

Code of Practice for the Security of Radioactive Material

Draft for consultation

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This consultation document

This document sets out possible wording for a new code of practice to be issued under the Radiation Safety Act 2016 for the security of radioactive material and nuclear material in use, storage and transport. Section 86(2) of the Act requires that anyone likely to be affected by the code is consulted before it is issued. The purpose of this document is to provide suggestions to assist in that consultation process.

The Introduction to the Code, Key roles, Definitions, Security management and Security system sections set out the proposed wording for the new code. The Submission form contains specific questions that submitters may wish to answer. These questions are included for convenience only and submitters should feel free to provide any information they feel is relevant to the development of the code.

The consultation period concludes on 16 August 2019. Please ensure that submissions are sent to the Office of Radiation Safety by then.

Introduction to the Code

Purpose and commencement

This Code of Practice for the Security of Radioactive Material is issued by the Director for Radiation Safety under section 86 of the Radiation Safety Act 2016. It provides operational details on compliance with the security requirements in sections 11 and 12 of the Act, which relate to the security of radioactive material. The requirements in this code do not limit the general nature of the requirements in those sections of the Act. This code comes into force on a date to be determined following the consultation period.

Scope

This code applies to the security of radioactive material, associated facilities and activities for the prevention of malicious acts intended or likely to cause harmful radiological consequences. Radioactive material includes sealed radioactive sources, unsealed radioactive sources, nuclear material and radioactive waste. The code applies throughout the lifetime of the radioactive material whether it is in use, storage or transport.

The following are excluded from the scope of this code:

- safety and security of irradiating apparatus
- safety of radioactive material.

Contact

The Director's contact details are:

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Key roles

The following individuals and bodies have roles and responsibilities in relation to this code.

Managing entity – the legal entity that manages or controls radiation sources whether they are in use, storage or transport. For material in use and storage, this is the person or organisation that must obtain a source licence as required by section 13(a) of the Act. For material in transport, this could be the consignor, carrier or consignee, depending on who is managing and controlling the material for the time being and, therefore, has prime responsibility for its security.

Office of Radiation Safety – New Zealand’s regulatory body for the security of radioactive material and nuclear material.

Radiation security officer - a person who is designated by the managing entity to oversee the application of regulatory requirements for the security of radioactive material and nuclear material.

Response personnel – personnel who respond to a security event such as employees of the managing entity, external contractors or officers of national organisations like New Zealand Police or New Zealand Defence Force.

Definitions

Defined terms given in **bold** have the following meanings.

A2 value – the activity value of radioactive material other than **special form radioactive material** derived from the **IAEA Transport Regulations** as set out in Appendix 3.

Associated activity – the possession, production, processing, use, storage, handling or disposal of radioactive material.

Associated facility – the place where radioactive material or nuclear material is used or stored.

D value – the activity level determined by the International Atomic Energy Agency used to categorise radioactive sources based on their potential to cause harm as set out in Appendix 3.

Defence in depth – the combination of multiple layers of systems and measures that have to be overcome or circumvented before nuclear security is compromised.

IAEA Transport Regulations – the latest edition of the Regulations for the Safe Transport of Radioactive Material issued by the International Atomic Energy Agency as No. SSR-6¹.

Insider – an individual with authorised access to associated facilities or associated activities or to sensitive information or sensitive information assets, who could commit, or facilitate the commission of a malicious act.

Malicious act – an act or attempt of unauthorised removal of radioactive material or sabotage.

Nuclear material – plutonium, uranium-233, uranium enriched in the isotope 235 or 233, uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore-residue, or any material containing one or more of the foregoing.

Plutonium – all plutonium except that with an isotopic concentration exceeding 80% in plutonium-238.

Radioactive material – material that spontaneously emits ionising radiation including sealed radioactive sources, unsealed radioactive sources, nuclear material and radioactive waste.

Sabotage – any deliberate act directed against an associated facility or an associated activity that could directly or indirectly endanger the health and safety of personnel, the public, or the environment by exposure to radiation or release of radioactive substances.

Secured area – an area with a single set of access controls in which radioactive material or nuclear material is used or stored.

Security culture – the assembly of characteristics, attitudes and behaviours of individuals, organisations and institutions that serves as a means to support, enhance and sustain nuclear security.

Security event – an event that has implications for the security of radioactive material.

Security plan – written plan maintained by the managing entity that describes the security approach and system to protect the material and complies with the requirements in Appendix 5.

