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CODE OF SAFE PRACTICE FOR THE USE OF NUCLEAR DENSITY METERS

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1 INTRODUCTION

1.1 This *Code of safe practice* covers the use of sealed radioactive materials in instrumentation used for the measurement of moisture content and/or density of materials. They are referred to as "nuclear density meters".

1.2 The ownership and use of radioactive materials is controlled by the *Radiation Protection Act 1965* and *Radiation Protection Regulations 1982*. As well as mandatory compliance with the *Act* and *regulations*, anyone licensed to use a nuclear density meter will be required by a condition on the license to comply with this *Code*.

1.3 This *Code* stipulates the specific way in which some parts of the *Act* and *regulations* must be satisfied with respect to nuclear density meters. As well, there are further requirements that are recognised as good practice necessary for safety. All of these requirements are indicated by the word "**shall**". They are binding on **all** people licensed to use nuclear density meters. Whenever a responsibility is shared by more than one licensee, to avoid ambiguity, one person must take the role of ensuring the responsibility is carried out. This licensee is referred to in this *Code* as the **principal licensee**.

1.4 General advice on the safe use of nuclear density meters and compliance with the radiation protection legislation and this *Code* is given in *Guidance notes: safe practice for the use of nuclear density meters*.

1.5 This *Code* deals with radiation safety only. Other legislation covering hazardous substances, transport, occupational safety, protection of the environment, local body planning and other issues may overlap with the radiation protection legislation. Compliance with this *Code* in no way implies that all or any of these other requirements have been satisfied.

2 REGISTERS AND RECORDS

This section applies in conjunction with *regulation* 16.

2.1 Every licensee **shall** ensure that a full and up-to-date register is kept of all nuclear density meters for which they are responsible. The record for each meter **shall** show the following:

a) an identifying number or code;

b) the normal storage location of the nuclear density meter;

c) the radionuclide(s);

d) the activity of the source(s) with specified units (GBq, mCi, etc);

e) the date(s) at which the source(s) had the activity shown;

f) the date of manufacture;

g) the name of the (principal) licensee responsible for the nuclear density meter.

2.2 The principal licensee responsible for any nuclear density meter **shall** keep a use log showing the following:

a) the identifying number or code of the meter;

b) the name of the licensee responsible for the meter;

c) the date of removal from storage for use;

d) the name and signature of the person removing the meter for use;

e) the date of return to storage;

f) the name and signature of the person returning the meter to storage.

And in the case of transfer of the meter to another branch or it being sent away for calibration etc, the following **shall** also be entered:

g) transport details including destination;

h) details of receipt from transport.

2.3 Any licensee who takes a nuclear density meter from storage for use **shall** be responsible for completing the required entry in the log.

3 SAFETY MANAGEMENT

3.1 Storage facilities

This section applies in conjunction with *regulation* 12 and the Second Schedule of the *regulations*.

3.1.1 The facility used to store a nuclear density meter when not in use **shall** be free from other dangerous goods that may cause a hazard either to the building or to the meter.

3.1.2 The storage facility **shall** have a warning sign as prescribed in paragraph 4 of the Second Schedule of the *regulations* at every point of access.

3.1.3 The storage facility **shall** either be sufficiently well shielded or sufficiently remote from occupied areas to ensure that no person receives an effective dose exceeding 0.3 mSv per year.

3.1.4 When a nuclear density meter is temporarily stored on location it **shall** be kept in a locked building or vehicle with access under the control of the licensee.

3.2 Responsibilities for storage

3.2.1 The principal licensee **shall** ensure that storage facilities complying with *regulation* 12 and this *Code* are provided when a nuclear density meter is not in use.

3.2.2 Any licensee responsible for the use of a nuclear density meter **shall** be responsible for its security at all times while it is out of storage, and **shall** be responsible for ensuring its return to the storage facility provided when work is completed.

3.3 Labelling

This section applies in conjunction with the Second Schedule of the *regulations.*

3.3.1 A durable warning label showing the instrument model and serial number **shall** be prominently displayed on the outside of the nuclear density meter and maintained in a clean and legible condition.

3.3.2 The nuclear density meter, and the transport case, **shall** be durably labelled, marked or engraved with the owner's, licensee's, or user's name or organisation and contact telephone number.

3.3.3 The carrying or transport case for the nuclear density meter **shall** be labelled to comply with the transport of radioactive materials requirements.

3.4 Prevention of accidents involving nuclear density meters

3.4.1 The position of gauges in use on engineering projects **shall** be marked by prominently visible warning markers.

3.4.2 No nuclear density meter **shall** be left unattended in a position accessible to vehicles on a construction site.

3.5 Maintenance and servicing

3.5.1 Any maintenance or servicing of nuclear density meters that involves exposing a radioactive source or dismantling of the radioactive source mechanism **shall** be carried out only by a licensee.

3.5.2 Maintenance **shall** be done only in accordance with the instruction manual provided by the manufacturer.

3.6 Requirements for inspection and wipe testing of sources

This section applies in conjunction with *regulation* 13.

