu$ Sv in a four week period for a member of the public. Members of the public are not provided with monitors to show that this dose has not been exceeded but calculations or a survey will have been performed to show that this dose is unlikely to be exceeded.

## GUIDANCE FOR PARTICULAR SITUATIONS

### Monitoring of part-time/casual employees

Dose estimation may be sufficient. Or a direct reading dosimeter could be used. However, if a dose greater than 250  $\mu\text{Sv}$  per year is predicted for the part-time employee, personal monitoring should be provided. This is particularly important if the part-time employee is working at more than one practice because the total annual dose must then be considered.

### Monitoring of pregnant staff

No changes to personal monitoring should be required other than for nuclear medicine (if necessary, the work practice should be modified to ensure compliance with relevant dose limits) but, rather, the standard monitoring could be supplemented by additional monitoring:

- if there is any possibility that dose limits may be exceeded; or
- if high exposures could occur, for example as a result of an incident; or
- to provide information and reassurance to the pregnant employee.

**(Note:** recently, it has been common in Tasmania to supplement TLD monitoring with use of a direct reading dosimeter.)

### People requiring personal monitoring

- Schedule 3 Part B of a licence issued under the *Radiation Protection Act 2005*, specifies some persons at risk for whom monitoring is mandatory.
- All persons listed on a licence as authorised to use radioactive materials or radiation apparatus should be monitored, other than those employed in practices specified as 'monitoring not mandatory' (see Table 1).
- Persons carrying out duties where incidental exposure to radiation may occur, eg person moving a radiation gauge within an industrial plant. Monitoring may not be required for a 'one-off' but the potential exposure to radiation should be estimated (in advance) and recorded and the person should be informed of the likely exposure. Should the potential exposure from all such tasks in one year exceed 250  $\mu\text{Sv}$ , then monitoring is required. Accidental exposure, eg if a shutter is not locked off, should also be taken into account.
- Interventional radiology – radiologist (or cardiologist) must be monitored. Radiographers present must be monitored. Doses to theatre staff may either be calculated from these measured doses or be estimated by monitoring the individuals.
- Iodine therapy – nurses attending iodine therapy patients must be monitored.

## Monitoring of extremities

- All individuals whose annual monitor reading exceeds 5 mSv must wear extremity monitors. This may include individuals involved in the administration of therapeutic doses of radioactive materials.

**Note:** the annual dose requirement takes into account the trend for doses to decrease as operators, involved in the administration of therapeutic doses of radioactive materials, gain experience.

- All individuals whose hands may be unavoidably placed in the primary beam (eg in some interventional radiology) must wear extremity monitors – at least for an annual check on doses over a four-week period.
- Nuclear medicine technologists, in their NPDP year, should wear extremity monitors.
- Research workers and other individuals performing new or novel work with radioactive materials should wear extremity monitors (where these are available for the type and energy of radiation in use).
- Operators of XRD and XRF units, particularly hand-held units or those units without sample auto-changing, should wear extremity monitors.

## Wearing location for monitors

Waist or chest is the usual wearing location. The service provider should provide advice. The service provider uses a formula to calculate the individual's dose. This formula generally assumes that the monitor is worn under any protective clothing. In medical situations, where two monitors are worn, one should be under protective clothing and the other outside, at collar level.

## People working at more than one location

Registered wearers working at more than one site should take into account their total exposure when the wearing period is being determined.

## Neutron monitoring

Neutron monitors are required for those people operating or using linear accelerators with energies >10 MeV and/or neutron sources, including Radiation Protection Unit staff and radiation consultants (if there is any likelihood of them working with neutron sources).

## Record keeping

This is an extremely important part of any monitoring program. The monitoring program design must address the records that need to be kept and the associated procedures for record keeping and record disposal.



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