Sensitive information – information, the unauthorised disclosure (or modification, alteration, destruction or denial of use) of which could compromise nuclear security or otherwise assist in the carrying out of a malicious act against a nuclear facility, organisation or transport. Such information may refer, for example, to the nuclear security arrangements at a

¹ The 2018 edition is available here https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1798_web.pdf

facility, the systems, structures and components at a facility, the location and details of transport of nuclear material or other radioactive material, or details of an organisation's personnel.

Special form radioactive material – a non-dispersible solid radioactive material or a sealed capsule containing radioactive material.

Transport – the deliberate physical movement of radioactive material or nuclear material from one place to another including in-transit storage that is incidental to that movement.

Threat – a person or group of persons with motivation, intention or capability to commit a malicious act.

Unacceptable radiological consequences – an effective dose exceeding 100 mSv received by any member of the public in the first 7 days following an event.

Unauthorised access – access or attempted access that is not inadvertent and has malicious intent.

Unauthorised removal – the theft or other unlawful taking of radioactive material.

Vulnerability assessment – evaluation and documentation of the features and effectiveness of the overall security system at a particular facility.

Security management

General

1. The managing entity must:
 - (a) take prime responsibility for the security of radioactive material and nuclear material under its management or control
 - (b) assign a security level to each:
 - (i) secured area in which radioactive material or nuclear material is to be used or stored as set out in Appendix 1
 - (ii) package in which radioactive material or nuclear material is to be transported as set out in Appendix 2
 - (c) establish a management system to enhance security that includes:
 - (i) effectively integrating security into the overall management system of the organisation
 - (ii) making a commitment to security from the highest level of management at the facility, and by providing all required resources
 - (iii) promoting continuous improvement and a security culture
 - (d) for the use and storage of radioactive material or nuclear material in secured areas that are assigned security levels A, B or C and for the transport of radioactive material or nuclear material in enhanced security packages:
 - (i) appoint a radiation security officer to oversee the application of regulatory requirements
 - (ii) consult with and engage the services of experts and interested parties as necessary.
2. The managing entity must implement security requirements:
 - (a) in proportion to the potential consequences of a malicious act
 - (b) taking account of the current threat assessment if this has been supplied by the Office of Radiation Safety
 - (c) in an integrated way ensuring radiation safety measures are not compromised
 - (d) adopting the concept of defence in depth
 - (e) to ensure that:
 - (i) the security goals in Appendix 4 are met
 - (ii) if there are two or more requirements in this code relating to the managing entity's activities then the more stringent of those requirements are applied.

Use and storage

3. For the use or storage of radioactive material or nuclear material in secured areas that are assigned security levels A, B or C, the managing entity must:
 - (a) ensure that all persons with responsibilities for security including response personnel:
 - (i) are qualified, educated and trained in security so that they understand their duties and can perform them competently
 - (ii) satisfy the training requirements in Appendix 6
 - (iii) are named in a current list with details of their qualifications, education and training
 - (iv) are notified of their duties in relation to security
 - (v) are authorised to assume their roles and responsibilities
 - (b) conduct background checks to assess the trustworthiness and reliability of all persons with security responsibilities that include:
 - (i) confirming identity with photo identification
 - (ii) verifying references
 - (iii) for security level A and security level B, commissioning a Ministry of Justice criminal record check
 - (iv) for security level A, undertaking five-yearly re-checks
 - (c) restrict access to security sensitive information by:
 - (i) identifying the information that must be protected
 - (ii) authorising persons to have access to such information
 - (iii) preventing disclosure to unauthorised persons
 - (d) establish processes for granting unescorted access to radioactive material, nuclear material or sensitive information to those who have a demonstrated need for such access
 - (e) provide access controls to restrict unescorted access to areas where radioactive material or nuclear material is present that verify a person's identity and authorisation for:
 - (i) security level A by, providing a combination of two or more verification measures that are protected against compromise such as manipulation or falsification
 - (ii) security levels B and C, by providing at least one verification measure
 - (f) provide and maintain a security plan that complies with the relevant requirements in Appendix 5
 - (g) conduct an evaluation for compliance and effectiveness, including performance testing
 - (h) establish a capability to manage and report security events.
4. For the use or storage of radioactive material or nuclear material in secured areas that are assigned security level D, the managing entity must secure the material:
 - (a) in accordance with prudent management practice

- (b) in a manner that impedes unauthorised removal.