3.6.1 Each source **shall** be checked visually (subject to paragraph 3.7.2) and by wipe testing on every occasion that there is any possibility that it may have been damaged, due to equipment malfunction or accident, or by exposure to excessive levels of corrosive materials. In the absence of such justification, routine inspections **shall** be undertaken as considered necessary, but at least according to the following schedule:

a) when new if the instrument is not supplied with a test certificate;

b) then after 10 years;

c) thereafter every 2 years.

3.6.2 The licensee **shall** ensure that a record is kept of every inspection and wipe test that includes the following:

a) the unique identification of the density meter;

b) the date of inspection and test;

c) details of results;

d) the name and signature of the person carrying out the test.

3.7 Methods of inspection and wipe testing

3.7.1 Inspection and wipe testing of a nuclear density meter **shall** be carried out only by a suitably licensed person.

3.7.2 The nuclear density meter **shall** be dismantled only to the extent intended by the manufacturer, and in accordance with the instruction manual.

3.7.3 The inspection **shall** take into account the following:

a) mechanical damage;

b) distortion;

c) wear from use;

d) corrosion.

3.7.4 If any damage is revealed by the checks, all necessary measures **shall** be taken to prevent the dispersal of any radioactive material which may have leaked from the source.

3.7.5 No attempt **shall** be made to clean the surface of the source containment, until a wipe test has been done, and this has shown the absence of leakage of radioactive material.

3.7.6 The method used for wipe testing of sources **shall** be approved by NRL.

3.8 Withdrawal of a nuclear density meter from use

This section applies in conjunction with *regulation* 13(3).

3.8.1 No source **shall** be left in use if there is any evidence of leakage of more than 0.2 kBq (5 nCi) of radioactive material. If the activity is only a trace (less than 0.2 kBq), the source **shall** be tested yearly to verify the leak is not continuous.

3.9 Disposal as waste

This section applies in conjunction with *regulations* 14 and 15.

3.9.1 If a nuclear density meter must be disposed of then the licensee responsible **shall** either:

a) dispose of the radioactive sources within New Zealand only after receiving approval from NRL of the proposed disposal method; or

b) re-export the meter to the manufacturer or to another radioactive waste disposal agent.

3.9.2 The licensee responsible **shall** ensure that a nuclear density meter sent for disposal is packaged safely taking into account any damage to the encapsulation and shielding of the radioactive sources.

3.10 Safety audits

3.10.1 The principal licensee for a nuclear density meter **shall** cause to be carried out a regular safety audit that verifies the following:

a) the inventory is correct and each meter is accounted for;

b) the use log is maintained accurately by all users;

c) each meter has been wipe tested as required in *regulation* 13 and section 3.6 of this *Code* and the results recorded;

d) each nuclear density meter is used only by persons authorised to do so either by holding a licence, or by acting under the supervision or instructions of a licensee;

e) the storage facility complies with *regulation* 12 and section 3.1 of this *Code;*

f) the labelling requirements of the Second Schedule of the *regulations* and section 3.3 of this *Code* are being met.

3.10.2 The audit (paragraph 3.10.1) **shall** be carried out at least annually.

4 OPERATOR SAFETY

4.1 General requirements

4.1.1 A nuclear density meter **shall** be used only for the purpose intended, and in accordance with the manufacturer's instruction manual.

4.1.2 A nuclear density meter **shall** not be dismantled for any reason except by a person who is trained to do so safely.

4.2 Use by an unlicensed person under the instructions of a licensee

This section applies in conjunction with Section 13(1) of the *Act.*

4.2.1 The licensee responsible **shall** ensure that any unlicensed user is provided with written safety procedures that include the following information:

a) the names of users authorised to use the meter;

b) procedures to follow in case of an accident or emergency such as damage to the meter;

c) the means of contacting a licensee in case of an accident or emergency.

4.3 Personal radiation monitoring

This section applies in conjunction with *regulation* 20.

Any person using a nuclear density meter in such a way that he or she may be within 1 metre of the unshielded gamma radiation source for more than 2 hours per week **shall** be continuously monitored using a personal dosimetry method approved by NRL.

5 ACCIDENTS AND EMERGENCIES

5.1 Accidents

5.1.1 No person **shall** use a nuclear density meter unless that person has been trained in the safety procedures to follow in the case of an accident.

5.1.2 If an accident occurs involving a nuclear density meter, every reasonable measure **shall** be taken to minimise possible exposure of personnel to radiation, and to prevent the release, or additional release, of radioactive material from the source encapsulation.

5.1.3 If an accident occurs that causes substantial mechanical damage to a nuclear density meter, the meter **shall** be inspected and wipe-tested before removal from the accident site.

5.2 Fire and civil defence emergencies

5.2.1 The principal licensee **shall** ensure that written procedures for safeguarding the sources in case of fire or other emergencies are contained in the company's procedure manual for fire and civil defence emergencies.

CROSS-REFERENCE INDEX

The regulatory framework for this *Code* is provided by the radiation protection legislation.

This index provides references to specific parts of the legislation, some of which, while not directly cited in the *Code*, do provide the regulatory authority for its requirements. It also indicates where practical compliance information can be found in the *Guidance notes*.

The references are from this *Code of safe practice for the use of nuclear density meters, NRL C15* to:

- *Radiation Protection Act 1965;*
- *Radiation Protection Regulations 1982;*
- *Guidance notes: safe practice for the use of nuclear density meters* (NRL, June 2000).

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