

## **Core of knowledge: X-ray inspection systems based on particle accelerator technology**

This 'core of knowledge' is the basic level of training in radiation safety an applicant must demonstrate to be granted (additional conditions apply) a licence under the *Radiation Protection Act 1965* to use:

### ***Irradiating apparatus***

for the purpose of

***inspection (particle accelerators).***

### **Continuing education**

Once every 2 years, a licensee will be required to demonstrate evidence of continuing education. Guidance on continuing education is available from NRL.

### **Training courses based on this core of knowledge**

#### **Practical component**

Practical experience with radiation measuring instrumentation and x-ray systems is expected.

#### **Assessment**

Following completion of a training course, each participant who intends to apply for a licence is required to complete a written assessment designed to confirm that the objectives of the training course have been met.

#### **Duration**

It is expected that a training course will be approximately 8 hours in duration.

#### **Modules**

Each core of knowledge is made up of standard-modules, and where applicable, one or more specific-modules. A standard-module (small variations can be expected between individual cores of knowledge) is common to all cores of knowledge.

### **Guide to depth of knowledge required**

The depth of knowledge required for each topic is indicated using the following scale:

- (1) Introductory.** Overview and familiarity only.
- (2) Working.** Knowledge gained should be able to be used in problem solving and practical situations.
- (3) In depth.** In addition to a working knowledge there should be a thorough understanding of the underlying basis or theory.

## Core of knowledge

### Modules

#### Standard 1

##### **Nature and sources of ionising radiation**

- Electrical production of X-rays (accelerators) (1).
- Types and characteristics of radiation (electrons, X-ray) and its interaction with matter (1). In particular, scattered radiation.
- Quantities and units (activity, absorbed dose and effective dose) (2).
- Sources of ionising radiation (natural and artificial) (1).

#### Standard 2

##### **Biological effects of ionising radiation and associated risks**

- Damage mechanisms (1).
- Whole body and extremity exposures (1).
- Deterministic effects; skin erythema, cataracts, LD<sub>50</sub> etc (1).
- Stochastic effects; cancer and hereditary effects (1).
- International Commission on Radiological Protection's risk factors and radiation risks in perspective (1).
- Public perception and communication of radiation risk (2).

#### Standard 3

##### **International Commission on Radiological Protection's principles of radiation protection**

- Justification (2).
- Optimisation (ALARA) (2).
- Individual dose limits (occupational and public dose limits, extremity dose limits and pregnant workers) (2).

#### Standard 4

##### **Legislative requirements and compliance monitoring**

- The *Radiation Protection Act 1965* and amendments and the *Radiation Protection Regulations 1982* (2). Particular emphasis should be placed on owner and licensee obligations.
- Role of NRL and compliance monitoring (2).
- The reporting of radiation incidents to NRL (including NRL incident report form) (2)

## Modules

### Specific 1

#### Incidents

- Review of incidents reported worldwide (1).
- Practical exercises based on plausible scenarios (2).

### Specific 8

#### Practical radiation protection (particle accelerators used for inspection)

- Radiation safety plans (2). In particular, reference should be made to *Code of Safe Practice for the Use of X-ray Security and Inspection Systems, NRL C16, 2001* and associated *Guidance Notes: Safe Practice for the Use of X-ray Security and Inspection Systems, 2001*.
- Radiation measurement instrumentation likely to be encountered (2).
- Performance of radiation measurements (2).
- Operational and emergency procedures (2). To include:
  - radiation surveys (initial, routine, special)
  - dosimetry programme (including personal dosimetry)
  - controlled areas (including signage) and access restriction
  - warning systems
  - interlock systems
  - emergency shutdowns.

### Specific 9

#### Particle accelerators used for inspection

- Types, principles, shielding and known hazards of operation (2).