Transport

5. For the transport of radioactive material or nuclear material in basic security packages, the managing entity must:
 - (a) provide crew members with written details of emergency contacts
 - (b) check the backgrounds of authorised individuals to ensure that they are trustworthy and reliable
 - (c) provide basic security awareness training that includes:
 - (i) the need for transport security
 - (ii) the nature of security related threats
 - (iii) methods to address security concerns and actions to be undertaken in the event of a security event
 - (d) identify and protect sensitive information
 - (e) provide adequate budget and resources, including a maintenance programme
 - (f) conduct evaluation of compliance
 - (g) ensure a capability to respond to security events
 - (h) establish a security event reporting capability.
6. For the transport of radioactive material or nuclear material in enhanced security packages, the managing entity must:
 - (a) meet the requirements in clause 5 for basic security packages
 - (b) maintain a security plan that complies with the relevant requirements in Appendix 5
 - (c) ensure the trustworthiness and reliability of authorised individuals
 - (d) ensure that all persons with responsibilities for security:
 - (i) are qualified, educated and trained in security so that they understand their duties and can perform them competently
 - (ii) satisfy the training requirements in Appendix 6
 - (iii) are named in a current list with details of their qualifications, education and training
 - (iv) are notified of their duties in relation to security
 - (v) are authorised to assume their roles and responsibilities
 - (e) conduct evaluation of compliance and effectiveness including performance testing, exercises and drills
 - (f) ensure the capability to manage security events.
7. For the transport of radioactive material or nuclear material in excepted security packages, the managing entity must secure the package in accordance with prudent management practice including:
 - (a) securing and storing the package in a manner that impedes unauthorised removal

- (b) not leaving packages or conveyances unattended for any longer than is absolutely necessary
- (c) whenever possible:
 - (i) using carriers with package tracking systems
 - (ii) using closed vehicles to keep the packages out of sight.

Security system

Unlawful removal

8. For radioactive material or nuclear material that is used or stored in secured areas that are assigned security level A, the managing entity must:
 - (a) verify and document the presence of radioactive material every day
 - (b) provide immediate detection of any unauthorised access to the secured area
 - (c) provide immediate detection of any attempted unauthorised removal of radioactive material, including by an insider
 - (d) immediately assess and verify detections under clauses 8(b) and (c)
 - (e) provide delay after detection that:
 - (i) contains at least two layers of barriers, and
 - (ii) is sufficient for response personnel to interrupt the unauthorised removal of material
 - (f) provide immediate communication to response personnel
 - (g) provide for an immediate response with sufficient capability to interrupt and defeat the adversary
 - (h) upon verification of attempted unauthorised access or attempted or actual unauthorised removal under clause 8(d):
 - (i) immediately notify the national radiation incident officer (021 393 632) and New Zealand Police and complying with their instructions
 - (ii) notify the incident to the Office of Radiation Safety.
9. For radioactive material or nuclear material that is used or stored in secured areas that are assigned security level B, the managing entity must:
 - (a) verify and document the presence of radioactive material:
 - (i) daily after field use for portable devices when used in the field
 - (ii) at least weekly in any other case
 - (b) provide immediate detection of any unauthorised access to the secured area
 - (c) provide detection of any attempted unauthorised removal of radioactive material
 - (d) immediately assess and verify detections under clauses 9(b) and (c)
 - (e) provide delay after detection that:
 - (i) contains at least two layers of barriers, and
 - (ii) is sufficient for response personnel to interrupt the unauthorised removal of material
 - (f) provide immediate communication to response personnel
 - (g) provide for an immediate initiation of response to interrupt the unauthorised removal

- (h) upon verification of attempted unauthorised access or attempted or actual unauthorised removal under clause 9(d):
 - (i) immediately notify the national radiation incident officer (021 393 632) and New Zealand Police and comply with their instructions
 - (ii) notify the incident to the Office of Radiation Safety.
10. For radioactive material or nuclear material that is used or stored in secured areas that are assigned security level C, the managing entity must:
- (a) verify and document the presence of radioactive material at least monthly
 - (b) provide detection of any unauthorised removal of radioactive material
 - (c) immediately assess and verify detections under clause 10(b)
 - (d) provide delay after detection that:
 - (i) contains at least one barrier or the presence of operator personnel, and
 - (ii) is sufficient to provide confidence that the security system will prevent unauthorised removal of material
 - (e) provide prompt communication to response personnel
 - (f) upon verification of unauthorised removal under clause 10(c):
 - (i) immediately notify the national radiation incident officer (021 393 632) and New Zealand Police and comply with their instructions
 - (ii) notify the incident to the Office of Radiation Safety.
11. For radioactive material or nuclear material that is used or stored in secured areas that are assigned security level D, the managing entity must provide confidence that the security system will prevent unauthorised removal of the material.
12. For the transport of radioactive material or nuclear material in enhanced security packages, the managing entity must:
- (a) immediately detect any unauthorised access to the package
 - (b) detect any attempted unauthorised removal of the package
 - (c) immediately assess the detections under clauses 12(a) and (b)
 - (d) verify package count and seal integrity upon delivery
 - (e) provide delay to likely prevent the unauthorised removal of the package
 - (f) provide immediate communication to response personnel
 - (g) immediately notify the national radiation incident officer (021 393 632) and New Zealand Police and comply with their instructions
 - (h) immediately initiate a response to interrupt the unauthorised removal.
13. For the transport of radioactive material or nuclear material in a basic security package, the managing entity must:
- (a) detect any unauthorised removal of the package
 - (b) verify the package count and seal integrity upon delivery
 - (c) notify any unlawful removal of the package to the Office of Radiation Safety.

Missing or lost material

14. The managing entity must:
 - (a) implement rapid and comprehensive measures to locate and recover missing or stolen material
 - (b) cooperate with and assist competent authorities, as appropriate, in their efforts to locate and recover radioactive material and nuclear material, including cooperating in on-site and off-site response.

Sabotage

15. For the use and storage of material in security level A secured areas and for the transport of enhanced security packages:
 - (a) the managing entity must determine whether an act of sabotage could result in unacceptable radiological consequences in the absence of physical protection or mitigation measures
 - (b) if an act of sabotage could result in unacceptable radiological consequences as determined in clause 15(a) the managing entity must:
 - (i) establish a contingency plan setting out the measures required to mitigate or minimise the radiological consequences
 - (ii) implement the measures identified in the contingency plan
 - (iii) notify the Office of Radiation Safety.

Appendix 1: Security level – use and storage

Radioactive material only

- Step 1 Determine the current radioactivity of each radioactive source to be used or stored in the secured area.
- Step 2 Calculate the A/D ratio for each radioactive source by dividing its radioactivity (from Step 1) by its D-Value (from Appendix 3).
- Step 3 Calculate the Adjusted A/D ratio for each radioactive source using these multipliers:

Physical parameter	Value	Multiplier
Vulnerability	High ²	10
	Moderate	1
	Low ³	0.1
Half life	Long ⁴	10
	Medium	1
	Short ⁵	0.1
Solubility	High ⁶	10
	Slight	1
	Nil	0.1

- Step 4 Calculate the Aggregate A/D ratio for all radioactive material in the secured area by adding the individual Adjusted A/D ratios from Step 3.
- Step 5 Assign a security level to each secured area in line with this table:

Aggregate A/D ratio (x)	Security level
$x \geq 1,000$	A
$1,000 > x \geq 10$	B
$10 > x \geq 1$	C
$x < 1$	D

² For example portable sources or where it is simple to remove the radioactive source from its housing

³ For example when machinery or specialist tools and knowledge are required to move the radioactive source

⁴ More than 30 years

⁵ Less than 10 days

⁶ For example salt

Nuclear material only

Step 1 Determine the mass of each item of nuclear material to be used or stored in the secured area.

Step 2 Add the individual masses from Step 1 to obtain totals for each of:

- unirradiated plutonium
- unirradiated uranium-235 enriched to 20% or more
- unirradiated uranium-235 enriched to 10% or more but less than 20%
- unirradiated uranium-235 enriched above natural but less than 10%
- unirradiated uranium-233.

Step 3 Assign security level C⁷ to the secured area if the total mass of any type of nuclear material exceeds the levels in this table:

Nuclear material type	Mass
unirradiated plutonium	15 grams
unirradiated uranium-235 enriched to 20% or more	15 grams
unirradiated uranium-235 enriched to 10% or more but less than 20%	1 kilogram
unirradiated uranium-235 enriched above natural but less than 10%	10 kilograms
unirradiated uranium-233	15 grams

Step 4 Change the assignment from Step 3 to security level D if all material that exceeds the levels in the table is in a form that is no longer usable for any nuclear activity, minimises environmental dispersal and is practicably irrecoverable.

Step 5 Assign security level D to the secured area if contains nuclear material but is not assigned security level C⁸.

⁷ New Zealand does not have any nuclear material that would require security levels A or B to be assigned.

⁸ This means that secured areas that contain only natural uranium, depleted uranium and thorium will be assigned security level D.

Radioactive material and nuclear material

- Step 1 Determine the security level for the secured area from the 'Radioactive material only' section above.
- Step 2 Determine the security level for the secured area from the 'Nuclear material only' section above.
- Step 3 Assign a security level to the secured area that is the higher of the two levels from Steps 1 and 2.

Examples

Example 1

Two Am-241 sources are stored in a safe, each with a current radioactivity of 592 GBq.

- The safe has a single set of access controls and is therefore a secured area.
- Am-241 is radioactive material but not nuclear material. The steps in the 'Radioactive material only' section apply.
- Each radioactive source has a current radioactivity of 592 GBq or 0.592 TBq (Step 1).
- The D-value for Am-241 from Appendix 3 is 0.06 TBq meaning that the A/D ratio for each radioactive source is 9.87 (Step 2).
- These sources have moderate vulnerability (multiplier of 1), a long half-life of 432 years (multiple of 10) and are not soluble (multiplier of 0.1). When all multipliers are applied the adjusted A/D ratio for each source remains at 9.87 (Step 3).
- The aggregate A/D ratio for the secured area is 19.74 (Step 4).
- Security level B is assigned to the safe because the aggregate A/D ratio exceeds 10 but is less than 1,000 (Step 5).

Example 2

A storage room contains an industrial radiography gamma camera with a 2.8 TBq Ir-192 radioactive source with depleted uranium shielding.

- The storage room has a single set of access controls and is, therefore, a secured area.
- Ir-192 is radioactive material but not nuclear material. Depleted uranium is nuclear material. The steps in the 'Radioactive material and nuclear material' section apply.
- Security level B should be assigned to the storage room for its radioactive material contents because:
 - the Ir-192 has a current radioactivity of 2.8 TBq (Step 1)
 - the D-value for Ir-192 from Appendix 3 is 0.08 TBq meaning that the A/D ratio for the source is 35 (Step 2)
 - this radioactive source has high vulnerability (multiplier of 10), a medium half life of 74 days (multiplier of 1) and is not soluble (multiplier of 0.1). When all multipliers are applied the adjusted A/D ratio remains at 35 (Step 3)

- this is the only radioactive source in the secured area and therefore the aggregate A/D ratio for the storage room is 35 (Step 4)
- security level B should be assigned because this exceeds 10 but is less than 1,000.
- Security level C should be assigned to the storage room for its nuclear material contents because:
 - depleted uranium is not listed in the table in Step 2
 - security level C should therefore be assigned (Step 5).
- The overall security level to be assigned to the storage room is security level B because this is the higher security level calculated for each of its radioactive and nuclear contents .

Appendix 2 – Security level - transport

Radioactive material only

- Step 1 Determine the current radioactivity of each radioactive source to be transported in the package.
- Step 2 Calculate the A/D ratio for each sealed radioactive source by dividing its radioactivity (from Step 1) by its D-Value (from Appendix 3).
- Step 3 Calculate the Aggregate A/D ratio for all sealed radioactive material in the package by adding the individual A/D ratios from Step 2.
- Step 4 Calculate the A/A2 ratio for each unsealed radioactive source by dividing its radioactivity (from Step 1) by its A2-Value (from Appendix 3).
- Step 5 Calculate the Aggregate A/A2 ratio for all unsealed radioactive material in the package by adding the individual A/A2 ratios from Step 4.
- Step 6 Categorise the package as an enhanced security package if the Aggregate A/D ratio exceeds 10 or the Aggregate A/A2 ratio exceeds 3,000.
- Step 7 In all other cases categorise the package as a basic security package.

Nuclear material only

- Step 1 Determine the mass of each item of nuclear material to be transported in the package.
- Step 2 Add the individual masses from Step 1 to obtain totals for each of:
- unirradiated plutonium
 - unirradiated uranium-235 enriched to 20% or more
 - unirradiated uranium-235 enriched to 10% or more but less than 20%
 - unirradiated uranium-235 enriched above natural but less than 10%
 - unirradiated uranium-233.
- Step 3 Categorise the package as an enhanced security package if the total mass of any type of nuclear material exceeds the levels in this table:

Nuclear material type	Mass
unirradiated plutonium	15 grams
unirradiated uranium-235 enriched to 20% or more	15 grams

unirradiated uranium-235 enriched to 10% or more but less than 20%	1 kilogram
unirradiated uranium-235 enriched above natural but less than 10%	10 kilograms
unirradiated uranium-233	15 grams

Step 4 Categorise the package as a basic security package if it contains nuclear material but is not categorised as an enhanced security package⁹.

Radioactive material and nuclear material

- Step 1 Determine the security classification of the package from the 'Radioactive material only' section above.
- Step 2 Determine the security classification of the package from the 'Nuclear material only' section above.
- Step 3 Categorise the package as the higher of the classifications from Steps 1 and 2.

Examples

Example 1 – Industrial radiography iridium-192 source exchange

An industrial radiography company imports a 2.8 Tbq Ir-192 radioactive source for a gamma camera. This will replace an old Ir-192 that has decayed to 100 GBq and will be returned to the supplier. The transport containers are shielded with depleted uranium.

Import package

- Ir-192 is radioactive material but not nuclear material. Depleted uranium is nuclear material. The steps in the 'Radioactive material and nuclear material' section apply.
- The imported package should be categorised as an enhanced security package for its radioactive material contents because:
 - the Ir-192 source has a current radioactivity of 2.8 TBq (Step 1)
 - Ir-192 is sealed radioactive material meaning that steps 2 and 3 apply (and steps 4 and 5 don't apply)
 - the D-value for Ir-192 from Appendix 3 is 0.08 TBq meaning that the A/D ratio for the source is 35 (Step 2)
 - this is the only radioactive source in the package and therefore the aggregate A/D ratio for the package remains at 35 (Step 3)

⁹ This means that packages that contain only natural uranium, depleted uranium and thorium will be categorised as basic security packages.

- this exceeds 10 and therefore the package is an enhanced security package.
- The imported package should be categorised as a basic security package for its nuclear material contents because:
 - depleted uranium is not listed in the table in Step 3
 - the package should therefore be categorised as a basic security package (Step 4).
- Overall the imported package is categorised as an enhanced security package because this is the higher of the two categorisations calculated above.

Export package

- The exported package should be categorised as a basic security for its radioactive material contents because:
 - the Ir-192 source has a current radioactivity of 100 GBq or 0.1 TBq (Step 1)
 - Ir-192 is sealed radioactive material meaning that steps 2 and 3 apply (and steps 4 and 5 don't apply)
 - the D-value for Ir-192 from Appendix 3 is 0.08 TBq meaning that the A/D ratio for the source is 1.25 (Step 2)
 - this is the only radioactive source in the package and therefore the aggregate A/D ratio for the package is 1.25 (Step 4)
 - this exceeds is less than 10 and therefore the package is a basic security package.
- The imported package should be categorised as a basic security package for its nuclear material contents because:
 - depleted uranium is not listed in the table in Step 3
 - the package should therefore be categorised as a basic security package (Step 4).
- Overall the exported package is categorised as a basic security package because this is the higher of the two categorisations calculated above.

Example 2 – Iodine-131 transport

A nuclear medicine department transports 200 MBq surplus I-131 to a veterinary clinic to treat a thyroid condition in a cat.

- The I-131 source has a current radioactivity of 200 MBq or 2×10^{-4} TBq (Step 1).
- I-131 is unsealed radioactive material meaning that steps 4 and 5 apply (and steps 2 and 3 don't apply).
- The A2 value for I-131 from Appendix 3 is 0.7 TBq meaning that the A/A2 ratio for the source is 2.9×10^{-4} .
- This is less than 3,000 and, therefore, the package is a basic security package (Step 5).

Example 3 – Nuclear density meter transported for field operations

A civil engineering company transports a nuclear density meter to perform field work. The meter contains two sealed radioactive sources – Am-241 with a current activity of 1.48 GBq (.00148 TBq) and Cs-137 with a current activity of 0.37 GBq (.00037 TBq).

- Both sources are sealed radioactive sources meaning that steps 2 and 3 apply (and steps 4 and 5 do not apply).

- The A/D ratios of these two sources are:
 - Am-241 - $.00148 \div 0.06 = 0.0247$
 - Cs-137 - $.00037 \div 0.1 = 0.0037$.
- The Aggregate A/D ratio for the package is 0.0284 (Step 3).
- This is less than 10 and, therefore, the package is a basic security package (Step 6 and 7).

Appendix 3 – D and A2-values

Radionuclide	D-value ¹⁰ (TBq)	A2-value ¹¹ (TBq)
Am-241	6.E-02	1.E-03
C-14	5.E+01	3.E+00
Cf-252	2.E-02	6.E-03
Co-57	7.E-01	1.E+01
Co-60	3.E-02	4.E-01
Cs-137	1.E-01	6.E-01
Gd-153	1.E+00	9.E+00
Ge-68	7.E-01	5.E-01
H-3	2.E+03	4.E+01
I-131	2.E-01	7.E-01
Ir-192	8.E-02	6.E-01
Mo-99	3.E-01	6.E-01
Pm-147	4.E+01	2.E+00
Pu-238	6.E-02	1.E-03
Pu-239/Be	6.E-02	1.E-03
Ra-226	4.E-02	3.E-03
Se-75	2.E-01	3.E+00
Sr-90 (Y-90)	1.E+00	3.E-01
Tc-99 ^m	7.E-01	4.E+00
Tl-204	2.E+01	7.E-01

¹⁰ D-values for radionuclides not listed in the table are available from https://www-pub.iaea.org/MTCD/Publications/PDF/EPR_D_web.pdf or from the Office of Radiation Safety.

¹¹ A2-values for radionuclides not listed in the table are available from https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1798_web.pdf (Table 2) or from the Office of Radiation Safety.

Appendix 4 – Security goals

Activity	Security goal
Use or storage of radioactive material or nuclear in secured areas assigned security level A	Very high level of confidence that the security system will prevent the unauthorised removal of the material
Use or storage of radioactive material or nuclear in secured areas assigned security level B	High level of confidence that the security system will prevent the unauthorised removal of the material
Use or storage of radioactive material or nuclear in secured areas assigned security level C or security level D	Confidence that the security system will prevent the unauthorised removal of the material
Transport of radioactive material or nuclear in enhanced security packages	High level of confidence that the security system will prevent the unauthorised removal of the material
Transport of radioactive material or nuclear in basic security packages	Confidence that the security system will prevent the unauthorised removal of the material

Appendix 5 – Security plans

This appendix sets out the requirements to be included in security plans as required by clauses 3(f) and 6(b). Requirements differ depending on whether radioactive material is for use and storage or for transport. If material is to be transported as well as being used or stored then the security plan must satisfy the requirements in both sections of this appendix.

Use and storage

Introduction

- Objectives of the plan – such as documenting the operation of the security system and security management measures to demonstrate compliance with the code of practice for the security of radioactive material
- Scope – brief description of the scope of the plan including its links to other relevant documents
- Preparation and updating – the process for developing, updating and approving the plan

Facility

- Description and location of radioactive material and nuclear material
- Assessed security levels assigned to each secured area
- Description of the physical features of the facility

Security management

- Description of the measures in place to meet the requirements of clauses 1 to 4 of this code including:
 - Roles and responsibilities including details of the appointed radiation security officer
 - Training and qualifications
 - Access authorisation
 - Trustworthiness and reliability
 - Information protection
 - Maintenance programme
 - Budget and resource planning
 - Evaluation for compliance and effectiveness

Security system

- Threat information if this has been provided by the regulatory body
- If applicable how the threat information is received and shared with personnel who have a need to know
- Process and methodology used to evaluate the security system
- How the security system has been designed to provide the level of protection required
- Physical measures for controlling access
- Detection, delay and alarm assessment measures

Security procedures

- Description of the written procedures for personnel who implement and maintain them

Response

- Description of response measures for all security events

Transport

Introduction

- Objectives of the plan – such as documenting the operation of the security system and security management measures to demonstrate compliance with the code of practice for security of radioactive material
- Scope – brief description of the scope of the plan including its links to other relevant documents
- Preparation and updating – the process for developing, updating and approving the plan

Shipment details

- Description of radioactive material or nuclear material
- Mode(s) of transport

Administrative requirements

- Policies and procedures
- Vulnerability and threat assessment
- Testing and evaluating the security plan
- Transport security verification
- Notification of relevant agencies

Personnel qualifications

- Trustworthiness
- Training

Responsibilities

- Organisational structure
- Allocation and transfer of responsibilities

Information management

- Information security
- Records retention

Transport security measures

- Routes
- Transport security system (conveyance, operations command and control, physical protection measures, communication and positional tracking for normal operations, maintenance and testing of systems and equipment)

Emergency response

- Emergency and contingency response
- Communications during incidents
- Reporting of threats and incidents

Appendix 6 - Training

	Security Officer				Operator			
	SLA	SLB	SLB	Tspt	SLA	SLB	SLC	Tspt
Nuclear security threats and risks	h	h	m	l	m	m	l	l
IAEA Nuclear security series publications	l	l	l	l	x	x	x	x
Radiation basics	m	m	l	m	m	m	l	l
Consequences of exposure to radiation	m	m	l	l	m	m	l	l
Physical protection	h	h	m	m	m	m	l	l
Categorisation of radioactive sources	m	m	l	l	m	m	l	l
Radioactive sources and their application	l	l	l	l	l	l	l	l
Transport security	x	x	x	h	x	x	x	m
Preventive and protective measures against insider threats	h	x	x	m	m	x	x	l
Material out of regulatory control	h	m	m	m	m	m	l	l
Information security	h	m	m	l	m	m	l	l
Security plans	m	m	m	m	l	l	l	l

Abbreviations used in this appendix

Parties

SLA – secured areas assigned security level A

SLB – secured areas assigned security level B

SLC – secured areas assigned security level C

Tspt – enhanced security transport packages

Level of knowledge

x – no requirement

l – low level of knowledge (general awareness and understanding of principles)

m – medium level of knowledge (basic understanding of the topic sufficient to influence practices undertaken)

h – high level of knowledge (detailed knowledge and understanding sufficient to be able to educate others)

Submission form

Your details

This submission was completed by: *(name)* _____

Address: *(street/box number)* _____
(town/city) _____

Email: _____

Organisation *(if applicable)*: _____

Position *(if applicable)*: _____

Additional information

I am, or I represent an organisation that is, based in:

New Zealand Australia Other *(please specify)*: _____

I am, or I represent, a: *(tick all that apply)*

Transport company Organisation that uses/stores material
 Radiation security officer Other *(please specify)*: _____

Privacy

We may publish submissions on the Ministry's website. If you are submitting as an individual, we will automatically remove your personal details and any identifiable information.

If you do not want your submission published on the Ministry's website, please tick this box:

Do not publish this submission.

Your submission will be subject to requests made under the Official Information Act. If you want your personal details removed from your submission, please tick this box:

Remove my personal details from responses to Official Information Act requests.

Please return this form:

By email to: orsenquiries@health.govt.nz (including 'security code' in the subject line)

By post to: Office of Radiation Safety, PO Box 5013, Wellington 6140.

Consultation questions

The Office of Radiation Safety is seeking comments on the following.

Scope

1. The scope of the code relates to the security of radioactive material and nuclear material in use, storage and transport. Is this appropriate?

Yes

No

If no, please provide alternative suggestions for the scope of this code.

Regulatory approach

2. The code adopts a hybrid approach including some performance-based requirements supported where necessary by prescriptive requirements? Is this appropriate?

Yes

No

If no, please provide suggestions for an alternate approach.

3. The code provides only minimal requirements in areas that don't currently apply in New Zealand. This means for example that there are minimal requirements relating to sabotage because the current inventory of material in New Zealand could not result in unacceptable radiological consequences. Is this appropriate?

Yes

No

If no, please provide suggestions for an alternate approach.

4. Do you support the use of examples in Appendices 1 and 2 to help explain complex calculations that are part of the international regime?

Yes

No

If no, please provide suggestions for an alternate approach.

Incorporation of international requirements

5. The code adopts requirements from a draft guidance document NSTO44 and NSTO48 issued by the International Atomic Energy Agency (IAEA). These are not yet in force but are expected to replace the existing guidance documents (NSS9 and NSS11) in the near future. Do you think it is appropriate to base this code on guidance that is yet to be formally issued by the IAEA?

- Yes
 No

If no, please provide suggestions for an alternate approach.

6. The draft IAEA guidance allows for the exemption of excepted packages as defined in the IAEA Transport Regulations? This is not brought forward into this code because the security requirements for basic security packages are minimal and the calculation for exempted package classification is complex. Do you think this is appropriate?

- Yes
 No

If no, please provide suggestions for an alternate approach.

Risk multipliers

7. The IAEA authorises national regulatory bodies to adjust risk calculations based on the vulnerability, half-life and solubility of radioactive material in use or storage. To achieve this the code proposes multipliers as set out in Appendix 1. Do you think these multipliers are appropriate?

- Yes
 No

If no, please provide suggestions for an alternate approach.

Training

8. The code in Appendix 6 establishes training requirements for personnel who are involved in the security of radioactive material or nuclear material. Do you think these training requirements are appropriate?

- Yes
 No

If no, please provide suggestions for an alternate approach.

Additional comments

9. a. Was the information in this code appropriately presented?
 Yes
 No
- b. Is there any other information or subject that should be included in this code?
 Yes
 No

Please provide any additional information you think is relevant.